## DEPARTMENT OF ENERGY

## Office of Energy Efficiency and Renewable Energy

## 10 CFR Part 430

**[Docket No. EE–RM–94–403]**

**RIN 1904–AA67**

## Energy Conservation Program for Consumer Products: Energy Conservation Standards for Clothes Washers

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

**ACTION:** Supplemental Advance Notice of Proposed Rulemaking.

**SUMMARY:** The Energy Policy and Conservation Act, as amended (EPCA or Act), requires the Department of Energy (DOE or Department) to consider amending the energy conservation standards for certain major household appliances. This supplemental advance notice of proposed rulemaking (ANOPR) addresses the requirement of EPCA to consider amending the energy conservation standards for clothes washers no later than five years after the date of publication of the previous final rule (May 14, 1991).

The purpose of this supplemental ANOPR is to provide interested persons with an opportunity to comment on:

First, the product classes that the Department is planning to analyze;

Second, the analytical framework, models (e.g., the Government Regulatory Impact Model (GRIM)), and tools (e.g., a Monte Carlo sampling methodology, and life-cycle-cost (LCC) and national energy savings (NES) spreadsheets) that the Department expects to use in performing analyses of the impacts of standards; and

Third, the results of preliminary analyses for life-cycle-cost, payback and national energy savings contained in the Preliminary Technical Support Document: Energy Efficiency Standards for Consumer Products: Clothes Washers (TSD) and summarized in this supplemental ANOPR.

**DATES:** Written comments must be received by February 2, 1999. The Department requests 10 copies of the written comments and, if possible, a computer disk. The Office of Codes and Standards is currently using WordPerfect 6.1.

A public hearing will be held on December 14 (1:00–4:00 p.m.) and 15 (9:00 a.m.–4:00 p.m.), 1998. See **SUPPLEMENTARY INFORMATION** for further details.

**ADDRESSES:** Written comments should be submitted to: U.S. Department of Energy, Attn: Brenda Edwards-Jones, Office of Energy Efficiency and Renewable Energy, ''Energy Efficiency Standards for Consumer Products,'' (Docket No. EE–RM–94–403), EE–431, Forrestal Building, 1000 Independence Avenue, SW, Room 1J–018, Washington, D.C. 20585, (202) 586–9127.

The public hearing will be held at the U.S. Department of Energy, Forrestal Building, 1000 Independence Avenue SW, Room 1E–245, Washington, D.C. 20585.

Copies of the Preliminary Technical Support Document: Energy Efficiency Standards for Consumer Products: Clothes Washers (TSD) may also be obtained from: U.S. Department of Energy, Office of Codes and Standards, 1000 Independence Avenue, SW, Rm 1J–018, Washington, D.C. 20585–0121, (202) 586–9127.

Public Information: The public may access the Freedom of Information Reading Room, located at the U.S. Department of Energy, Forrestal Building, 1000 Independence Avenue, SW, Room 1E–190, Washington, D.C. 20585 between the hours of 9:00 a.m. and 4:00 p.m., Monday through Friday, (except Federal holidays). Call (202) 586–6020 for information.

For more information concerning public participation in this rulemaking proceeding, see section IV, ''Public Comment Procedures,'' of this document.

**FOR FURTHER INFORMATION CONTACT:**
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**SUPPLEMENTARY INFORMATION:**

## I. Introduction

### *A. Authority*

Part B of Title III of the Energy Policy and Conservation Act, Public Law 94–163, as amended by the National Energy Conservation Policy Act, Public Law 95–619, the National Appliance Energy Conservation Act of 1987, Public Law 100–12, the National Appliance Energy Conservation Amendments of 1988, Public Law 100–357, and the Energy Policy Act of 1992, Public Law 102–486 (the Act or EPCA), created the Energy Conservation Program for Various Consumer Products other than Automobiles. 42 U.S.C. 6291–6309.

The National Appliance Energy Conservation Act of 1987 amended the Act to impose prescriptive standards (design feature requirements) for clothes washers as part of the energy conservation program for consumer products. EPCA, Section 325(g), 42 U.S.C. 6295(g). The design feature requirement that clothes washers shall have an unheated rinse option was effective for appliances manufactured on or after January 1, 1988. The Act required the Department to conduct a rulemaking by January 1, 1990, to determine if the above mentioned standards should be amended. The Act provided that any amendment to the standards would apply to products manufactured three years after the rulemaking. The Final Rule was issued on May 14, 1991, and is effective for products manufactured on or after May 14, 1994 (hereinafter referred to as the May 1991 Final Rule). 56 FR 22279. The Act also requires the Department to conduct a subsequent rulemaking no later than five years after the date of publication of the previous final rule.

Before the Department determines whether or not an energy conservation standard is economically justified, it must first solicit comments on the proposed standard. EPCA, Section 325(p), 42 U.S.C. 6295(p). Any new or amended standard is required to be designed so as to achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. EPCA, Section 325(o)(2), 42 U.S.C. 6295(o)(2). After reviewing comments on the proposal, the Department must then determine that the benefits of the standard exceed its burdens based to the greatest extent practicable, on a weighing of the following seven factors:

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

(2) The savings in operating costs throughout the estimated average life of the covered product 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 directly 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 considers relevant.

### *B. Background*

#### 1. History

The Department initiated a clothes washer rulemaking to determine if the standards (design feature requirements) imposed by the Act should be amended. The Department published an Advance Notice of Proposed Rulemaking (ANOPR) (53 FR 17712, May 18, 1988), a Notice of Proposed Rulemaking (NOPR) (54 FR 32744, August 9, 1989), and the May 1991 Final Rule. The May 1991 Final Rule mandated performance-based energy conservation standards for clothes washers. The standards specified a minimum energy factor (EF) for two of the five classes of clothes washers (top-loading standard and top-loading compact). The energy conservation standards in the May 1991 Final Rule are effective for products manufactured on or after May 14, 1994.

In the May 1991 Final Rule, the Department announced that it was accelerating the second review of energy efficiency standards for clothes washers because it became aware, after the rulemaking was closed, of a design option (horizontal-axis (H-axis) wash tub in a top-loading washer) in use in Europe that was not included in the proposed rule and upon which no comment was received. The Department did not consider establishing a standard based on the top-loading H-axis design option because this information came to the attention of the Department after the close of the comment period on the proposed rule and thus was not subject to public debate.

On September 28, 1990, the Department published an ANOPR for nine products which included the second review of energy efficiency standards for clothes washers. 55 FR 39624. In response to that notice, a number of energy efficiency advocates and appliance manufacturers requested that the Department delay the second review until a 1995–1996 time frame. The additional time was requested in order to allow manufacturers time to meet the standards in the May 1991 Final Rule which became effective on May 14, 1994, and to fully evaluate new, more energy efficient technologies such as top-loading H-axis clothes washers. This additional time, manufacturers contended, would enable them to provide more meaningful and relevant comments on the next, legislatively required, rulemaking. The Department considered the request, and by letter, dated February 26, 1992, notified the parties requesting the delay that the Department had determined that it would conduct the rulemaking on the later schedule, as requested.

On November 14, 1994, the Department issued an ANOPR to begin the second review of energy efficiency standards for clothes washers, dishwashers and clothes dryers. In this ANOPR, the Department presented the product classes that the Department planned to analyze, the analytical framework and models that the Department expected to use in performing analyses, and issues on which the Department was interested in gathering data. The Department received comments in response to this ANOPR and also collected data from the manufacturers which was compiled by the Association of Home Appliance Manufacturers (AHAM) on May 8, 1995, and July 6, 1995. (AHAM, No. 27 and 38.)

#### 2. Test Procedure

Simultaneous with the rulemaking for clothes washer standards, the Department was also in the process of revising the clothes washer test procedure. The Department needed to address a number of innovative technologies for which there were no test procedures. A number of proposals were published, one on December 22, 1993 (58 FR 67710), and another on March 23, 1995. 60 FR 15330. In its comments to the March, 1995 proposed rule, AHAM requested that DOE adopt

an additional new test procedure, based on current consumer habits, which would be used in considering the revision of the clothes washer energy conservation standards, and would go into effect upon issuance of standards.

On April 22, 1996, the Department issued a supplemental NOPR proposing such a new test procedure, Appendix J1, as well as certain additional revisions to the currently applicable test procedure in Appendix J to Subpart B of 10 CFR Part 430. 61 FR 17589. The supplemental notice was published to seek comments on whether it should adopt the AHAM recommended test procedure with certain changes. The Final Rule, published on August 27, 1997, adopted this recommendation. 62 FR 45484. Appendix J1 of the revised test procedure would go into effect upon issuance of standards. Appendix J1 includes a modified energy factor (MEF) which replaces the EF. Contrasting with the previous EF (Energy Factor) descriptor, the MEF descriptor incorporates clothes dryer energy by consideration of the remaining moisture content (RMC) of clothes leaving the clothes washer. Other substantive differences between the test procedures include using different water temperatures for testing and using cloth loads in J1 and not in J. The issuance of the Final Rule was a major step in accelerating the development of clothes washer standards because it provided the basis upon which the energy and water consumption, as well as the manufacturing costs would be submitted.

3. Process Improvement

During consideration of the fiscal year 1996 appropriations, there was considerable debate about the efficacy of the standards program. The Department of the Interior and Related Agencies Appropriations Act for Fiscal Year 1996 included a moratorium on proposing or issuing energy conservation appliance standards for the remainder of Fiscal Year 1996. *See* Pub. L. 104–134. Congress advised DOE to correct the standards-setting process and to bring together stakeholders (such as manufacturers and environmentalists) for assistance. In September 1995, the Department announced a formal effort to consider further improvements to the process used to develop appliance efficiency standards, calling on energy efficiency groups, manufacturers, trade associations, state agencies, utilities and other interested parties to provide input to guide the Department. On July 15, 1996, the Department published a Final Rule: Procedures for Consideration of New or Revised Energy Conservation Standards for Consumer Products (hereinafter referred to as the Process Rule). 61 FR 36974.

The Process Rule outlines the procedural improvements identified by the interested parties. The process improvement effort included a review of the: (1) economic models, such as the Manufacturer Analysis Model and Residential Energy Model; (2) analytical tools, such as the use of a Monte Carlo sampling methodology; and (3) prioritization of future rules. The Process Rule includes the accounting for uncertainty and variability by doing scenario or probability analysis (as detailed in the Process Rule, 10 CFR 430, Subpart C, Appendix A §§ 1(f), 4(d)(2), and 10(f)(1)). In addition, an Advisory Committee on Appliance Energy Efficiency Standards, consisting of a representative group of these interested parties, was established to make recommendations to the Secretary regarding the implementation of the Process Rule.

The clothes washer standards rulemaking is the first rule to be developed under the Process Rule. Although there were two previous ANOPRs, the Department made a commitment to use the Process Rule to the extent possible in the development of the new clothes washer standards. In this supplemental ANOPR, the Department is presenting the framework by which it will develop the standards. The framework reflects improvements and steps detailed in the Process Rule. The rulemaking process is dynamic. If timely new data, models or tools that enhance the development of standards become available, they will be incorporated into the rulemaking. For example the Advisory Committee has made several recommendations and the Department has proposed responses which are discussed in this supplemental ANOPR.

On November 15, 1996, the Department held a workshop to discuss proposed design options and a preliminary engineering analysis for clothes washers. Two reports were presented: ''Draft Report on the Preliminary Engineering Analysis for Clothes Washers'' and ''Draft Report on Design Options for Clothes Washer'' (Clothes Washer Public Workshop, No. 55 B and C). A number of concerns were raised relating to the application of the Process Rule to the clothes washer rulemaking, including the need for a review of the manufacturing impact analysis model and methodologies, and a review of non-regulatory approaches (Thiele, No. 55L, at 80), whether the manufacturing cost data collected needed to be updated (Topping, No. 55L, at 52), and whether the Department ought to continue relying on the old methods of doing the analysis. (Perlis, No. 55L at 167.)

Responding to comments from the November 1996 workshop concerning the application of the Process Rule to the clothes washer rulemaking, the Department developed an analytical framework for appliance standards rulemaking. It was presented during a clothes washer workshop held on July 23, 1997. The analytical framework describes the different analyses (e.g., the LCC, payback and national impact analyses) to be conducted (*See* Table 1), the method for conducting them, e.g., the use of a new LCC and NES spreadsheet and the relationship between the various analyses. The framework will be tailored to each rulemaking. Therefore, the same procedures will not necessarily be followed in all of the rulemakings. For example, although manufacturing cost data needs to be collected for each rulemaking, the method for collecting the data can be customized to the specific product.

TABLE 1.—CLOTHES WASHER ANALYSES UNDER PROCESS RULE

| ANOPR | NOPR | Final rule |
|---|---|---|
| Screening Analysis | Revised Pre-ANOPR Analyses (LCC and National Impacts Analyses) | Revise Analyses (LCC and National Impacts Analyses). |
| Engineering Analysis | Consumer Sub-group Analysis. | |
| Life-Cycle-Cost Analysis | Industry Cash-flow Analysis (GRIM). | |
| Preliminary National Impacts Analysis | Manufacturer Impact Analysis. | |
| | Utility Impact Analysis. | |

TABLE 1.—CLOTHES WASHER ANALYSES UNDER PROCESS RULE—Continued

| ANOPR | NOPR | Final rule |
|---|---|---|
| | Environmental Analysis. | |

The Department is in the process of developing two new spreadsheet tools in an effort to meet the objectives of the Process Rule. The first spreadsheet calculates LCC, and payback. The second one calculates national energy savings (NES). Both tools will be tailored for specific products. These spreadsheets and the results of the preliminary analysis were discussed at a clothes washer workshop held on March 11, 1998.

The Department has reviewed the recommendations made by the Advisory Committee on Appliance Energy Efficiency Standards on April 21, 1998. (Advisory Committee, No. 96). These recommendations relate to using the full range of consumer marginal energy rates (CMER) in the LCC analysis (replacing the use of national average energy prices), defining a range of energy price futures for each fuel used in the economic analyses and defining a range of primary energy conversion factors and associated emission reductions, based on the generation displaced by energy efficiency standards for each rulemaking. The Department plans to incorporate the recommendations, when appropriate, into the various rulemaking analyses.

Today's supplemental ANOPR pertains to clothes washers and utilizes the framework described in Section II. Although the November, 1994 ANOPR included clothes dryers and dishwashers, clothes washers are considered a high priority product and have been separated out to accelerate the rulemaking. Comments previously received for the September 28, 1990, ANOPR and the November 1994 ANOPR relative to clothes washers are being addressed in this document, where applicable.

## II. Clothes Washers Analyses

This section includes a general introduction to each analysis section and provides a discussion of issues relative to the clothes washer rule.

### *A. Preliminary Market and Technology Assessment*

The preliminary market and technology assessment characterizes the relevant product markets and existing technology options including prototype designs.

1. Market Assessment

*a. General.* When initiating a standards rulemaking, the Department develops information on the present and past industry structure and market characteristics of the product(s) concerned. This activity consists of both quantitative and qualitative efforts to assess the industry and products based on publicly available information. Issues to be addressed include: (1) manufacturer market share and characteristics; (2) trends in the number of firms; (3) the financial situation of manufacturers; (4) existing non-regulatory efficiency improvement initiatives; and (5) trends in product characteristics and retail markets. The information collected serves as resource material to be used throughout the rulemaking.

*b. Product Specific.* The Department reviewed existing literature and data sources to get an overall picture of the clothes washer market in the United States. Information was compiled primarily from industry publications (trade journals), government agencies, trade organizations (AHAM) and research reports. The Department gathered the following information: (1) manufacturer market share; (2) historical shipments; (3) washer sales by outlet type; (4) top retailers; (5) price distribution; (6) market saturation; (7) voluntary programs; (8) fuel distribution of water heaters; and (9) gas and electric sales of dryers (brand names). Information relating to consumer impact and voluntary programs also was obtained. The information described is discussed in the sections where it is used in the analysis. The Preliminary TSD provides additional information.

2. Technology Assessment

*a. General.* Information relative to existing technology options and prototype designs are used as inputs to the screening analysis. In consultation with interested parties, the Department develops a list of design options for consideration. All technologically feasible design options are candidates in this initial assessment.

*b. Product Specific.* This clothes washer rulemaking analysis was originally performed using the design option approach. In this approach, information is gathered on all possible energy saving design options. The Department gathered design option information from previous clothes washer analyses, trade publications, industry research organizations, product brochures from domestic and foreign manufacturers, and appliance conferences, including the International Appliance Technical Conference (IATC). Features such as high spin speed (allowing for lower remaining moisture content) and automatic fill control became important due to changes in the clothes washer test procedure. AHAM provided additional information on the energy savings potential and viability of these designs. The ''Draft Report on Design Options for Clothes Washers'' and ''Draft Report on the Preliminary Engineering Analysis for Clothes Washers'' provide details on the potential technologies. (Clothes Washer Public Workshop, No. 55B and 55C).

The technology assessment began with a study of the efficiencies of washers currently on the market. To gain greater insight and to begin creating an efficiency distribution of current product offerings, the Department used both Appendix J and J1 test procedures on nine different clothes washers; seven vertical-axis (V-axis) models and two H-axis models. Products from all five major American manufacturers were included. The complete results are given in the Preliminary TSD. The testing program results show a large variation in MEF values are possible for clothes washers with nearly identical EF ratings. The Federal Trade Commission (FTC) and manufacturers (through AHAM) also provided energy efficiency labeling information. Further descriptions of the most current data are provided in the engineering section of the Preliminary TSD.

3. Preliminary Base Case Shipments Forecast

*a. General.* The Department develops a base case forecast of product shipments in the absence of new standards. This forecast requires an assessment of the impacts of past and existing non-regulatory efforts by manufacturers, utilities and other interested parties. DOE considers information on the actual impacts of such initiatives to date, and also

considers information presented regarding the possible impacts that any existing initiatives might have in the future. Such information could include a demonstration of the steps manufacturers, distribution channels, utilities or others will take to realize such voluntary efficiency improvements.

The base case shipments forecast is used as input to the national impacts analysis, in which a forecast of annual shipments and their weighted average energy efficiency is needed to the year 2030.

*b. Product Specific.* In order to develop its base case forecast for clothes washer sales the Department reviewed: (1) Federal procurement guidelines; (2) voluntary programs (i.e., utility and consortium educational materials and/or rebates); (3) government and industry demonstration and information programs (e.g., Energy Star Program); and (4) documented discussions with organizations and individuals. Clothes washer sales will be forecasted by efficiency level for the time period of 2003 to 2030. This forecast will be more difficult for the clothes washer rulemaking, because the efficiency factor (EF) was changed to the modified energy factor (MEF). The Department has limited information concerning the energy performance of existing product offerings using the MEF descriptor. Given the vastly different nature of the variables and testing methods of the current J and future J1 test procedures, the EF values cannot be translated to MEF values. In addition, the analysis revealed a rapidly evolving market response to the introduction of new H-axis model clothes washers. In 1997, the WashWise consortium interviewed manufacturers and asked them to estimate the market share of H-axis washers in five years. WashWise is a public/private partnership between Pacific Northwest electric, gas, water and wastewater utilities, appliance manufacturers and local retailers. Their goal is to reduce the use of energy and water by encouraging consumers in Washington, Oregon, Idaho and western Montana to purchase resource-efficient washers. The results showed a large divergence of estimates ranging from a low of 5 percent to a high of 25 percent (*Coming Clean About Resource-Efficient Clothes Washers: An Initial WashWise Program and Market Progress Report-Final Report,* No. E98–003, January 28, 1998). (March 11, 1998 Workshop Material, No. 82 OO).

For the purpose of the base case forecast in the preliminary national impacts analysis, the effect of voluntary programs has been expressed as the percent of new clothes washers sold each year that will have efficiencies corresponding to those of H-axis washers. The H-axis washer is characterized using the data submitted by AHAM for a 35 percent energy reduction from the baseline MEF. The spreadsheet uses disaggregated values (i.e., water heater energy, dryer energy and mechanical energy) provided by AHAM. Disaggregated values provided by AHAM for the baseline washer are also used for the base case forecast. Calculations based on disaggregated values reflect the efficiencies of machines actually being sold which may differ from the minimum required efficiency. The preliminary base case assumes a 1.5 percent share of H-axis machines in 1995 with a 0.5 percent increase in H-axis sales every year thereafter, until 2030 (i.e., 19 percent).

The NES spreadsheet allows for changes in the distribution of efficiencies of clothes washers due to non-regulatory programs. The user specifies the percent of new clothes washer sales that will achieve the selected energy reduction (relative to the baseline washer design) in future years. In later analyses (i.e., the NOPR) the Department expects to use a distribution of current and forecasted efficiencies based on the best available information. Information is still being gathered for this task. The Department seeks comment on this forecast and welcomes any available information on current product efficiencies.

*B. Screening Analysis*

The screening analysis reviews various technologies with regard to whether they: (a) are impracticable to manufacture, install and service; (b) have an adverse impact on product utility or product availability; and (c) have adverse impacts on health and safety. The screening analysis establishes product classes, baseline units, and efficiency levels (or combinations of design options) for further analysis.

1. Product Classes

*a. General.* Product types are divided into classes using the following criteria: (a) the type of energy used; (b) capacity; and (c) performance-related features that affect consumer utility or efficiency. Different energy efficiency standards will apply to different product classes. In general, classes are defined using information obtained in discussions with appliance manufacturers, trade associations, and other interested parties.

*b. Product Specific.* The Department's three proposals regarding clothes washer product classes and a discussion of related comments follow:

- Eliminate the Semi-Automatic Top-Loading, Front-Loading and Suds Saving classes identified in the May 1991 Final Rule. The Department is proposing to eliminate certain previously defined classifications (Semi-Automatic Top-Loading, Front-Loading and Suds Saving) because they do not offer any added utility which is inherently less energy efficient and therefore would require protection from the energy conservation standards. EPCA, § 325(o)(2)(B)(I)(IV), 42 U.S.C. 6295 (o)(2)(B)(I)(IV). In the May 1991 Final Rule, these classes were not subject to minimum energy conservation standards because they represented a small portion of the market, and due to a lack of adequate information to analyze them. However, the 1988 standard requiring an unheated rinse option is still applicable to these classes. The Department has further reviewed this topic and believes that these products should be subject to the minimum energy conservation standards applicable to either compact or standard clothes washers.
- Divide all products into a Compact (less than 2.0 ft.$^3$ capacity) Class and a Standard (2.0 ft.$^3$ or greater capacity) Class. In its written comments, Whirlpool asked the Department to maintain the current efficiency requirement for the compact class due to the limited potential for energy-efficient improvements and the small market share for these products. Whirlpool also indicated that the V-axis compact clothes washer market and the manufacturing base for these products has changed since the current standards were developed. The previous stand-alone 1.6 ft.$^3$ compact V-axis clothes washer products have been replaced by a product that maintains the small cabinet (22'' width) utility and portability (via castors); however, its basket capacity is slightly larger. Because of the limited market size, Whirlpool is currently the only American manufacturer of these products. They also supply them to other appliance companies for sale under various brand names. For these reasons, the Department will revise the compact V-axis product class definition (1.6 ft.$^3$ capacity) to include all V-axis clothes washers less than 2.0 ft.$^3$ (Whirlpool, No. 69 at 3). The Department plans to increase the compact class to include all clothes washers (both V- and H-axis machines) less than 2.0 ft.$^3$ and seeks comments on this change.
- Classify H- and V-Axis clothes washers as compact or standard rather

than establish a separate class for these products. Based on current information, the Department believes that there is no basis for separate classes for H- and V-axis clothes washers. Recent and near-term product offerings, and working prototypes of horizontal and vertical axis clothes washers demonstrate large energy savings while maintaining important product features. The Department received comments suggesting that it identify V- and H-axis machines as a single product class. Whirlpool stated that the DOE's analyses to date and the recent consumer acceptance in the market of H-axis products confirm the validity of a single product class, irrespective of the axis. Whirlpool further stated that the concerns over clothes washer performance, consumer utility and reliability are unfounded in either principal or fact. (Whirlpool, No. 93 at 1.) The Natural Resources Defense Council (NRDC) stated that the ''H-axis'' design option does not affect the utility of clothes washers and it is not the only design option that can comply with the standards. According to the NRDC, the evidence does not support the establishment of different standards even if separate classes were established. (NRDC, No. 60 at 1.)

However, other commenters feel that the Department should not reject separate product classes. General Electric Appliances (GEA) indicated that the Department is proceeding as if all relevant consumer utilities are met by H-axis products already on the market or by machines planned for production. GEA further stated that the port of access is not the only relevant consumer utility that must be addressed. Many other consumer utilities, including reliability, must be addressed. (GEA, No. 88 at 2.) The Department seeks additional comments on this issue and is currently working with stakeholders to formulate a process to gather additional consumer input on the issues surrounding clothes washer utility. This process is discussed further in Section II.F.2.b.

2. Baseline Units

*a. General.* In order to analyze design options for energy efficiency improvements, the Department defines a baseline unit. For each product class, the assumed baseline unit is a unit that minimally exceeds the existing standard. To determine the characteristics of the baseline unit in this screening analysis, the Department gathered information from trade organizations, manufacturers, and consultants with expertise in specific product types.

*b. Product Specific.* The Department issued two new test procedures during the course of this rulemaking: Appendices ''J'' and ''J1.'' 62 FR 45484. (*See* Section I.B.2. on Test Procedure.) The engineering analysis for this supplemental ANOPR is based on the Appendix J1 test procedure. This test procedure calculates a MEF descriptor. Unlike its EF predecessor, the MEF uses remaining moisture content (RMC) to account for energy saved due to lower drying times and temperature use factors (TUFs). Using cloth loads and different water temperatures are among the many other substantive differences between the J and J1 test procedures. Given these different testing methods and variables, there is no computational relationship between the EF and MEF descriptors.

In order to determine the MEF value for the baseline unit, clothes washer manufacturers were asked to take a representative clothes washer with an EF as close as possible to 1.18 (current minimum EF) and perform the new J1 procedure. If no clothes washer was available with an EF value close to 1.18, they were asked to adjust the water volume, machine energy, and/or hot water volume to obtain an EF of 1.18. Five manufacturers (Amana, Frigidaire, GEA, Maytag and Whirlpool) submitted data to AHAM. AHAM mathematically averaged these values to derive an industry average MEF value of 0.817 for the baseline unit (based on an EF=1.18).

3. Design Options/Efficiency Levels

*a. General.* Following the development of an initial list of design options during the technology assessment and the screening analysis, the Department, in consultation with interested parties, will select appropriate efficiency levels (or combinations of design options) for manufacturing cost and energy use data collection.

*b. Product Specific.* This clothes washer rulemaking analysis was originally performed using the design option approach. The November 1994 ANOPR included a list of design options that could be considered in determining the potential energy savings from new clothes washers standards. Data on the cost and energy consumption of these design options were obtained from U.S. clothes washer manufacturers through AHAM on May 8, 1995 (AHAM, No. 27). At the July 13, 1995, Workshop, DOE presented a detailed design option analysis that also ranked the cost effectiveness of each option under consideration. On July 6, 1995, AHAM provided additional design option information and comments about the way the information should be interpreted. (AHAM, No. 38.)

A report using the updated design option information was presented during a screening workshop held on November 15, 1996. The report entitled, ''Draft Report on Design Options for Clothes Washers,'' used criteria laid out in the Process Rule to screen out design options and preclude them from further analysis. After the workshop, AHAM commented that the manufacturers did not believe that disclosure of the design options used to achieve a given efficiency level was practical, had value or could be released without disclosure of proprietary information. (AHAM, No. 67 at 1,2.) Since the technical approach to achieve any particular efficiency level above the baseline likely involves multiple design options specific to each company, AHAM stated that its members believed that supplying cost and energy use data for several energy levels was sufficient. Several efficiency levels were selected which corresponded approximately to the efficiency levels calculated using the design-option approach. These efficiency levels were discussed at the March 11, 1998, workshop.

It was agreed that the efficiency level approach would be used. Levels were established and utilized in the engineering analysis (*See* Section II.c.1.b).

4. Proprietary Designs

*a. General.* In its analysis, the Department considers all design options that are commercially available or present in a working prototype, including proprietary designs. Proprietary designs are fully considered in the Department's engineering and economic analyses.

*b. Product Specific.* At the November 15, 1996, workshop, it was acknowledged that Whirlpool had four patented proprietary prototype designs that used V- and H-axis platforms. Whirlpool indicated that these were working prototypes. (Whirlpool, No. 55L at 77.) On November 29, 1996, the Department sent a letter to the stakeholders with the patent numbers for the Whirlpool designs as requested during the November workshop. (DOE, No. 57.)

In response to a Department request to obtain more information, AHAM stated that it was inappropriate for its members to comment on the cost/efficiencies of the Whirlpool designs. AHAM asked that prior to seeking cost/efficiency information on these designs, DOE should verify that these clothes washer designs were viable, were able to perform their intended function and had

usage patterns and lifetimes similar to existing clothes washers. (AHAM No. 67 at 2.) At the July 1997 workshop, GEA expressed concern that the Department had not verified that the Whirlpool designs met consumer utility performance requirements. (GEA, No. 72L at 210.)

In response to these concerns, the Department witnessed efficiency testing of the prototype design conducted according to the revised DOE clothes washer test procedure. The results of the testing demonstrated that the prototype could reach efficiency levels comparable to H-axis efficiency levels. The Department also witnessed other performance tests on the Whirlpool design. Tests performed include: (1) cleanliness testing, using several different stains; (2) gentleness of action testing; and (3) and rinsability. The test results were benchmarked by conducting identical tests on two other clothes washers: A top selling V-axis model and a top selling H-axis model. The tests were conducted twice for each machine using a seven pound test load. The American Standards Testing Material ASTM–D4265 standard was used for evaluating stain and soil removal. Nine different types of stained swatches were evaluated, six samples of each stain. The cloth used was specified in the AHAM test methods in addition to various other cloths. The gentleness testing was conducted using a material with a five hole pattern cut into the swatches and was evaluated based on the number of strands present after washing. The rinsability was determined by placing the washed cloths into a high speed exacter and analyzing the residual detergent in the water exacted. In all cases, the performance of the Whirlpool design fell within the range of results obtained for the other clothes washers tested.

The Department will consider the Whirlpool prototype design in this rulemaking in the engineering and economic analyses. However, since the manufacturing costs estimates for the prototype are derived using a different approach than for other efficiency levels cost estimates, the economic analysis will be conducted separately. Further discussion on the costing of the Whirlpool prototype can be found in Section II.C.1.b.i.

*C. Engineering Analysis*

The engineering analysis first determines the maximum technologically feasible energy efficiency level and then develops cost-efficiency relationships to show the manufacturer costs of achieving increased efficiency.

1. Energy Savings Potential and Manufacturing Costs

*a. General.* The engineering analysis estimates the energy savings potential of the individual or combinations of design options not eliminated in the previous screening analysis. The Department, in consultation with stakeholders, uses the most appropriate means available to determine energy consumption, including an overall system approach or engineering modeling. Ranges and uncertainties in performance are established. The energy savings measures developed in the engineering analysis are combined with end-user costs in the LCC analysis.

The engineering analysis involves adding individual or combinations of design options to the baseline unit. A cost-efficiency relationship is developed to show the manufacturer cost of achieving increased efficiency. The efficiency levels corresponding to various design option combinations are determined from manufacturer data submittals and from DOE engineering calculations.

The Act requires that, in considering any new or amended standards, the Department must consider those that ''shall be designed to achieve the maximum improvement in energy efficiency that the Secretary determines is technologically feasible and economically justified.'' EPCA, § 325(l)(2)(A), 42 U.S.C. 6295(l)(2)(A). Therefore an essential role of the engineering analysis consists of identifying the maximum technologically feasible level. The maximum technologically feasible level is one that can be reached by the addition of efficiency improvements and/or design options, both commercially feasible and in prototypes, to the baseline units. The Department believes that the design options comprising the maximum technologically feasible level must have been physically demonstrated in at least a prototype form to be considered technologically feasible.

Three methodologies can be used to generate the manufacturing costs needed for the engineering analysis. These methods include: (1) The design-option approach, reporting the incremental costs of adding design options to a baseline model; (2) the efficiency-level approach, reporting relative costs of achieving energy efficiency improvements; and/or (3) the cost-assessment approach which requires a ''bottoms-up'' manufacturing cost assessment based on a detailed bill of materials. The Department considers public comments in determining the best approach for a rulemaking.

If the efficiency-level approach is used, the Department will select appropriate efficiency levels for data collection on the basis of: (1) Energy savings potential identified from engineering models; (2) observation of existing products on the market; and/or (3) information obtained for the technology assessment. Stakeholders will be consulted on the efficiency level selection.

The use of a design-option approach provides useful information such as the identification of potential technological paths manufacturers could use to achieve increased product energy efficiency. It also allows the use of engineering models to simulate the energy consumption of different design configurations under various user profiles and applications. However, the Department recognizes that the manufacturer cost information derived in the design-option approach does not reflect the variability in design strategies and cost structures that can exist between manufacturers. Therefore, the Department may derive additional manufacturing cost estimates from other approaches developed in consultation with interested parties.

The cost-assessment approach can be used to supplement the efficiency-level or design option approaches under special circumstances when data is not publicly available because of proprietary reasons, the product is a prototype and/or the data is not provided by the manufacturers.

*b. Product Specific.* At the workshop held on November 15, 1996, a report entitled, ''Draft Report on the Preliminary Engineering Analysis for Clothes Washers,'' was presented. This report analyzed the engineering data submitted by AHAM concerning the manufacturing cost and energy savings potential for different design strategies that combined design options. Stakeholders and peer reviewers at the workshop provided guidance on how the engineering analysis could be improved. Some manufacturers requested that the Department accept new data in replacement of the data originally supplied. (AHAM, No. 6 at 1; Whirlpool, No. 65 at 2.) New cost and performance data was available owing to recent experience in manufacturing efficient designs. It was noted that the existing data did not, as the process rule describes, consider uncertainty and variability in manufacturing costs. (Perlis, No. 55L at 161–5.) Additionally, peer reviewers commented that cost effectiveness is manufacturer specific and suggested that the Department

consider soliciting from manufacturers cost-efficiency curves that leave them free to select optimal design strategies. (Topping, No. 55H at 6.) (Gordon, No. 55I at 5.)

Following the workshop, the Department received a comment from a manufacturer which recommended that further engineering analyses for the rulemaking be focused on energy efficiency (MEF) levels and not on design options. Whirlpool also stated that cost-efficiency curves should be developed for the industry. (Whirlpool, No. 65, at 5). Whirlpool remarked that a cost-efficiency approach, which shows manufacturer costs for increased efficiency, is the most suitable because it provides a high degree of design confidentiality. It recommended that this method be used in the engineering analysis, and that the Department should abandon the practice of adding design options or combinations of options to the baseline clothes washer. (Whirlpool, No. 69 at 3). Whirlpool recommended that the data base for the engineering analysis be updated where large variabilities and/or uncertainties existed. They noted that the market has continued to evolve as many new products had been introduced since the development of the current database. (Whirlpool, No. 92 at 3).

Responding to DOE's request for comments on an approach to gathering data for the engineering analysis, AHAM stated that its members believed that supplying cost and energy use data for several energy levels was sufficient. These levels would include baseline and efficiencies of 5, 10, 15, 20, 35, 40, 45 and 50 percent above baseline. The efficiencies of 5, 10, 15 and 20 percent would apply to a V-axis clothes washer and, the efficiencies of 35, 40, 45, and 50 percent would apply to a H-axis clothes washer. (AHAM, No. 67 at 1). These efficiency levels were selected to correspond approximately to the efficiency levels calculated using the design-option approach. The Department and the manufacturers later agreed to include data for V-axis clothes washers 25 percent above the baseline to adjust for a revision to the baseline MEF from .88 to .817. A complete description of the data collection methodology including a discussion of uncertainty and variability in manufacturing costs, as well as the guidelines used to calculate manufacturing costs is included in the Preliminary TSD.

ACEEE raised concerns relative to the manufacturer cost data provided by AHAM. ACEEE stated that, in general, the average incremental retail costs for high-efficiency washers (35 percent improvement and up) seemed a bit too high based on discussions that it had with a variety of manufacturers and clothes washer technical experts. More specifically, ACEEE expressed concerns that these data show a substantial price jump between the 40 percent and 45 percent improvement cases. ACEEE believes that the 45 percent improvement level can be met with standard H-axis machines with very small incremental costs relative to the 40 percent improvement H-axis machines. It recommends that DOE collect additional data on 40 percent and 45 percent improvement machines, including reverse engineering and revising the previous measure-based engineering analysis. (ACEEE, No. 94 at 1).

The Department notes that the costs reported by AHAM at efficiency levels 40 percent and 45 percent are a representation of industry cost submitals for these levels. Also, given the changes in the test procedure, previous data from the design option engineering analysis cannot be used without causing significant concerns about accuracy and relevance. The results of the cost assessment summarized in Section II.C.1.b.i. will however provide a secondary source of manufacturing costs for several efficiency levels.

At the March 11, 1998, workshop, the Department requested cost and consumption data for V-axis clothes washers at efficiencies of 30, 35, and 40 percent above the baseline. The Department decided to make this request after receiving the results of a third-party independent testing that was conducted on top selling clothes washer models manufactured and sold in the U.S. This testing was held in order to determine if there was a correlation between the EF and the MEF descriptors defined in the test procedure (Appendix J and J1) Final Rule for clothes washers. 62 FR 45484. Since the test procedure was recently finalized, there was no information available on the MEF values for clothes washers currently on the market. This information is needed to determine a distribution of shipments. The preliminary test results indicated that there were at least two currently available V-axis models on the market that could reach efficiency levels near a 30 percent improvement level.

AHAM responded to this request for additional information on April 3 and 8, 1998. AHAM commented that the testing performed for DOE reflects an incorrect assessment of energy efficiency on current models and indicated that manufacturers could not achieve these levels with traditional V-axis clothes washers. (AHAM, No. 84 and 86). Based on follow-up testing conducted for DOE, there appears to be a significant variation in the RMC values obtained in tests even for clothes washers of the same model. DOE plans to further review this issue. Since the two models approaching a 30 percent improvement in efficiency were ''super capacity'' models, the Department will try to determine if capacity or volume effects the maximum achievable efficiency improvement in V-axis designs. The Department seeks comment on this issue.

i. Manufacturing Cost—Reverse Engineering. At the November 1996 workshop, it was acknowledged that Whirlpool had four patented proprietary, working prototype designs which included both vertical and horizontal axis platforms. (Whirlpool, No. 55L at 77). During the workshop, Whirlpool asked that the designs be included in the rulemaking analysis. It also indicated that it would be appropriate to conduct an independent study to estimate the manufacturing costs of the new designs. (Whirlpool, No. 55L at 169). Whirlpool did not see the practicality of each manufacturer estimating the cost of the Whirlpool designs. Estimates by other manufacturers would only be based on patent information. Therefore it could not be expected to produce consistency in approach or a high degree of accuracy. (Whirlpool, No. 69 at 4).

Maytag commented that the Whirlpool designs needed to be subjected to a full and complete engineering and cost analysis by DOE. Maytag requested that all manufacturers be given the opportunity to participate in this process since the cost of applying these designs to a manufacturer's own basic washer design varies greatly from manufacturer to manufacturer. (Maytag, No. 64 at 1). GEA also stated that the analysis needed to be expanded to cover the designs disclosed by Whirlpool. It further stated that only a revised method focusing on the technical know-how, manufacturing capabilities and economic strengths of individual manufacturers would permit the proper evaluation of the impacts on ''atypical manufacturers.'' (GEA, No. 63 at 7).

In response the Department conducted a ''tear-down'' manufacturing cost assessment of one of the V-axis Whirlpool prototypes. The main objective of the manufacturing cost assessment is to quantify the differential manufacturing costs of producing high efficiency clothes washers based on (1) the Whirlpool proprietary V-axis design, and (2) commercially available V- and

H-axis designs. The overall project consists of two phases:

Phase I provides detailed cost estimates for two state-of-art, high volume, V-axis washers as a baseline for further analysis. The major objective of this phase is to obtain stakeholder comment on the costing methodology and baseline costs. Preliminary results of Phase I were presented during the March 1998 workshop. The Phase I methodology and final results are presented in the Preliminary TSD.

Phase II will develop a differential cost estimate for the proprietary V-axis design and for two commercially-available H-axis clothes washers, relative to the baseline clothes washers evaluated in Phase I. This phase is currently in progress. Preliminary results will be made available for public review prior to publishing the NOPR.

Raytheon Appliances (now Alliance Laundry Systems LLC) had questions regarding a number of assumptions in the reverse engineering analysis. These assumptions concerned work shifts per day, equipment depreciation life, capacity utilization and production volume. After considering Raytheon's comments, the Department modified some of the assumptions used in the manufacturing cost assessment approach.

As suggested by Raytheon, the assumption of 2.5 shifts per day was reduced to 2.0 shifts per day. The Department agrees that 2.5 shifts per day is high based on additional visits to several clothes washer manufacturing plants and further discussions with manufacturing staff in the industry. Originally, 2.5 shifts per day was chosen based on an average of 2 shifts per day for assembly operations and 3.0 shifts per day for fabrication processes (pressing, machining, injection molding, etc.). The baseline manufacturing cost analysis has been revised to reflect an average of 2.0 shifts per day for the plant.

The assumption of a 15–17 year lifetime for baseline equipment depreciation life was not changed to 5–7 years as suggested. Based on the Department's industry structure analysis from publicly available sources, the Department believes a 5–7 year life would be considered too short for an average equipment depreciation life. Although some equipment does have a relatively short service life (hand tools ~ 1 year), an average of 15–17 years is more appropriate for the overall plant and equipment. In the analysis, various equipment depreciation lives are used depending on the specific type of equipment. When summarizing the total investment, the overall average is approximately 15 years.

As suggested by Raytheon, the 100 percent capacity utilization assumption was reduced. However it was reduced to 95 percent not 80–90 percent as proposed. Although 100 percent utilization might seem unrealistic, many operations run at or above capacity, depending on current market conditions. Since utilization is dependent on the market, the Department has reduced the utilization to 95 percent to reflect the less than ideal situation. The Department did not lower the utilization to 80 or 90 percent since current market conditions for most manufacturers would indicate higher production. Furthermore, the theoretical ''greenfield'' (entirely new) plant for the baseline unit assumed that construction and sizing were based on current sales and appropriate market forecasts.

The current assumption of a production rate of 1.5 million units per year remains unchanged even though it does not represent a smaller manufacturer such as Raytheon Appliances. The Department is aware that 1.5 million units is not representative of the smaller (or larger) manufacturers, but does represent a median volume. At this time, the Department is keeping the production volume for the ''greenfield'' plant at 1.5 million units per year; however, DOE will be investigating an alternative scenario for a low volume (<500,000 units per year) manufacturer such as Raytheon Appliances. It is important to note that the baseline value will be used to calculate a differential cost for production of a higher efficiency washer at the same production volume.

In summary, the Department has considered all the suggested corrections and made changes to the baseline analysis as deemed appropriate at this time (2.5 shifts reduced to 2.0 shifts, and 100 percent capacity utilization reduced to 95 percent). For a baseline unit, the Department's industry analysis is based on public available data (e.g., Census of Manufacturers by U.S. Department of Commerce) which indicates that equipment depreciation life should remain unchanged. The Department will be investigating the effects of lower production volumes in the NOPR analysis. A sensitivity analysis was used to evaluate each of the assumptions commented on by Raytheon. The impact of these changes on the estimate of baseline cost is approximately 3 to 4 percent.

*D. Life-Cycle-Cost (LCC) and Payback Analysis*

In determining economic justification, the Act directs the Department to consider a number of different factors, including the economic impact of potential standards on consumers. The Act also establishes a rebuttable presumption that a standard is economically justified if the additional product costs attributed to the standard are less than three times the value of the first year energy cost savings. EPCA, § 325(o)(2)(B)(iii), 42 U.S.C. 6295 (o)(2)(B)(iii).

To consider these requirements the Department calculates changes in LCCs to the consumers that are likely to result from the proposed standard and two different simple payback periods: distributions of payback periods and a payback period (which follows the test procedure without variation), calculated for purposes of the rebuttable presumption clause. The effect of standards on individual consumers includes a change in the operating expense (usually decreased) and a change in the purchase price (usually increased). The net effect is analyzed by calculating the change in LCC as compared to the base case (the current analysis compares the LCC of a new efficiency level to the AHAM baseline). Inputs to the LCC calculation include the installed consumer cost (purchase price plus installation cost), operating expenses (energy, water, sewer, and maintenance costs), lifetime of the appliance, and a discount rate.

The LCC and one of the payback periods (distribution payback) are calculated using the LCC spreadsheet model developed in Microsoft Excel for Windows 95, combined with Crystal Ball (a commercially available software program) based on actual distributions of input variables. The second payback, test procedure payback, is not calculated using Crystal Ball and input variable distributions, but is instead based on the spreadsheet option allowing single input values.

Based on the results of the LCC analysis, DOE selects candidate standard levels for a more detailed analysis. The range of candidate standard levels typically includes: (1) the most energy-efficient combination of design options or most energy-efficient level; (2) the combination of design options or efficiency level with the lowest LCC; and (3) the combination of design options or efficiency levels with a payback period of not more than three years. Additionally, candidate standard levels that incorporate noteworthy technologies or fill in large gaps

between efficiency levels of other candidate standards levels may be selected.

The payback, for purposes of the rebuttable presumption test, attempts to capture the payback to consumers affected if a new standard was promulgated. It compares the cost and energy use of clothes washers consumers would buy in the year the standard becomes effective with what they would buy without a new efficiency standard. In some cases this means comparing the baseline energy efficiency and cost with the trial standard level, in other cases the trial standard level would also be compared to a higher efficiency washer purchased without new standards (but at a lower efficiency than the trial standard level). A weighted average of these payback periods, in the year a new standard level would take effect, is considered the payback for purposes of the rebuttable presumption clause. In future analyses (for the NOPR), all of the consumer economic analysis discussed above will be based on a projected distribution of efficiencies sold at the time a new standard becomes effective (i.e., the base case).

In order to compare the LCCs to the distribution of washer efficiencies, the LCC spreadsheet will be modified to enable the user to input the market share of each washer efficiency level in 5 percent increments.

1. Life-Cycle-Cost Spreadsheet Model

*a. General.* This section describes the LCC spreadsheet model used for analyzing the economic impacts of possible standards on individual consumers. The LCC analysis is conducted using a spreadsheet model developed in Microsoft Excel for Windows 95, combined with Crystal Ball (a commercially available software program). The Model uses a Monte Carlo simulation to perform the analysis considering uncertainty and variability. The spreadsheet is organized so that ranges (distributions) can be entered for each input variable needed to perform the calculations.

In recognition that each household is unique, variability is explicitly accounted for in the model by performing the LCC calculation for a large number of individual households. A Monte Carlo simulation is used to sample individual households from the Energy Information Administration's (EIA) Residential Energy Consumption Survey (RECS) database. The results are expressed as the number of households having impacts of particular magnitudes.

The statistics provided by the 1993 RECS are based on a sample of 7,111 households from the population of all primary, occupied residential housing units in the United States. Each household is weighted so that the data properly represents the 96.6 million households in the 50 states and the District of Columbia.

The spreadsheet has the capability to sample only subsets of households for the analysis of particular sub-populations, for example, low income households. It also has the capability of isolating households in the RECS database that have a particular fuel combination of appliances (e.g., in the case of water heating and clothes drying the possible combinations of appliances include electric/electric, electric/gas, gas/electric, gas/gas, oil/electric, or oil/gas). Alternately a combination of fuel types, weighted to observed proportions can be specified, representing the entire population. The spreadsheet samples subsets of the U.S. population from the RECS to calculate the effect on sub-group populations. A description of the methodology and contents of the RECS database is contained in the Preliminary TSD.

Major inputs to the LCC analysis are: (1) consumer expense for purchasing an appliance; (2) the period of time the appliance will provide service (lifetime); (3) the value to a residential customer of saving electricity, expressed as cents per kilowatt-hour; (4) the value to a residential customer of saving gas, expressed as dollars per million British Thermal Unit (Btu); (5) the residential price of distillate; (6) energy and/or water consumption; (7) residential customer rate for water and wastewater (sewer)($/thousand gallons), excluding fixed charges; and (8) the rate at which expenditures (cash flows) are discounted to establish their present value. A more detailed discussion of the spreadsheet is contained in the Preliminary TSD.

For LCC analyses the Advisory Committee recommended that DOE use the full range of consumer marginal energy rates instead of national average energy prices. Absent consumer marginal energy rate information, the Committee recommended DOE use a range of net energy rates, calculated by removing all fixed charges. The Department agrees the use of marginal energy rates would improve the accuracy of the analysis (LCC and NES) and will attempt to determine marginal rates. The Department believes it is unknown at this point if removing fixed costs is more or less reflective of marginal rates and does not intend to take this intermediate step.

In order to develop consumer marginal energy rates, the Department proposes to collect data on current rate schedules and energy consumption. These rates will be assigned to a national sample of buildings, weighted to represent the total U.S. population of buildings. The result will be a weighted distribution of consumption by marginal rates. This approach will be applied for residential and commercial customers.

DOE proposes to obtain a sample of residential buildings from existing surveys, such as the RECS or from a commercially available database. The commercially available database is more expensive, but has significant added value in terms of assigning the buildings to states or to utilities, including a broader sample of the population, and permitting stratification of this larger sample to distinguish among some subpopulations. Each building will be assigned to a geographic region (e.g., state or utility service territory). Energy consumption by month will be included in the database for each building, in order to treat seasonal changes in consumption and rates. Peak demand will be included for commercial buildings.

Recent Federal surveys (RECS, Commercial Building Energy Consumption Survey (CBECS)) gather information by fuel on annual energy consumption and total expenditures. Total expenditures included customer and other fixed charges, energy rates, demand charges, taxes, etc. but these are not tabulated separately from each other. These surveys gathered customer bills but did not extract information on rate schedules, fixed charges or marginal rates. The Department proposes to explore the feasibility of extracting historical information on rate schedules, including the relationship between fixed charges and marginal rates to average prices. This effort, if successful, will provide information about the extent to which marginal rates differ from average prices, or from average prices less fixed charges.

Given restructuring of parts of the energy supply sector, customers may have more than one bill (e.g., one from the distribution company, and one or more from generators or suppliers). To capture complete information, future surveys are expected to gather energy pricing information directly from customers, rather than from utilities or local distribution companies. The most efficient means to collect energy pricing information in the future involves changing the current processing of the billing information so as to gather more detail from the bills, to include consumption by month and pricing

information. The pricing information would have for each customer the rate schedule including the marginal rates, fixed charges, demand charges for commercial and industrial customers, or time-of-use rates where applicable. The Department will express the need for these data in discussions with EIA concerning the design of future surveys.

Residential electricity rate schedules will be collected from Federal databases where available, or state regulatory agencies. The information obtained for each rate schedule will include any fixed charges (customer charges, etc.), block structure, and rate per kilowatt-hour (kWh) by block. Information from utilities or local distribution companies will be examined to determine: confirmation of the set of rate schedules, the number of customers by state using each rate schedule, the total electricity sales by state by rate schedule, and (if possible) monthly electricity sales by state by rate schedule.

Residential natural gas rate schedules will be collected from Federal databases where available, or state regulatory agencies. The information obtained for each rate schedule will include any fixed charges (customer charges, etc.), block structure, and rate per therm by block. Information from utilities or local distribution companies will be examined to determine: confirmation of the set of rate schedules, the number of customers by state using each rate schedule, the total gas sales by state by rate schedule, and (if possible) monthly gas sales by state by rate schedule.

Commercial and industrial electricity rate schedules will be examined in a similar process as for residential electricity rates, but with additional information to account for demand charges. The information obtained for each rate schedule will distinguish any fixed charges (customer charges, etc.), block structure, rate per kWh by block, and demand charges.

In the database of buildings, such characteristics as energy consumption and expenditures and number of customers by state or utility will be used to map a rate schedule onto each of the buildings in the national sample. The marginal rate for each building will be the block from the rate schedule corresponding to that building's monthly energy consumption.

For life cycle savings calculations, monthly energy savings will be estimated for each building. These savings will be evaluated for each building at the monthly marginal rate, using the rate schedule assigned to each building.

Until a time series of marginal rates is available, future trends in energy prices will be used to derive estimates of CMER to be used in the economic analysis of possible energy performance standards. The trend in average price (by fuel and sector) will be used to create an index relative to current prices and applied to the current range of marginal rates. In other words, it will be assumed that the marginal rates will change in proportion to the expected change in average price.

Given the uncertainty of projections of future energy prices, scenario analysis will be used to examine the robustness of possible energy efficiency standards under different energy price conditions. These scenarios will be used in the LCC and the NES calculations discussed in Section II.E.1. Each scenario will provide a self-consistent projection, integrating energy supply and demand. The scenarios will differ from each other in the energy prices that result. The Committee suggested the use of three scenarios. While many scenarios can be envisioned, specification of three scenarios should be sufficient to bound the range of energy prices.

The most recent DOE Annual Energy Outlook 1998 (AEO 1998) reference case provides a well-defined middle scenario. In addition, the range of scenarios used in the AEO will be examined to establish the scenarios with the highest and lowest energy prices in the sector and fuel of interest. As an example, for commercial products such as fluorescent lamp ballasts, commercial and industrial electricity prices will be examined. AEO scenarios will serve as the fall back high and low scenarios, and the focus of discussion with stakeholders on further refinements to the high and low bounds. The range of energy prices represented by these scenarios and the underlying assumptions will be made available to stakeholders for comment. Independent estimates of future energy prices will also be considered. Based upon stakeholder input, the underlying assumptions may be further revised. This process will result in defining a likely high and low bound on the energy price trends.

The economic analysis will be conducted using a spreadsheet for LCC, and one for NES. The future trend in energy prices assumed in each of the three scenarios will be clearly labeled and accessible in each spreadsheet. DOE and stakeholders will be able to easily substitute alternative assumptions in the spreadsheets to examine additional scenarios as needed.

Two approaches are proposed to estimate forecast marginal rates:

(1) For now, the trends from the three scenarios will be converted to indexes and applied to the current range of consumer marginal energy rates to estimate future consumer marginal energy rates. So if the trend in average residential electricity prices were to decline by 20 percent over some period of time, then the marginal rate for each household would be assumed to decline from its initial observed value by 20 percent over that same period of time.

(2) Restructuring is expected to simplify rates and to homogenize rates to some extent. That is, rates are expected to move toward the middle of the range. The index approach is subject to question if the change in the range of marginal rates varies depending upon the initial marginal rate. The current range of average residential prices is from about 2 to 14 cents per kWh. If in the future the highest current rates decline, but the lowest current rates fail to decline (or even increase) over time, then the index approach fails. A second approach can account for the differences in trends by using regional data. National Energy Modeling System (NEMS) provides regional information on average prices by sector over time. The rates for buildings, including residential households, in each region will be scaled to correspond to the future trend in average prices for that region.

*b. Product Specific.* This section discusses the approaches for analyzing the economic impacts on individual consumers from potential new clothes washer standards. A spreadsheet as described in Section II.D.1.a. is used to calculate these economic values. In future analyses, all three of the economic metrics will be compared to a base case of washer efficiencies sold in the year the new standard would take effect. In this preliminary analysis, only the test procedure payback is compared to a distribution of efficiencies forecasted to the year 2003.

i. LCC Analysis. Table 2 summarizes some of the major assumptions used to calculate the consumer economic impacts of various energy-efficiency levels. In addition a number of assumptions are discussed in more detail.

TABLE 2.—ASSUMPTIONS USED IN THE LCC PRELIMINARY ANALYSIS

| | |
|---|---|
| Start year (effective date of standard) | 2003. |
| Retail Prices: Baseline Clothes Washer | Retail Price—$421 including tax; from retail price survey. |
| Lifetime | Distribution (12–17 years). |
| Cycles Per Year | Distribution from RECS database (207–645). |
| Energy Price Trend | AEO 1998 reference case to the year 2020 with extrapolations to the year 2030. |
| Water Price | Distribution from Ernst & Young, 1994 National Water and Wastewater Rate Survey ($0.00 to $7.84 per 1000 gallons). |
| Annual Real change in Water and Sewer Cost (Water Price Escalator) | 0 percent. |
| Discount Rate | Distribution (0–15 percent). |
| Energy Consumption Per Cycle | AHAM data. |
| Variation in Household Energy Prices, Energy Use, and Water Heater Shares. | RECS data . |

*Retail Prices:* The analysis accompanying this supplemental ANOPR uses a 2-step mark-up approach to estimate retail prices. First, the manufacturing costs (i.e., full production costs) are marked up to the manufacturer price using a manufacturer mark-up. Then the manufacturer price is marked up by a retail mark-up to arrive at the retail price. The price paid by the consumer includes the sales tax in addition to the retail price. This sales tax is accounted for by using a sales tax mark-up over the retail price of the clothes washers.

In the Preliminary TSD, the Department used a fixed retail mark-up of 1.40, and a fixed mark-up of 1.052 to cover the sales tax. The manufacturer mark-up over full production costs was bound by a maximum value of 1.35, which maintains industry (manufacturer) cost structure, and a minimum value of 1.00, which represents a pass-through of full production costs. The latter includes depreciation of new capital. Recuperation of non-production costs are not included. In order to characterize the uncertainty in manufacturer mark-ups, the Department used a triangular distribution characterized by a maximum manufacturer mark-up of 1.35, a minimum manufacturer mark-up of 1.00, and a most likely mark-up of 1.18 (the average). Using a fixed retail mark-up of 1.40 and a sales tax mark-up of 1.052, the total mark-up from full production costs to consumer price ranges from a minimum of 1.473 to a maximum of 1.990.

The Preliminary TSD presents a detailed discussion on retail mark-ups. The TSD also outlines the Department's methodology for estimating manufacturer mark-ups.

In the future NOPR analyses, the Department will use a consistent set of assumptions for prices across all analysis sections (manufacturer impact, national benefits, and consumer impacts). Manufacturer prices will be marked up by a fixed retail mark-up (currently estimated at 1.40), and a sales tax mark-up (1.052) to arrive at the consumer price. Whereas the development of price scenarios for the manufacturer impact analysis will be the subject of a future workshop, the Department is considering an approach used in the 1991 Arthur D. Little report [1] to AHAM. This approach entails creating manufacturer mark-up scenarios by conducting a financial analysis using the Government Regulatory Impact Model (GRIM). The GRIM is a standard annual cash flow analysis which uses price, quantity, and cost information to assess the impact of regulatory conditions on manufacturer income and cash flow. The model calculates the actual cash flows, by year, and then determines the present value of those cash flows, both without regulations and with regulations. The post-standard retail prices required in order to achieve several scenarios will be found by running the GRIM and treating manufacturer price as a variable. Additional price (mark-up) scenarios that might be considered include: (1) the price (mark-up) resulting in maintenance of current industry value; (2) the price (mark-up) reducing industry value to zero; and (3) the price (mark-up) resulting from pass-through of incremental material, labor, and burden costs only.

The Department received three comments on the subject of manufacturer mark-up. Raytheon commented that the low end of 1.00 for the range of manufacturer mark-up should not be used. It recommended that the economic justification involve not only full production costs but all anticipated costs. (Raytheon, No. 91, at 1). GEA commented that the Department's conclusion on the estimated manufacturer price was erroneous. GEA pointed out that the Department had inexplicably transformed an average manufacturer mark-up of 1.35 into an upper bound. (GEA, No. 88 at 3–4). Whirlpool submitted that an estimation of average manufacturer mark-up of 1.18 is acceptable at this point in the rulemaking. (Whirlpool, No. 93, at 4). In response to these comments, the Department notes that a simple pass through of incremental material costs coupled with declining volumes has been suggested in a previous industry submital as the ''the most likely scenario.'' As described previously, the Department proposes to use the GRIM model to conduct scenario analysis on manufacturer mark-ups to keep the set of assumptions for all analysis sections consistent with one another. The GRIM will use price-volume interactions and manufacturers will be able to comment on the likely price scenario for different efficiency levels. Shipment data will be obtained from the NES spreadsheet model described in Section II.E.1. It may be reasonable to assume that the ability to pass through incremental costs will vary as costs increase and/or product attributes are changed.

The American Council for an Energy-Efficient Economy (ACEEE) commented that, at the March 1998 workshop, the Circuit City representative suggested that assuming an average 40 percent retail markup is probably too high. A 25 percent retail markup was more typical of the industry. The 40 percent estimate may have factored in higher markups on extended warranties and other services. (ACEEE, No. 94 at 3). In reviewing Circuit City's comment, the Department understands that the statement referred to a gross margin of 25 percent which represents a mark-up of 1.33. This is in close agreement with the Department analysis of retailer financial statements having an important component of

[1] Arthur D. Little, Inc., *Financial Impact of DOE Top Loading Horizontal Axis Standards on U.S. Washing Machine Manufacturers, Report to Association of Home Appliance Manufacturers Horizontal Axis Task Force,* August 1991. Page 19. (Speed Queen Company, No. 15, Appendix G)

appliances in their product mix ( 25.2 percent to 26.3 percent gross margin). Also, as referenced in the Preliminary TSD, this gross margin is the net of some buying and warehousing costs. At present the Department has no basis for changing the retail mark-up assumption. DOE will continue to research data sources and seeks comment on this issue.

Energy Prices: The LCC spreadsheet model samples the individual prices paid by households in RECS(93) (latest published version of RECS). These prices are updated (scaled up or down based on AEO 1998 national prices) and converted to 1997 dollars.

Energy Price Trend: Several possible fuel price scenarios are built into the LCC spreadsheet model, including: (1) constant; (2) AEO 1998 reference case; (3) Gas Research Institute 1998 (GRI 1998); (4) high growth; and (5) low growth. High growth and low growth currently refer to AEO 1998 fuel price scenarios for high and low economic growth. GEA indicated that the Department needs to take additional steps in revising the LCC analysis. Everything in recent experience shows that energy prices continue to decline faster than the forecasters' ability to discern, but the Department continues to build in high price assumptions.

ACEEE indicated that the EIA residential electricity price forecast used in the analysis is too low. It recommends that DOE focus on the EIA ''high economic growth'' case price projections. This case calls for an average residential electricity price decrease of 8.3 percent over the 1996–2010 period. (ACEEE, No. 94, at 3).

In the future, as discussed in the Department's response to the Advisory Committee, the Department will review the range of scenarios used in the AEO to establish the scenarios with the highest and lowest energy prices in the sector and fuel of interest. The most recent DOE AEO 1998 reference case provides a well-defined scenario. Sensitivities both above and below these values can also be modeled in the AEO low and high growth cases. For the above reasons AEO 1998 was used as the forecast used in the preliminary analysis. The range of energy prices represented by these scenarios and the underlying assumptions will be made available to stakeholders for comments. This process will result in defining a likely high and low bound on the energy price trend.

Water and Sewer Prices: Information on water prices is not as readily available as fuel prices information. Some utilities have large fixed charges, while others are subsidized or paid for through taxes. Furthermore, there are no standard approaches to calculating water and sewer costs. In some locations the price of water increases as consumption increases. In other areas, water price decreases with increasing consumption. Additional consideration must be given to consumers who are not connected to a municipality water supply or sewage system. In some cases, only one or the other is connected. As with other variables, the Department plans to use a range of water prices in the economic analysis to account for the variability among different households.

The main source of data on water and sewer prices is from a 1994 survey of water prices in major metropolitan areas by Ernst & Young. The Ernst and Young data was adjusted for service population, base utility charges and average household use by Al Dietemann of Seattle Water. These adjusted values are the basis for the water price used in the preliminary analysis. For the NOPR analysis DOE plans to update the 1994 prices.

Water Price Escalator: The Department has found no national level water price forecasts. Currently, DOE's analysis assumes that future water rates are constant. Whirlpool stated that recent studies (Ernst & Young, 1994 National Water and Wastewater Rate Survey; Raftelis Environmental Consulting Group, 1996 Water and Wastewater Rate Survey) show that water and wastewater charges have increased steadily each year during the period from 1986 to 1996. This trend should be expected to continue and should be reflected in the LCC calculations. (Whirlpool, No. 93 at 2).

ACEEE stated that the present analysis is much too conservative because it assumes that water prices will not increase in real terms. Submitted for the docket was a just-published study by Osann and Young which summarized typical water/sewer bills over the 1986–1996 period. ACEEE recommended that a water/sewer bill inflation rate in the 1.1—2.7 percent range (real) be incorporated into the economic analysis. (ACEEE, No. 94 at 2–3).

The study referred to in the ACEEE comment (Osann and Young) shows an average annual increase of 5.7 % for a residential water/sewer bill over the 1986–1996 time period. Since the underlying inflation rate given was 3.1% this provided an annual increase in water/sewer bills of approximately 2.6% real. In another analysis, using EPA data, in the (Osann and Young) report, infrastructure needs were estimated to be $280 billion. Accounting for the total gallons used and a discount rate, a rate increase of 1.1% (real) was estimated. The ACEEE comment refers to total cost increases and does not specify what portion of the increase can be assigned to an increase in marginal rate. The ACEEE comment recommends a water/wastewater escalation rate of 1.1 to 2.7% real but does not provide a single value or a distribution.

The Department agrees that future water prices should not be assumed to be constant and is therefore in the process of further analyzing both current prices and future escalation rates. The proposed analysis is on going and will be completed after the ANOPR is released. The proposed analysis consists of updating previous data from Ernst and Young report as adjusted by Al Dietemann, as well as the use of new data obtained from the American Water Works Association (AWWA). The Ernst and Young data is being updated by calling 125 utilities, getting their water rate schedules and their forecasts for the future, as well as any historical information available. The Department is working on combining these two data sources into one database. This data will be organized by utility and can be mapped onto either individual RECs households or onto regional areas. A distribution of water prices (as in the current analysis) will be used, as well as a distribution of escalation rates. In an attempt to be consistent with the methodology being developed for fuel rates, the Department will attempt to establish marginal water rates and water prices and escalation rates that vary with the water/wastewater utility. The Department is seeking comments concerning this approach.

*Energy consumption per cycle:* The energy use information used to calculate LCC is taken from the engineering analysis and adjusted to account for variability in field conditions. This adjustment is for the loads of laundry washed per week, which varies from house to house. It is expressed as a distribution of wash cycles per year that is obtained from the RECS.

Several comments were received on the subject of RECS data. The use of outdated RECS data, especially that related to family size and annual loads, must be discontinued if a truer picture of potential savings is to be drawn. (GEA, No. 88, at 3). Whirlpool noted that a concern was raised at the March, 1998 workshop about the use of 1993 RECS data for the distribution of gas vs. electric water heaters and dryers, family size and number of wash loads per year. Whirlpool agrees that the RECS data could be brought up to date, but this is not a high priority. Whirlpool argues that the use of the currently available

RECS data will not weaken any of the analyses for this rulemaking. (Whirlpool, No. 93 at 1). DOE intends to use updated RECS data when it becomes available.

*Manufacturing cost:* The LCC spreadsheet is organized so that a range (incorporating variability and uncertainty) can be entered to describe the manufacturing costs associated with increases in energy efficiency. Efficiency improvements over the baseline model can be selected in increments of 5 percent up to a 50 percent efficiency improvement. The cost data used was provided by manufacturers. It was then compiled and reported to the Department by AHAM.

*Operating cost:* ACEEE stated that the present analysis ignores the possibility that some consumers will use less detergent with new high-efficiency machines than with standard machines. It recommends that DOE construct two alternative scenarios (one in which no detergent will be saved and the other that assumes some consumers will use less detergent). ACEEE indicated that the Bern Kansas study provided some evidence for detergent savings. (ACEEE, No. 94 at 2). Procter and Gamble commented that the perception that detergent dosage will be reduced in horizontal axis or drum washers proportionally to water volume is invalid. While this appears to be a popular belief, the detergent dosage is not substantiated by the facts. Procter and Gamble further stated that the important impact is that users of new lower water use/energy efficient washers cannot expect to find detergent cost savings. (Procter & Gamble, No. 9 at 1). DOE seeks additional data on this issue.

ii. Payback Analysis (Distribution of Paybacks). Payback is calculated based on the same inputs used for the LCC analysis (with the difference that the values are based only on the first year the standard takes effect). The output is a distribution of payback periods. The mean payback period is also reported. Additional information is available in the LCC spreadsheet but is not reported in the Supplemental ANOPR or Preliminary TSD. This data includes charts of cash flow taking into account the changing annual fuel prices.

In order to compare the Payback Periods to the distribution of washer efficiencies, the LCC spreadsheet will be modified to enable the user to input the market share of each washer efficiency level in 5 percent increments.

iii. Rebuttable/Test Procedure Payback. The payback for purposes of the rebuttable presumption clause is calculated on the LCC spreadsheet but without using any distributions or Crystal Ball. Payback periods are first calculated between the new standard level and each washer efficiency being sold in the year 2003. The paybacks are then weighted and averaged according to the percentage of each washer efficiency sold before a new standard is enacted. Rather than distributions, single point values for the inputs are used. These values (including cycles per year, electric fuel source, etc.) will correspond to those outlined in the DOE test procedure, Appendix J1. The result is a single payback value and not a distribution. The payback is calculated for the expected effective year of the standard (e.g., 2003). Examples and further details are presented in the TSD.

With the presently available data, the baseline efficiency level is weighted with market shares of 94.5 percent for vertical axis washers (baseline) and 5.5 percent for horizontal axis washers (35 percent efficiency improvement). If available, data on a forecasted distribution of washer efficiencies in the year 2003 will be used to refine the above calculations for the NOPR analysis.

2. Preliminary Results

*a. General.* Calculation of LCC captures the tradeoff between the purchase price and operating expenses for appliances. In addition, two other measures of economic impact are calculated: distributions of payback periods and a payback period calculated for purposes of the rebuttable presumption clause. The outputs of the LCC spreadsheet include distributions of the impact for each energy efficiency level compared to the baseline. A variety of graphic displays illustrate the implications of the analysis results. These include: (1) A cumulative probability distribution showing the percentage of U.S. households which would have a net saving by owning a more energy efficient appliance, and (2) a chart depicting the variation in LCC for each efficiency level considered.

*b. Product Specific.* This section presents preliminary results for LCCs and payback periods for all efficiency levels in the engineering analysis. Since the value of most inputs are uncertain and must be represented by a distribution of values rather than a discrete value, the results presented in the Preliminary TSD are also described by a distribution of values. Tables 3 and 4 provide a brief overview by showing percentile LCCs and payback periods, respectively, for the efficiency level improvements. These tables are generated with the current LCC spreadsheet and have not yet taken into account a distribution of pre-new-standard washer efficiencies, but instead are based on the AHAM baseline value. Greater detail is provided in the Preliminary TSD.

The LCC spreadsheet calculates and reports changes in LCC (delta LCC). The output is a distribution best illustrated by the cumulative charts for LCC difference shown in the Preliminary TSD. The convention is used whereby all values in parentheses are negative. Negative delta LCCs mean that the LCC after standards is lower than that without standards (i.e., the base case).

Table 3 showing the percentiles of LCC change is best described by an example. The 0 percent value means that all delta LCCs are greater than the value shown. The value for the 50th percentile means half of the delta LCCs are higher and half are lower. The 100 percent value means that 100 percent of the calculated values of delta LCC are less than the shown value.

Taking the first row (5 percent efficiency level) as an example, the values are interpreted as follows. The value shown for 0 percent means that there is a 0 percent probability that a household will have a reduction in LCC larger than the $83 in absolute value. Toward the middle, there is a 50 percent probability that a household will have a reduction in LCC larger than $16. The 100 percent column indicates that there is a 100 percent probability that a household will have a reduction in LCC larger than $2.

The column labeled ''mean'' refers to the mean of the distribution. In other words, the average of all of the results of the Monte Carlo runs.

The column labeled ''percent with LCC less than the baseline'' establishes at what percentile there will not be any difference in LCC between the standards case and AHAM baseline (i.e., the delta LCC is 0). For example, for the first row of the table (5 percent energy efficiency increase level), there is a 100 percent probability that households will have a lower LCC if a standard were enacted. For the 50 percent efficiency level, there is a 74.2 percent probability that households will have a lower LCC (In other words, 74.2 percent of households will have a lower LCC if a 50 percent standard level is enacted).

TABLE 3.—PERCENTILE LCC

| Percent efficiency level | Change in LCC from baseline [1] shown by percentiles of the distribution of results [2] (values in $) | Percent with LCC less than baseline | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 10 | 25 | 50 | 75 | 90 | 100 | Mean |
| 5 | ($83) | ($33) | ($24) | ($16) | ($11) | ($8) | ($2) | ($19) | 100.0 |
| 10 | ($232) | ($82) | ($55) | ($36) | ($23) | ($15) | $13 | ($43) | 99.5 |
| 15 | ($402) | ($140) | ($90) | ($55) | ($33) | ($19) | $63 | ($68) | 95.6 |
| 20 | ($504) | ($161) | ($98) | ($55) | ($26) | $10 | $129 | ($67) | 86.7 |
| 25 | ($1,486) | ($465) | ($303) | ($164) | ($67) | $4 | $137 | ($205) | 89.2 |
| 35 | ($1,997) | ($639) | ($408) | ($211) | ($59) | $79 | $570 | ($252) | 83.4 |
| 40 | ($2,039) | ($649) | ($412) | ($207) | ($64) | $75 | $645 | ($253) | 83.7 |
| 45 | ($2,068) | ($606) | ($365) | ($155) | $9 | $159 | $666 | ($199) | 73.6 |
| 50 | ($2,075) | ($617) | ($374) | ($156) | $6 | $153 | $571 | ($204) | 74.2 |

[1] The baseline LCC, based on SWA of the most likely costs, is $1,554.
[2] For sample size of 10,000 trials. Energy price trends are for AEO 1998. Operating costs include water prices. No escalator is assumed for water price.

TABLE 4.—PAYBACK PERIOD

| Percent efficiency level | Payback period in years shown by percentiles of the distribution of results [1] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 10 | 25 | 50 | 75 | 90 | 100 | Mean |
| 5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 3.7 | 0.1 |
| 10 | 0.0 | 0.0 | 0.0 | 0.1 | 0.5 | 1.6 | 15.8 | 0.6 |
| 15 | 0.0 | 0.0 | 0.1 | 0.2 | 0.6 | 4.1 | 40.7 | 1.4 |
| 20 | 0.0 | 0.1 | 0.2 | 0.5 | 5.2 | 10.8 | 57.9 | 3.6 |
| 25 | 0.0 | 0.8 | 1.8 | 3.6 | 6.0 | 8.8 | 34.5 | 4.4 |
| 35 | 0.8 | 2.0 | 2.8 | 4.2 | 6.9 | 11.4 | 49.8 | 5.8 |
| 40 | 0.7 | 2.0 | 2.8 | 4.3 | 6.9 | 11.4 | 57.8 | 5.8 |
| 45 | 0.7 | 2.4 | 3.6 | 5.8 | 9.3 | 13.9 | 54.0 | 7.2 |
| 50 | 0.9 | 2.7 | 3.8 | 5.9 | 9.1 | 13.5 | 54.5 | 7.2 |

[1] For sample size of 10,000 trials. Energy price trends are for AEO 1998. Operating costs include water prices. No escalator is assumed for water price.

Table 5 below shows the simple payback for purposes of the rebuttable presumption clause. This means it follows test procedure assumptions for electric water heaters and dryers.

TABLE 5.—REBUTTABLE PRESUMPTION PAYBACK IN YEARS [1]

| Percent efficiency level | 0 percent to standard | 35 percent to standard | Weighted payback |
|---|---|---|---|
| 5 | 0.1 | NA | 0.1 |
| 10 | 0.2 | NA | 0.2 |
| 15 | 0.6 | NA | 0.6 |
| 20 | 1.8 | NA | 1.8 |
| 25 | 2.7 | NA | 2.7 |
| 35 | 3.7 | NA | 3.7 |
| 40 | 3.7 | 3.7 | 3.7 |
| 45 | 4.9 | 29.2 | 6.2 |
| 50 | 5.0 | 19.6 | 5.8 |

[1] Market shares of 94.5 percent V-axis and 5.5 percent H-axis are assumed for the year 2003.

*E. Preliminary National Impacts Analysis*

The national impacts analysis assesses the net present value (NPV) of total consumer LCC, energy (and water, if appropriate) savings and indirect employment impacts. A preliminary assessment of the aggregate impacts at the national level is conducted for the ANOPR. Analyzing impacts of Federal energy-efficiency standards requires a comparison of projected U.S. residential energy consumption with and without standards. The base case, which is the projected U.S. residential energy consumption without standards, includes the mix of efficiencies being sold at the time the standard becomes effective. Sales projections together with efficiency levels of the washers sold, are important inputs to determine the total energy consumption due to clothes washers under both base case and standards case scenarios. The differences between the base case and standards case provides the energy and cost savings. Depending on the analysis method used, the sales under a standards case projection may differ from those of a base case projection.

The Department estimates national energy and water, if applicable, consumption for each year beginning with the expected effective date of the standards. National annual energy and water savings are calculated as the difference between two projections: a base case and a standards case. Analysis includes estimated energy savings by fuel type for electricity, natural gas, and oil. Energy consumption and savings are estimated based on site energy (kWh of electricity, million Btu of natural gas or oil used in the home), then the electricity consumption and savings are converted to source energy.

DOE agrees with the Advisory Committee's recommendation that the assumption of a constant conversion factor should be dropped in favor of a conversion factor that changes from year

to year. The conversion factor would be calculated for each year of the analysis based on the generating capacity displaced and the amount of site energy saved (see detail procedure below). For future conversion factors, DOE proposes to use the following method:

(1) Start with an integrated projection of electricity supply and demand (e.g., the NEMS Annual Energy Outlook reference case), and extract the source energy consumption.

(2) Estimate projected energy savings due to possible standards for each year (e.g., using the NES spreadsheet).

(3) Feed these energy savings back to NEMS as a new scenario, specifically a deviation from the reference case, to obtain the corresponding source energy consumption.

(4) Obtain the difference in source energy consumption between this standard level scenario and the reference case.

(5) Divide the source energy savings in Btu, adjusted for class specific transmission and distribution losses, by the site energy savings in kilowatt-hours to provide the time series of conversion factors in Btu per kilowatt-hour.

The resulting conversion factors will change over time, and will account for the displacement of generating sources. Furthermore, the NES spreadsheet models will include a clearly defined column of conversion factors, one for each year of the projection. DOE and stakeholders can examine the effects of alternative assumptions by replacing this column of numbers.

Measures of impact reported include the NPV of total consumer LCC, NES and water savings, if appropriate, and indirect employment impacts. Each of the above are determined for selected trial standard levels. These calculations are done by the use of a spreadsheet tool called the NES Spreadsheet Model, which has been developed for all the standard rulemakings and tailored to each specific appliance rulemaking.

1. National Energy Savings (NES) Spreadsheet Model

*a. General.* In order to make the analysis more accessible and transparent to all stakeholders, a spreadsheet model was developed using Microsoft Excel in Windows 95 to calculate the national energy and water savings, and the national economic costs and savings from new standards. Input quantities can be changed within the spreadsheet. For example, the markup factor to determine retail price from the manufacturing cost can be easily changed in the spreadsheet. Unlike the LCC analysis, in the NES Spreadsheet, distributions are not used for inputs or outputs. Sensitivities can be demonstrated by running different scenarios.

One of the more important components of any estimate of future impact is shipments. Forecasts of shipments for the base case and the standard case need to be obtained as an input to the NES.

The most basic method for forecasting future shipments is a simple saturation-based method which assumes saturations remain unchanged and solves for a growth rate in shipments sufficient to keep saturations constant in light of population growth. There are several factors that can make this estimate inaccurate. These factors include possible changes in: the number of households, saturation levels, appliance lifetimes, prices (including operating costs), and consumer decisions about whether to repair rather than replace an appliance. Because of these complexities, and to improve on the forecasts, the following four different statistical models were studied.

Auto-Regressive Moving Average (ARIMA) Model

Under this model, a univariate time series data analysis approach is used to predict future values of a time series using only its current and past data. The advantage of the ARIMA univariate approach is that only time series data is needed to run the model. The disadvantages of this approach are that (1) historical trends may not be a good guide to the future, and (2) the model cannot explicitly account for changes in the number of households, percent of household owning washers, price, or operating expense.

AHAM has commented that it believes that the use of regression analysis is inappropriate to project shipments of washers to the year 2030. AHAM suggests that a time series (ARIMA) type model is better. AHAM commented that since the method presented at the July 23, 1997, workshop seems to be heavily based on assumptions regarding the saturation of certain housing types, the Department needs to provide these underlying assumptions prior to any calculation of NES. (AHAM, No. 76.) An ARIMA type model is among those being analyzed to obtain shipment forecasts by the Department.

Multi-Variate Time Series Fit

In addition to the ARIMA univariate process for projecting sales, a multi-variate time series data analysis was also reviewed. This analysis is based not only on sales but new housing starts as well. The advantage of the multi-variate time series method is that only two time series are needed to build the model (i.e., shipments from the previous year and the change in the number of households from the previous year). The disadvantages of this approach are that (1) again, historical trends may not be a good guide to the future, and (2) the model cannot explicitly account for replacement sales, changes in saturation, price, and operating cost.

Saturation/Lifetime Model

A saturation/lifetime (S/L) model was developed as yet another alternative for forecasting sales. The S/L model assumes that the saturation of an appliance varies with time. Appliance removals are based upon assumptions regarding the distribution of the appliance lifetimes, and the above functional form of the model allows for flexibility in that different assumptions regarding saturations and lifetimes can be used in an attempt to get the best fit to historical data. The advantages of the saturation/lifetime method are that (1) the method explicitly accounts for lifetimes, (2) housing and saturation stocks are based only on time-series data, so that different housing and saturation fits can be used to get ''good'' fits to historical sales. The disadvantages of this approach are that (1) removals must be based on assumptions about lifetimes, and (2) the model cannot explicitly account for the impact of price and operating cost on housing and saturation stocks.

Accounting Model

The accounting model seeks to forecast shipments by determining sales destined for new homes plus the additional sales meant to replace appliances being retired from service. For those sales meant for the replacement market, the model accounts for the impact of homes which are being retired from the existing housing stock. The advantages of the accounting model are that (1) it is a straightforward and simple model, (2) it explicitly accounts for new appliances separately in new houses and replacements, and (3) price and operating costs can be incorporated into saturation terms. The disadvantages of the accounting model are that (1) saturations of appliances in new and stock homes must be forecasted, (2) housing starts must be forecasted (e.g., based on AEO projections), and removals must be based on assumptions about lifetimes.

Table 6 shows the degree to which each approach accounts for different variables that impact actual shipments.

TABLE 6.—VARIABLES ACCOUNTED FOR BY DIFFERENT FORECAST APPROACHES

| Model | Variable accounted for: | | | | |
|---|---|---|---|---|---|
| | Washer sales | Number of households | Saturation | Washer life-time | Price and operating cost |
| ARIMA | X | | | | |
| Multi-variate | X | X | | | |
| Saturation/Life | X | X | X | X | |
| Accounting | X | X | X | X | X |

Among the important drivers of energy consumption are: voluntary programs promoting higher energy efficiency products and consumers response to changes in price and operating expense. The extent to which voluntary programs may increase the share of energy efficient products, prior to the implementation date of any new standards, is estimated in the base case. How consumers respond to changes in prices and operating expenses can be expressed by means of elasticities. An elasticity is the percent change in one quantity in response to a percent change in a driving variable. Elasticity will be taken into account if a method of quantifying the price elasticity can be developed or perhaps several scenarios can be modeled.

Other quantities in the NES spreadsheet are: energy price projections including an analysis of consumer marginal energy rates for each fuel (*See* Section II.D.1.a); effective date of the standard (start year); discount rate and the year of the NPV (1997); manufacturing cost; appliance purchase price; water cost and escalation rate; baseline energy use;, impacts of other appliances applicable to the rulemaking analysis; lifetime; fuel mix; and the conversion factor from site to source energy.

The energy savings and NPV are calculated from the expected date any standard level would take effect to the year 2030. Both individual year and cumulative data are generated. Output charts and tables provide: cumulative energy and water savings, (where applicable), the cost and savings per year (in a chart) and the cost and NPV due to standards.

*b. Product Specific.* The model to be used for the clothes washer rulemaking is the one described above in Section II.E.1.a. Following is a discussion of the application of this model for the clothes washer rulemaking analysis.

Table 7 shows the assumptions used in NES for the preliminary analysis which are summarized below and discussed in greater detail in the Preliminary TSD.

TABLE 7.—ASSUMPTIONS USED FOR GENERATING PRELIMINARY NATIONAL IMPACTS

| | |
|---|---|
| Fuel Price | EIA Annual Energy Outlook 1998 to the year 2020 and extrapolated to the year 2030. |
| Water Price | Average—$3.18 per 1000 gallons. |
| Discount Rate and the Year of the NPV | 7 percent discounted to the year 1997. |
| Start Year for New Standards | 2003. |
| Annual Real Change in Water & Sewer Cost (water price escalator) | 0 percent. |
| Manufacturing Cost | Shipment-weighted average of the most likely (from AHAM data). |
| Total Mark up on Manufacturer Costs. | 1.731. |
| Energy Consumption Data | AHAM data. |
| Clothes Washer Shipments | Assumed same for standards and base case (inelastic to price and energy savings). |
| Percent Horizontal-Axis Washers | 1.5 percent in 1995, increasing by 0.5 percent each year. |
| Primary Energy Conversion Factors | AEO 1998. |

*Fuel Price:* The energy price scenarios to be considered for the clothes washer analysis include: AEO 1998 reference; GRI 1998; and high and low cases (which are currently AEO high and low economic cases.) Other boundary cases may be analyzed in response to the Advisory Committee on Appliance Energy Efficiency Standards recommendations relating to defining a range of energy price futures for each fuel used in the rulemaking economic analysis. (Advisory Committee, No. 96 at 2) (*See* Section II.D.1.a). See Preliminary TSD for more information on extrapolation of prices between 2020 and 2030. The Department is planning to revise the method contained in the current spreadsheet used for the preliminary ANOPR analysis. AEO 1998 forecasts only go out to the year 2020. Since the analysis needs projections to the year 2030, other methods must be used for this time period. The Department plans to use the EIA approach to forecast fuel prices for the Federal Energy Management Program (FEMP). For petroleum prices, EIA uses the average annual growth rate of the world oil price over the years 2010 to 2020 and then adds the implied refinery and distribution markups for each petroleum product to arrive at the regional prices for the 2021 to 2030 period. Natural gas prices are similarly derived using the average annual growth of wellhead natural gas over 2010 to 2020 and adding on regional markups. Electricity prices are assumed to be constant after 2020 on the assumption that the transition to a restructured industry will have been completed.

*Annual Real Change in Water and Sewer Cost (water price escalator):* For the preliminary analysis the cost of water and the escalation rate of water prices used in the analysis is specified in Table 7. For the NOPR analysis, DOE plans to update prices and estimate future prices and escalation rates. (*See* Section II.D.b.i.)

AHAM commented that the Department cannot use water savings in its economic justification of standards. Under the provisions of NAECA, this is not a specified consideration and is no more than a side-benefit of the energy savings. (AHAM, No. 76 at 1.) The

Department believes that water savings should be accounted for. EPCA states that in determining whether a standard is economically justified the Secretary shall determine whether the benefits of the standard exceed its burdens by, to the greatest extent practicable considering ''the total project amount of energy or as applicable, water savings likely to result directly from the imposition of the standard,'' ''the need for national energy and water conservation'' and ''other factors the Secretary considers relevant.'' EPCA, § 325(o)(2)(B)(I)(III)(VI)(VII), 42 U.S.C. 6295(o)(2)(B)(I)(III)(VI)(VII).

*Clothes Washer Shipments:* In the analysis presented in the Preliminary TSD the sales forecast for the base case and the standard case are assumed to be the same. While DOE is reviewing the different models to forecast shipments, shipment forecasts were created using the Residential Energy Model (REM). The purpose for using this data is to provide some data to demonstrate the NES methodology. This data does not reflect how shipments will be determined. These forecasts will be changed for the NOPR analysis.

The accounting model is still under development as price and operating cost effects have yet to be incorporated. Research is on-going to develop new estimates of price and operating expense elasticities to account for: (1) changing the definition of operating expense to include water and wastewater rates; (2) changing the definition of the value of energy savings from average prices to marginal rates; and (3) a longer time series to include more recent data. Inasmuch as the accounting model is the only approach that will take into account price and operating costs, the Department believes it should be the primary tool for forecasting clothes washer shipments. The Department seeks comments about the determination of price and operating cost elasticities.

The base case assumes that clothes washers efficiencies will increase due to non-regulatory reasons. Voluntary programs are expected to increase the share of higher energy efficiency clothes washers sold. The Department has reviewed existing literature relating to voluntary programs (e.g., the Energy Star and WashWise Programs). See the voluntary programs section of the Preliminary TSD for a summary of this review.

Based on this review, in the preliminary analysis the impact of voluntary programs is expressed as the percent of new clothes washers each year that have efficiencies corresponding to those of H-axis washers (35 percent energy reduction from the baseline MEF). The initial share of H-axis machines is estimated to be 1.5 percent of total washer sales in 1995. The impact of voluntary programs is estimated to cause a 0.5 percent increase in H-axis share every year thereafter. The current assumption is that in 2003 the percentage of horizontal axis washers will be 5.5 percent. The energy information used in the spreadsheet is taken from the disaggregated data provided by AHAM for the standard level with the lowest efficiency H-axis model (35 percent increase in energy efficiency). Additional work is underway to estimate future efficiencies under the base case scenario. Current estimates will be revised as additional data becomes available. The Department welcomes any additional data useful for forecasting future sales of high-efficiency washers due to non-regulatory reasons.

*Primary Energy Conversion Factors:* In the spreadsheet DOE is using the AEO 1998 projections.

*Clothes Washer Lifetime:* To account for the savings over the lifetime of new clothes washer sales, the analysis continues to the year 2030. Clothes washers are expected to have a lifetime of about 12–16 years. Some washers bought in 2002—prior to the new standards—are expected to be replaced as late as 2018. In those cases, one lifetime for washers meeting the new standards will end in 2030–2034.

2. Preliminary Results

*a. General.* National energy consumption is calculated for the base case and each candidate standards level by multiplying the number of clothes washers by vintage times unit energy consumption by vintage. The vintage is the age of the washer (one-year old up to sixteen-years old). National annual energy savings are calculated as the difference between two projections: a base case (without new standards) and a standards case. Cumulative energy and water savings, if appropriate, are the sum of the annual national energy or water savings, respectively, over several time periods (e.g., 2003–2010, 2003–2020, and 2003–2030).

Once the energy savings have been determined, economic impacts are calculated. The primary metric for measuring national economic impact is the NPV. NPV (of total life-cycle costs) is the difference between the present value of the energy savings over the life of the appliance and the present value of (usually increased) initial costs of a more efficient appliance. The NPV calculations also captures any differences in installation or maintenance costs. On a national level the efficiencies and number of appliances sold each year are also taken into account. Another way of describing NPV is to determine the LCCs (for all appliances sold) with and without standards and take the difference.

Costs are typically increases in the purchase price associated with the higher energy efficiency of appliances purchased in the standards case compared to the base case. Costs are calculated as the difference in the purchase price between the base case and standards case for new appliances purchased each year multiplied by the appliance sales in the standards case. Price increases appear as negative values in the NPV.

Savings are typically decreases in operating costs associated with the higher energy efficiency of appliances purchased in the standards case compared to the base case. Total operating cost savings is the product of savings per unit and the number of units of each vintage surviving in a particular year. Savings appear as positive values in the NPV.

Net savings each year are calculated as the difference between Total Operating Cost Savings and Total Equipment Costs. The savings are calculated over the life of the appliance, accounting for the differences in yearly energy rates.

Future annual costs and savings are discounted to the present time and summed. The NPV is the difference between the present value of increased costs of a more efficient appliance and the present value of energy savings, relative to the base case expenditures. In other words the NPV resembles the difference in total consumer LCC between the base case and standards case, after correcting for any change in sales of clothes washers. NPV greater than zero indicates net savings (i.e., that the standard reduces consumer expenditures in the standards case relative to the base case). NPV less than zero indicates that the standard incurs net costs.

The elements of the NPV can be expressed in another form, as the benefit/cost ratio. The benefit is the savings in decreased energy expenses, while the cost is the increase in the purchase price due to standards relative to the base case. When the NPV is greater than zero, the benefit/cost ratio is greater than one.

*b. Product Specific.* The results shown in Table 8 below, are based on a single shipment weighted average (SWA) cost instead of a cost distribution. Below is a description of the columns in the

Preliminary National Energy Savings Results, Table 8.

The first column shows the efficiency improvement over the base case. This is the value of energy efficiency improvement based on the baseline MEF provided by AHAM.

The second column shows the energy savings in quads. This represents the amount of primary energy savings accumulated from the years 2003 to 2030. The energy savings are a result of consumers buying more efficient washers than they would normally have bought had no new standard levels been enacted.

The third column shows the water savings in trillions of gallons at the corresponding efficiency level.

The fourth column, NPV, shows the dollar savings corresponding to the energy and water savings and accounting for increase in the purchase price. The energy prices change from year to year and AEO 1998 projections of future prices are used.

The Preliminary TSD explains the results variables in greater detail and has charts to accompany the tables.

TABLE 8.—PRELIMINARY NATIONAL ENERGY SAVINGS RESULTS (2003 TO 2030 CUMULATIVE)

| Percent efficiency improvement over the base case | Energy savings (quads) | Water savings (trillion gallons) | Net present benefit (NPV) (billion 1997$) |
|---|---|---|---|
| 5 | 0.36 | 0.46 | 1.02 |
| 10 | 1.18 | 0.46 | 2.41 |
| 15 | 2.18 | 0.45 | 3.80 |
| 20 | 2.66 | 0.59 | 3.67 |
| 25 | 5.09 | 10.13 | 11.07 |
| 35 | 7.85 | 14.62 | 13.47 |
| 40 | 7.90 | 14.62 | 13.53 |
| 45 | 9.49 | 12.47 | 8.81 |
| 50 | 10.06 | 12.47 | 9.07 |

3. Indirect Employment Impacts

*a. General.* The July 1996 Process Rule includes employment impacts among the factors to be considered in selecting a proposed standard. The Department estimates the impacts of standards on employment for appliance manufacturers, relevant service industries, energy suppliers, and the economy in general. Employment impacts are separated into indirect and direct impacts. Direct employment impacts would result if standards lead to a change in the number of employees at manufacturing plants and related supply and service firms. Direct impacts will be further discussed in the section on manufacturing analysis. Indirect impacts are impacts on the national economy other than in the manufacturing sector being regulated. Indirect impacts may result from both expenditures shifting among goods (substitution effect), and income changing, which will lead to a change in overall expenditure levels (income effect).

Indirect employment impacts from standards are defined as net jobs eliminated or created in the general economy as a consequence of increased spending on the purchase price of appliances and reduced household spending on energy. New appliance standards are expected to increase the purchase price of appliances (retail price plus sales tax, and installation). The same standards are also expected to decrease energy consumption, and therefore reduce household expenditures for energy. Over time, the increased purchase price is paid back through energy savings. The savings in energy expenditures may be spent on other items. Using an input/output model of the U.S. economy, this analysis seeks to estimate the effects on different sectors, and the net impact on jobs. National impacts will be estimated for major sectors of the U.S. economy. Public and commercially available data sources and software will be utilized to estimate employment impacts. At least three scenarios will be analyzed to bound the range of uncertainty in future energy prices. All methods and documentation will be made available for review.

*b. Product Specific.* For purposes of national impact analysis, possible indirect employment impacts for appliance manufacturers, relevant service industries, energy suppliers, and the economy in general (i.e., national employment) due to efficiency standards will be analyzed. The Department is proposing to use a model, which focuses on those sectors of the economy most relevant to buildings, developed by the Office of Building Technologies and State Programs. This software, IMBUILD, is a PC-based economic analysis system that characterizes the interconnections among 35 sectors as national input-output structural matrices. The model can be applied to future time periods. The IMBUILD output includes employment, industry output, and wage income. The impacts of new appliance standards are estimated in the NES spreadsheet as household energy savings (reduced energy expenditures), and increased appliance purchase price. These impacts are output from NES and input to IMBUILD. Additional detail is provided in the Preliminary TSD.

*F. Consumer Analyses*

The consumer analysis evaluates impacts to any identifiable groups, such as consumers of different income levels, who may be disproportionately affected by any national energy efficiency standard level.

The Department could evaluate variations in regional energy prices, water and sewer prices, variations in energy use and variations in installation costs that might affect the NPV of a standard to consumer sub-populations. To the extent possible, DOE obtains estimates of the variability in each input quantity and considers this variability in its calculation of consumer impacts. The analysis is structured to answer questions such as: How many households are better off with standards and by how much? How many households are not better off and by how much? The variability in each input quantity and likely sources of information are discussed with stakeholders.

Variations in energy use for a particular appliance can depend on factors such as: climate, type of household, people in household, etc. Annual energy use can be estimated by a calculation based on an accepted test procedure or it can be measured directly in the field. The Department could perform sensitivity analyses to consider how differences in energy use will affect sub-groups of consumers.

The impact on consumer sub-groups will be determined using the LCC spreadsheet model. Details of this model are explained in the LCC section of the Preliminary TSD. Of particular interest is the potential effect of standards on households with different income levels.

1. Purchase Price

*a. General.* The Department will be sensitive to increases in the purchase price to avoid negative impacts to identifiable population groups, such as consumers of different income levels. Additionally, the Department will assess the likely impacts of an increased purchase price on product sales and fuel switching.

*b. Product Specific.* In order to determine the effect of an increase in the purchase price, it would be useful to know what the elasticity of clothes washer prices is. The Department is still determining how these data could be obtained. While preliminary analyses indicate that factors, such as the current state of the economy have a greater correlation to sales of washers than do an increase in clothes washer prices, it is still important to estimate the impact

of changing prices on the sales of clothes washers. In making estimates of these price effects, the Department needs to gauge the difference in clothes washer sales from a change in the price of all clothes washers, as could result from revised energy efficiency standards. In addition, the Department will be estimating how price changes from revised energy efficiency standards for clothes washers will affect the behavior of consumers.

2. Consumer Participation

*a. General.* The Department seeks to inform and involve consumers and consumer representatives in the process of developing standards. This includes notification of consumer representatives during the rulemaking process and where appropriate, seeking direct consumer input.

*b. Product Specific.* The Act requires that ''the Secretary consider, among other factors, if any lessening of the utility or the performance of the products is likely to result from the imposition of the standard. EPCA, § 325 (o)(2)(B)(I)(3), 42 U.S.C. 6295 (o)(2)(B)(I)(3). In this rulemaking because comments have been received specifically to the consumer utility and performance of V- and H-axis clothes washers, the Department reviewed existing literature pertaining to these issues.

The Department has made available a ''Draft Report on Consumer Research for Clothes Washers.'' This document is included in the appendix of the Preliminary TSD. The report summarizes research relative to consumer satisfaction with H-axis washing machines. Sources and projects summarized in the report include:

- Major studies by consortia,
- Individual utility demand side management & market transformation studies,
- Consumer test publications,
- Trade organizations, and
- Government projects.

Based on the December 1997 Advisory Committee meeting, the Consumer Subcommittee made two key recommendations to obtain consumer input:

(1) Adopt a three-step process:

- Obtain background research
- Hold focus groups
- Conduct interviews/surveys.

(2) Initiate the consumer analysis process in the clothes washer rule.

In accordance with the Advisory Committee's recommendations, the Department reviewed background information regarding consumer issues related to clothes washers as discussed in the ''Draft Report on Consumer Research for Clothes Washers.'' At the March 11, 1998, Clothes Washer Workshop, the background research findings were presented and a working group was formed to develop a method for obtaining additional consumer input pertinent to the rule. Two comments were received on the subject of additional consumer research. ACEEE found the body of existing studies to be fairly compelling, and did not see a need for extensive additional work. (ACEEE, No. 94 at 4). Raytheon recommended that consumer purchase studies should involve consumers at all income levels and be made using existing retail prices excluding rebate incentives, for both V-axis and H-axis clothes washers. (Raytheon, No. 91 at 2).

The working group held a conference call on April 30, 1998, to evaluate different techniques for obtaining consumer input. Focus groups, surveys, and a conjoint analysis were all considered. The working group recommended a three-step approach for obtaining additional consumer input:

(1) Develop a list of attributes. Based on the working groups' individual members' research and knowledge. Each member has submitted a list of clothes washer attributes valued by consumers,

(2) Conduct a consumer survey to refine the list of attributes that would be included in a quantitative consumer analysis study,

(3) Conduct a conjoint analysis to quantitatively estimate the value consumers place on the clothes washer attributes.

The Department must first announce the process to use for conducting any type of public survey in the **Federal Register** notice in accordance with the requirements of the Paperwork Reduction Act of 1995, Public Law 104–13 (44 U.S.C. 3506(c)(2)(A)). This will be a separate notice which is in process of being published. The Department will then solicit bids for a marketing research firm to conduct the focus groups to refine the list of attributes and to conduct the conjoint analysis.

*G. Manufacturer Impact Analysis*

The manufacturer impact analysis estimates the financial impact of standards on manufacturers and calculates impacts on competition, employment, and manufacturing capacity.

Prior to initiating the detailed manufacturing impact analysis the Department will prepare an approach document and have it available for review. While the general framework will serve as a guide, the Department intends to tailor the methodology for each rule on the basis of stakeholder comments. The document will outline procedural steps and outline issues for consideration. Three important elements of the approach consist of the preparation of an industry cash-flow, the development of a process to consider sub-group cash-flow, and the design of an interview guide.

The policies outlined in the process rule required substantial revisions to the analytical framework to be used in performing manufacturer impact analysis for each rulemaking. In the approach document, the Department will describe and obtain comments on the methodology to be used in performing the manufacturer impact analyses. The manufacturer impact analyses will be conducted in three phases. Phase 1 consists of two activities, namely, preparation of an industry characterization and identification of issues. The second phase has as its focus the larger industry. In this phase, the GRIM will be used to perform an industry cash flow analysis. Phase 3 involves repeating the process described in Phase 2 (the industry cash-flow analysis) but on different sub-groups of manufacturers. Phase 3 also entails calculating additional impacts on competition, employment, and manufacturing capacity.

1. Industry Cash Flow

*a. General.* A change in standards affects the analysis in three distinct ways. Increased levels of standards will require additional investment, will raise production costs, and will affect revenue through higher prices and, possibly, lower quantities sold. To quantify these changes the Department performs an industry cashflow analysis using the GRIM. Usually this analysis will use manufacturing costs, shipments forecasts, and price forecasts developed for the other analyses. Financial information, also required as an input to GRIM, will be developed based on publicly available data and confidentially submitted manufacturer information.

The GRIM analysis uses a number of factors—annual expected revenues; manufacturer costs such as cost of sales, selling and general administration costs, taxes, and capital expenditures related to depreciation, new standards, and maintenance—to arrive at a series of annual cash flows beginning from before implementation of standards and continuing explicitly for several years after implementation. The measure of industry net present values are calculated by discounting the annual cash flows from the period before implementation of standards to some

future point in time. The Preliminary TSD describes the GRIM's operating principles and presents alternative approaches to developing the information necessary to perform the computations.

*b. Product Specific.* The Department has received manufacturing cost data from manufacturers which was compiled and reported by AHAM. This data will be used to conduct an industry cash flow analysis for the NOPR. A draft document ''Financial Inputs to GRIM for the Clothes Washer Rulemaking Analysis'' has been prepared for stakeholder review. This document outlines and documents the financial assumptions to be used in GRIM when performing the industry cash flow analyses. The Department intends to use the manufacturing costs, retail prices, and shipment values from the preliminary analysis in the GRIM model. This will be distributed to interested parties prior to the workshop to be held after publication of this Supplemental ANOPR.

2. Manufacturer Sub-Group Analysis

*a. General.* Using industry ''average'' cost values is not adequate for assessing the variation in impacts among sub-groups of manufacturers. Smaller manufacturers, niche players or manufacturers exhibiting a cost structure largely different from industry averages could be more negatively impacted. Ideally, the Department would consider the impact on every firm individually. In highly concentrated industries this may be possible. In industries having numerous participants, the Department will use the results of the industry characterization to group manufacturers exhibiting similar characteristics. The financial analysis of the ''prototypical'' firm performed in the Phase 2 industry analysis can serve as a benchmark against which manufacturer sub-groups can be analyzed.

The manufacturing cost data collected for the engineering analysis will be used to the extent practical in the sub-group impact analysis. To be useful, however, this data should be disaggregated to reflect the variability in costs between relevant sub-groups of firms.

The Department will conduct detailed interviews with as many manufacturers as is possible to gain insight into the potential impacts of standards. During these interviews, the Department will solicit the information necessary to evaluate cashflows and to assess competitive, employment and capacity impacts. Firm-specific cumulative burden will also be considered.

*b. Product Specific.* In order to conduct a manufacturer sub-group analysis, it will be necessary to define representative sub-groups and conduct separate cash flow analysis for each. For example, one option consists of conducting separate cash flows for all manufacturers. Another option, could entail conducting cash flow analysis only for those manufacturers which believe their impacts are more severe then industry average. The Department will outline and discuss these and other approaches at the post supplemental ANOPR analysis workshop.

Whirlpool proposed that the GRIM model be changed from input to output aggregation. Each industry member would develop its own inputs to the GRIM model over a range of MEF levels proposed by the DOE. The GRIM models would be run by industry members to generate a range of individual company outputs. The outputs of the individual companies could then be aggregated to determine industry impact. Individual companies would not be required to submit detailed input assumptions, but only changes in revenues, shipments, profit after tax, and cash flow, capital investment and design and marketing spending could also be provided. A third party could do the aggregation and then conduct a reality check by comparing the aggregated output to currently available industry data. (Whirlpool No. 66 at 3). The Department seeks further input as to how the data for the GRIM analysis should be collected from the manufacturers and how it should be utilized.

3. Interview Process

*a. General.* The revised rulemaking process provides for greater public input and for improved analytical approaches, with particular emphasis on earlier and more extensive information gathering from interested parties. The proposed three-phase manufacturer impact analysis process will draw on multiple information sources, including structured interviews with manufacturers and a broad cross-section of interested parties. Interviews may be conducted in any and all phases of the analyses as determined in Phase 1.

The interview process has a key role in the manufacturer impact analyses, since it provides an opportunity for interested parties to privately express their views on important issues. A key characteristic of the interview process is that it is designed to allow confidential information to be considered in the rulemaking decision.

The initial industry characterization will collect information from relevant industry and market publications, industry trade organizations, company financial reports, and product literature. This information will aid in the development of detailed and focused questionnaires, as needed, to perform all phases of the manufacturer impact analyses. It is the intention of the Department that the contents of questionnaires and the list of interview participants be publicly vetted prior to initiating the interview process.

The Phase 3 (sub-group analysis) questionnaire will solicit information on the possible impacts of potential efficiency levels on manufacturing costs, product prices, and sales. Evaluation of the possible impacts on direct employment, capital assets, and industry competitiveness will also draw heavily on the information gathered during the interviews. The questionnaires will solicit both qualitative and quantitative information. Supporting information will be requested whenever applicable.

Interviews will be conducted according to DOE procedures. Interviews will be scheduled well in advance in order to provide every opportunity for key individuals to be available for comment. Although a written response to the questionnaire is acceptable, an interactive interview process is preferred because it helps clarify responses and provides the opportunity for additional issues to be identified.

Interview participants will be requested to identify all confidential information provided in writing or orally. Approximately two weeks following the interview, an interview summary will be provided to give participants the opportunity to confirm the accuracy and protect the confidentiality of all collected information. All the information transmitted will be considered, when appropriate, in DOE's decision-making process. However, confidential information will not be made available in the public record.

DOE will collate the completed interview questionnaires and prepare a summary of the major issues and outcomes. The Department will seek comment on the outcome of the interview process.

*b. Product Specific.* The Department is developing an interview guide to supplement the sub-group GRIM cash-flow analysis. The interview will solicit information on the possible impacts of potential efficiency levels on manufacturing costs, product prices, and sales. As such it will contribute to the Department's understanding of how sub-groups may have different values for these quantities compared with the

overall industry. This will allow the Department to report and explain significant variances when publishing the analysis results.

Evaluation of the possible impacts on direct employment, capital assets, and industry competitiveness will also draw heavily on the information gathered during the interviews. The questionnaires will solicit both qualitative and quantitative information. Supporting information will be requested whenever applicable.

The Department plans to make a draft of the questionnaire available prior to the post-supplemental ANOPR analysis workshop.

*H. Competitive Impact Assessment*

*a. General.* Legislation directs the Department to consider any lessening of competition that is likely to result from standards. It further directs the Attorney General to gauge the impacts, if any, of any lessening of competition. DOE will make a determined effort to gather and report firm-specific financial information and impacts. The competitive analysis will focus on assessing the impacts to smaller, yet significant, manufacturers. The assessment will be based on manufacturing cost data and on information collected from interviews with manufacturers, consistent with Phase 3 of the manufacturer impact analyses. The Department of Justice (DOJ) has offered to help in drafting questions to be used in the manufacturer interviews. These questions will pertain to the assessment of the likelihood of increases in market concentration levels and other market conditions that could lead to anti-competitive pricing behavior. The manufacturer interviews will focus on gathering information that would help in assessing asymmetrical cost increases to some manufacturers, increased proportion of fixed costs potentially increasing business risks, and potential barriers to market entry (proprietary technologies, etc.).

*b. Product Specific.* The Department met with DOJ on June 11, 1998, for initial discussions pertaining to the manufacturer impacts of potential clothes washers standards. DOJ has agreed to review the manufacturer questionnaire prior to discussions with the manufacturers.

*I. Utility Analysis*

The utility analysis estimates the effects of proposed standards on electric and gas utilities.

1. Proposed Methodology

*a. General.* The Department proposes to use a version of EIA's widely recognized NEMS for the utility and environmental analyses. NEMS is a large multi-sectoral partial equilibrium model of the U.S. energy sector that has been developed over several years by the EIA primarily for the purpose of preparing the Annual Energy Outlook (AEO). NEMS produces a widely recognized baseline forecast for the U.S. through 2020 and is available in the public domain. The version of NEMS to be used for appliance standards analysis will be called NEMS–NAECA, and will be based on the AEO 1998 version with minor modifications.[2]

NEMS offers a sophisticated picture of the effect of appliance standards since its scale allows it to measure the interactions between the various energy supply and demand sectors and the economy as a whole. In addition, the scale of NEMS permits analysis of the effects of standards on both the electric and gas utility industries.

To analyze the effect of standards, NEMS–NAECA is first run exactly as it would be to produce an AEO forecast, then a second run is conducted with residential energy usage reduced by the amount of energy (gas, oil, and electricity) saved due to appliance standards for the appliance being analyzed. The energy savings input is obtained from the NES spreadsheet. Outputs available are the same as those in the original NEMS model including residential energy prices, generation and installed capacity (and in the case of electricity, which primary fuel is used for generation).

*b. Product Specific.* I. Assumptions. Other than the difference in energy consumption due to clothes washer standards, input assumptions into NEMS–NAECA will follow those used to produce AEO 1998. The entire utility analysis will be conducted as a policy deviation from the AEO 1998, and the assumptions will be the basic set of assumptions applied. For example, the operating characteristics (energy conversion efficiency, emissions rates, etc.) of future electricity generating plant will be exactly those used in AEO 1998, and the prospects for natural gas supply will be exactly those assumed in AEO 1998.

[2] EIA approves use of the name NEMS only to describe an AEO version of the model without any modification to code or data. Since, in this work, there will be some minor code modifications and the model will be run under various policy scenarios that deviate from AEO assumptions, DOE proposes use of the name NEMS–NAECA for the model as used here.

Since the AEO 1998 version of NEMS–NAECA forecasts only to the year 2020, a method for extrapolating price data to 2030 is required. The adopted method uses the EIA approach to forecast fuel prices for the Federal Energy Management Programs (FEMP). These are the prices used by FEMP to estimate life-cycle costs of Federal equipment procurements. For petroleum products, the average growth rate for the world oil price over the years 2010 to 2020 is used in combination with the refinery and distribution markups from the year 2020 to determine the regional price forecasts. Similarly, natural gas prices are derived from an average growth rate figure in combination with regional price margins from the year 2020. Electricity prices are held constant at 2020 levels on the assumption that the transition to a restructured utility industry will have been completed.

ii. Results. In principle, any of the forecasts that appear in AEO 1998 could be estimated by NEMS–NAECA to take into account the effects of a particular clothes washer standard level. The Department intends to report the major results on residential sales of fuels, prices of fuels, and generating sources displaced by energy savings. As might be expected, as the total energy use of America is much larger than that possible due to the savings from clothes washers, there is little expected difference in the forecasted price of energy.

*J. Environmental Analysis*

An Environmental Assessment is required pursuant to the National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321 *et seq.*), regulations of the Council on Environmental Quality (49 CFR parts 1500–1508), the Department regulations for compliance with NEPA (10 CFR part 1021), and the Secretarial Policy on the National Environmental Policy Act (June 1994). The Environmental Assessment will be presented as part of the NOPR and an opportunity will be provided for comments prior to the final rule.

The main environmental concern addressed is emissions from fossil fuel-fired electricity generation. Power plant emissions include oxides of nitrogen ($NO_X$) and sulfur ($SO_2$), as well as carbon dioxide ($CO_2$). The first two are major causes of acid precipitation, which can affect humans by reducing the productivity of farms, forests and fisheries, decreasing recreational opportunities and degrading susceptible buildings and monuments. $NO_X$ is also a precursor gas to urban smog and is

particularly detrimental to air quality during hot, still weather. $CO_2$ emissions contribute to raising the global temperature via the ''greenhouse effect.'' The long-term consequences of higher temperatures may include perturbed air and ocean currents, perturbed precipitation patterns, changes in the gaseous equilibrium between the atmosphere and the biosphere, and the melting of some of the ice now covering polar lands and oceans, causing a rise in sea level.

1. Proposed Methodology

*a. General.* The Department proposes to use the EIA widely recognized NEMS for the appliance environmental analyses (as well as the utility analyses). The version of NEMS to be used for appliance standards analysis will be called NEMS–NAECA, and will be based on the AEO 1998 version with minor modifications. NEMS–NAECA is run exactly the same as the original NEMS except that residential energy usage is reduced by the amount of energy (gas, oil, and electricity) saved due to appliance standards for the appliance being analyzed. The input of energy savings is obtained from the NES spreadsheet. For the environmental analysis, the output is the forecasted physical emissions. The net benefits of a standard will be the difference between emissions estimated by the AEO 1998 version of NEMS–NAECA and those it estimates with a standard in place.

*b. Product Specific.* The environmental analysis should be relatively straightforward using NEMS–NAECA. Carbon emissions are tracked in NEMS using quite a detailed carbon module that provides good results because of its broad coverage of all sectors and inclusion of interactive effects. The only form of carbon tracked by NEMS–NAECA is $CO_2$, so the carbon discussed in this report is only in the form of $CO_2$ but is reported as elemental carbon to remain consistent with the AEO 1998.[3]

The two airborne pollutant emissions that have been reported in past analyses, $SO_2$ and $NO_X$, are reported by NEMS–NAECA. In the case of $SO_2$, the Clean Air Act Amendments of 1990 set an $SO_2$ emissions cap on all power generation. The attainment of this target is flexible among generators through the use of emissions allowances and tradable permits. NEMS includes a module for $SO_2$ allowance trading and delivers a forecast of $SO_2$ allowance prices. Please note that accurate simulation of $SO_2$ trading tends to imply that physical emissions effects will be zero because emissions will always be at the ceiling. This fact has caused considerable confusion in the past. However, there is an $SO_2$ benefit from conservation in the form of a lower allowance price and, if big enough to be calculable by NEMS–NAECA, this value will be reported. Please see TSD for further discussion of this issue. One small effect that NEMS–NAECA must consider in addition to AEO 1998 calculations is the effect of standards on $SO_2$ emissions from in-house combustion of oil, since the emissions cap does not apply to households. This effect is calculated using simple emissions factors.

The NEMS algorithm for estimating $NO_X$ emissions also does not estimate in-house emissions, nor are the emissions calculated for ozone non-attainment areas. In-house emissions account for the combustion of fossil fuels, primarily natural gas, within individual homes. Since households that use natural gas, fuel oil or coal do contribute to $NO_X$ emissions, the effect on in-home $NO_X$ emissions will be calculated externally to NEMS–NAECA, using simple emissions factors.

Energy use for selected appliance efficiency levels will be the same as those in the NES spreadsheet. Other input assumptions into NEMS–NAECA will follow those used to produce AEO 1998. In principle, any of the forecasts that appear in AEO 1998 could be estimated by NEMS–NAECA to take into account the effects of a particular clothes washer standard level, but in the standard reporting, the Department intends to report emissions of $SO_2$, $NO_X$ and $CO_2$. The time horizon of NEMS–NAECA is 2020. Beyond this point, results will be extrapolated using a simple formula (for methodology, see preliminary TSD) to extend the forecast to 2030. Alternative price forecasts corresponding to the side cases found in AEO 1998 will also be generated for use by NES and will be explored in a similar fashion with NEMS–NAECA runs.

*K. Regulatory Impact Analysis*

DOE will be preparing a draft regulatory analysis pursuant to E.O. 12866, ''Regulatory Planning and Review,'' which will be subject to review under the Executive Order by the Office of Information and Regulatory Affairs (OIRA) 58 FR 51735 (October 4, 1993). Six major alternatives were identified by DOE as representing feasible policy options to achieve consumer product energy efficiency. Each alternative will be evaluated in terms of ability to achieve significant energy savings at a reasonable cost and will be compared to the effectiveness of the rule.

As part of the docket for the Refrigerator Products Energy Conservation Standards (Docket No. EE–RM93–801) AHAM stated that the Department needs to improve the evaluation of non-regulatory means of achieving energy savings. (AHAM, No. 207 at 7).

Under the Process Rule policies, the Department is committed to continually explore non-regulatory alternatives to standards. In the table below is a discussion of what was examined in 1994 and what is being proposed for this rulemaking. The Department is seeking comments on this approach. This approach is further discussed in the TSD.

| Alternatives examined in 1994 | Alternatives to examine in 1998 |
|---|---|
| —No action ..... | —No new regulatory action. |
| —Consumer tax credits. | —Consumer tax credits. |
| —Manufacturer tax credits. | —Manufacturer tax credits. |
| —Performance standards. | —Performance standards. |
| —Consumer rebates | —Rebates. |
| —Prescriptive standards | |
| —Voluntary standard | —Voluntary energy efficiency targets. |
| —Enhanced labeling and consumer education | |
| | —Early replacement. |
| | —Mass government purchases. |

## III. Standards Scenarios

Upon reviewing the preliminary LCC and NES results, the Department observes that the efficiency levels analyzed, 5 to 50 percent efficiency improvement over baseline efficiency, produced a range of impacts. For example, the NES impacts show a range from 0.36–10.06 quads of energy saved over the 2003 to 2030 period. As expected, the higher the efficiency level, the greater the savings. Similarly, the analysis shows an increase in water savings from 0.46 to 12.47 trillions of gallons saved. On the other hand, the NPV shows an increase from $1.02 billion at the 5 percent level, to a maximum of $13.53 billion at the 40 percent level, and then a reduction to $9.07 billion at the 50 percent level. The LCC and payback analyses show results similar to the NPV analysis where the greatest economic benefit is at the 40 percent level.

Based on the analyses performed, the 40 percent efficiency level standard would appear to result in the greatest

[3] The conversion factor from carbon to $CO_2$ is approximately 3.6667.

economic benefit to the Nation. (*See* Tables 3, 4 and 8.) The national net present benefit at the 40 percent efficiency level (which represents an equivalent to a moderate H-axis level) is $13.53 billion. This is approximately 22 percent higher than the NPV benefit at the 25 percent efficiency level (which represents the current highest V-axis level) and 49 percent higher than the 50 percent level, the maximum technologically feasible level. The LCC results in Table 3 indicate that a 40 percent efficiency level has the greatest consumer mean LCC savings. At 40 percent, the consumer mean LCC savings is $253, or $48 and $49 greater than the 25 and 50 percent levels, respectively. In addition, at the 40 percent level, the range in LCC impacts is a savings of $2,039 (0th percentile) to an increase of $645 (100th percentile). The LCC analysis further shows that at the 40 percent level approximately 83.7 percent of consumers will experience a LCC savings; and that only 16.3 percent of the Nation's population will experience an increase in LCC. Whereas, the LCC analysis indicates that at the 25 percent efficiency level, standards will negatively impact 10.8 percent of the Nation's population and at the 50 percent level, standards will adversely impact 25.8 percent of the population. (*See* Table 3.)

Also, the rebuttable presumption payback periods shown in Table 5 indicate that all efficiency levels from 5 percent up to 25 percent show a less than 3 year payback. The 40 percent efficiency level shows a 3.7 year payback which represents a reasonable payback period considering the increased energy savings at this level. There is a significant jump in the payback period at the 45 and 50 percent efficiency levels therefore making these efficiency levels look less attractive.

These observations are based on preliminary LCC and NES results which will be updated and revised in the NOPR and final rule analyses. These observations, however, do not include analyses results from the manufacturer impact or consumer subgroup and survey information.

The following are examples of possible alternative standards scenarios for consideration by the Department:

- A moderate standard at an early effective date. For example, a level at a 25 percent improvement, effective three years after the publication of the Final Rule.
- A stringent standard, at a later effective date. For example, a level at 45 percent improvement effective five years after the publication of the Final Rule.
- A two phase approach. For example, a level at 20 percent effective three years after the publication of the Final Rule (projected effective date—October, 2002) and a level at 40 percent effective eight years after publication of the Final Rule.

The Department seeks comments on the alternative standard scenarios for consideration in the analysis for the proposed rule.

## IV. Public Comment Procedures

### *A. Participation in Rulemaking*

The Department encourages the maximum level of public participation possible in this rulemaking. Individual consumers, representatives of consumer groups, manufacturers, associations, States or other governmental entities, utilities, retailers, distributors, manufacturers, and others are urged to submit written statements on the proposal.

The Department has established a period of 75 days following publication of this document for persons to comment on this proposal. All public comments received will be available for review in the Department's Freedom of Information Reading Room. In addition, the following data is available in the Department's Freedom of Information Reading Room:

- Copies of the Preliminary TSD
- Transcripts of the public hearings
- Copies of the public comments received by the Department
- Previous **Federal Register** notices relating to this clothes washer rulemaking

A public hearing will be held on December 14 (1:00–4:00 p.m.) and 15 (9:00 a.m.–4:00 p.m.), 1998, at the U.S. Department of Energy, Forrestal Building, 1000 Independence Avenue SW, Room 1E–245, Washington, D.C. 20585. The December 14 session will be a training session for the Government Regulatory Impact Model (GRIM). More detailed information about this hearing will be on the Office of Codes and Standards web site beginning in November. The web site address is as follows: http://www.eren.doe.gov/buildings/codes__standards/index.htm.

### *B. Written Comment Procedures*

Interested persons are invited to participate in this proceeding by submitting written data, views, or arguments with respect to the subjects set forth in this document. Comments will not be accepted by fax or e-mail. Instructions for submitting written comments are set forth at the beginning of this document and below.

Comments should be labeled both on the envelope and on the documents, ''Clothes Washer Rulemaking (Docket No. EE–RM–94–403),'' and must be received by the date specified at the beginning of this document. Ten copies are requested to be submitted. Additionally, the Department would appreciate an electronic copy of the comments to the extent possible. The Department is currently using WordPerfect™ 6.1. All comments and other relevant information received by the date specified at the beginning of this document will be considered by the Department in the proposed rule.

All written comments received on the supplemental Advance Notice of Proposed Rulemaking will be available for public inspection at the Freedom of Information Reading Room, as provided at the beginning of this document.

Pursuant to the provisions of 10 CFR 1004.11, any person submitting information or data that is believed to be confidential, and exempt by law from public disclosure, should submit one complete copy of the document and ten (10) copies, if possible, from which the information believed to be confidential has been deleted. The Department will make its own determination with regard to the confidential status of the information or data and treat it according to its determination.

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

### *C. Issues for Public Comment*

The Department is interested in receiving comments and data to improve its preliminary analysis. In particular, the Department is interested in seeking response to the following questions and/or concerns that were addressed in this rulemaking.

Information on the energy efficiency and relative market shares of current products on the market as described by the Modified Energy Descriptor (MEF):

• The Department has limited information concerning the energy performance of existing product offerings using the MEF descriptor. Given the vastly different nature of the variables and testing methods of the current J and future J1 test procedures, the EF values cannot be translated to MEF values.

Proposed product classes for products in this rulemaking:

• In their written comments, Whirlpool asked the Department to maintain the current efficiency requirement for the compact class due to the limited potential for energy-efficient improvements and the small market share for these products. Whirlpool also indicated that the V-axis compact clothes washer market and the manufacturing base for these products has changed since the current standards were developed. The previous stand-alone 1.6 ft.$^3$ compact V-axis clothes washer products have been replaced by a product that maintains the small cabinet (22″ width) utility and portability (via castors); however, its basket capacity is slightly larger. Because of the limited market size, Whirlpool is currently the only manufacturer of these products. They also supply them to other appliance companies for sale under various brand names. For these reasons, the Department will revise the compact V-axis product class definition (1.6 ft.$^3$ capacity) to include all V-axis clothes washers less than 2.0 ft.$^3$ (Whirlpool, No. 69 at 3). The Department plans to increase the compact class to include all clothes washers (both V- and H-axis machines) less than 2.0 ft.$^3$ and seeks comments on this change.

• The Department received comments suggesting that it identify V- and H-axis machines as a single product class. Whirlpool stated that the DOE's analyses to date and the recent consumer acceptance in the market of H-axis products confirm the validity of a single product class, irrespective of the axis. Whirlpool further stated that the concerns over clothes washer performance, consumer utility and reliability are unfounded in either principle or fact. (Whirlpool, No. 93 at 1.) The Natural Resources Defense Council (NRDC) stated that the ''H-axis'' design option does not affect the utility of clothes washers and it is not the only design option that can comply with the standards. According to the NRDC, the evidence does not support the establishment of different standards even if separate classes were established. (NRDC, No. 60 at 1.)

However, other commenters feel that the Department should not reject separate product classes. General Electric Appliances (GEA) indicated that the Department is proceeding as if all relevant consumer utilities are met by H-axis products already on the market or by machines planned for production. GEA further stated that the port of access is not the only relevant consumer utility that must be addressed. Many other consumer utilities, including reliability, must be addressed. (GEA, No. 88 at 2.) The Department seeks additional comments on this issue and is currently working with stakeholders to formulate a process to gather additional consumer input on the issues surrounding clothes washer utility. This process is discussed further in Section II.F.2.b.

The relationship between clothes washer capacity and the maximum achievable efficiency using conventional V-axis designs:

• AHAM commented that the testing performed for DOE reflects an incorrect assessment of energy efficiency on current models and indicated that manufacturers could not achieve these levels with traditional V-axis clothes washers. (AHAM, No. 84 and 86). Based on follow-up testing conducted for DOE, there appears to be a significant variation in the RMC values obtained in tests even for clothes washers of the same model. DOE plans to further review this issue. Since the two models approaching a 30 percent improvement in efficiency were ''super capacity'' models, the Department will try to determine if capacity or volume effects the maximum achievable efficiency improvement in V-axis designs. The Department seeks comment on this issue.

Data as to whether detergent use is a factor in consumer operating cost and savings:

• ACEEE stated that the present analysis ignores the possibility that some consumers will use less detergent with new high-efficiency machines than with standard machines. They recommend that DOE construct two alternative scenarios (one that no detergent will be saved and the other that some consumers will use less detergent). ACEEE indicated that the Bern Kansas study provided some evidence for detergent savings. (ACEEE, No. 94 at 2). Proctor and Gamble commented that the perception that detergent dosage will reduce in horizontal axis or drum washers essentially proportionally to water volume is invalid. This appears to be a popular belief, but it is not substantiated by the facts. The important impact is that users of new lower water/energy efficient washers cannot expect to find detergent cost savings. (Proctor & Gamble, No. 9 at 1). DOE seeks additional data on this issue.

Data on retail mark-up assumption:

• The American Council for an Energy-Efficient Economy (ACEEE) commented that at the March 1998 workshop the Circuit City representative suggested that assuming an average 40 percent retail markup is probably too high. A 25 percent retail markup was more typical of the industry. The 40 percent estimate may have factored in higher markups on extended warranties and other services. (ACEEE, No. 94 at 3). In reviewing Circuit City's comment, the Department understands that the statement referred to a gross margin of 25 percent which represents a mark-up of 1.33. This is in close agreement with the Department analysis of retailer financial statements having an important component of appliances in their product mix (25.2 percent to 26.3 percent gross margin). Also, as referenced in the Preliminary TSD, this gross margin is the net of some buying and warehousing costs. At present the Department has no basis for changing the retail mark-up assumption. DOE will continue to research data sources and seeks comment on this issue.

Information on national level historical, current, and projections of water and sewer rates:

• Information on water prices is not as readily available as fuel prices information. Some utilities have large fixed charges, while others are subsidized or paid for through taxes. Furthermore, there are no standard approaches to calculating water and sewer costs. In some locations the price of water increases as consumption increases. In other areas, water price decreases with increasing consumption. Additional consideration must be given to consumers who are not connected to a municipality water supply or sewage system. In some cases, only one or the other is connected. As with other variables, the Department plans to use a range of water prices in the economic analysis to account for the variability among different households. DOE seeks information on national level historical, current, and projections of water and sewer rates.

• The Department agrees that future water prices should not be assumed to be constant and is therefore in the process of further analyzing both current prices and future escalation rates. The proposed analysis is on going and will be completed after the ANOPR

is released. The proposed analysis consists of updating previous data from Ernst and Young report as adjusted by Al Dietemann, as well as the use of new data obtained from the American Water Works Association (AWWA). The Ernst and Young data is being updated by calling 125 utilities, getting their water rate schedules and their forecasts for the future, as well as any historical information available. The Department is working on combining these two data sources into one database. This data will be organized by utility and can be mapped onto either individual RECs households or onto regional areas. A distribution of water prices (as in the current analysis) will be used, as well as a distribution of escalation rates. In an attempt to be consistent with the methodology being developed for fuel rates, the Department will attempt to establish marginal water rates and water prices and escalation rates that vary with the water/wastewater utility. The Department is seeking comments concerning this approach.

Information relating to the determination of price and operating cost elasticities:

• In order to determine the effect of an increase in the purchase price, it would be useful to know what the elasticity of clothes washer prices is. The Department is still determining how these data could be obtained. While preliminary analyses indicate that factors, such as the current state of the economy have a greater correlation to sales of washers than do an increase in clothes washer prices, it is still important to estimate the impact of changing prices on the sales of clothes washers. In making estimates of these price effects, the Department needs to gauge the difference in clothes washer sales from a change in the price of all clothes washers, as could result from revised energy efficiency standards. In addition, the Department will be estimating how price changes from revised energy efficiency standards for clothes washers will affect the behavior of consumers.

Information on how the data for the GRIM analysis should be collected from the manufacturers:

• Whirlpool proposed that the GRIM model be changed from input to output aggregation. Each industry member would develop their own inputs to the GRIM model over a range of MEF levels proposed by the DOE. The GRIM models would be run by industry members to generate a range of individual company outputs. The outputs of the individual companies could then be aggregated to determine industry impact. Individual companies would not be required to submit detailed input assumptions, but only changes in revenues, shipments, profit after tax, and cash flow, capital investment and design and marketing spending could also be provided. A third party could do the aggregation and then conduct a reality check by comparing the aggregated output to currently available industry data. (Whirlpool No. 66 at 3). The Department seeks further input as to how the data for the GRIM analysis should be collected from the manufacturers and how it should be utilized.

Comments on the proposed DOE approach for determining shipments:

• In as much as the accounting model is the only approach that will take into account price and operating costs, the Department believes it should be the primary tool for forecasting clothes washer shipments. The Department seeks comments about the determination of price and operating cost elasticities.

• For the purpose of the base case forecast in the preliminary analysis, the impact of voluntary programs has been expressed as the percent of new clothes washers sold each year that will have efficiencies corresponding to those of H-axis washers. The H-axis washer is characterized using the data submitted by AHAM for a 35 percent energy reduction from the baseline MEF. The spreadsheet uses disaggregated values (i.e., water heater energy, dryer energy and mechanical energy) provided by AHAM. Disaggregated values provided by AHAM for the baseline washer are also used for the base case forecast. Calculations based on disaggregated values reflect the efficiencies of machines actually being sold which may differ from the minimum required efficiency. The preliminary base case assumes a 1.5 percent share of H-axis machines in 1995 with a 0.5 percent increase in H-axis sales every year thereafter, until 2030 (i.e., 19 percent).

The NES spreadsheet allows for changes in the distribution of efficiencies of clothes washers due to non-regulatory programs. The user specifies the percent of new clothes washer sales that will achieve the selected energy reduction (relative to the baseline washer design) in future years. In later analyses (i.e., the NOPR) the Department expects to use a distribution of current and forecasted efficiencies based on the best available information. Information is still being gathered for this task. The Department seeks comment on this forecast and welcomes any available information on current product efficiencies.

Data on the possible adverse affects of standards on identifiable groups of consumers that experience below-average utility or usage rates:

• The consumer analysis evaluates impacts to any identifiable groups, such as consumers of different income levels, who may be disproportionately affected by any national energy efficiency standard level.

Information on what non-regulatory alternatives to standards need to be reviewed:

• Under the Process Rule policies, the Department is committed to continually explore non-regulatory alternatives to standards. In the table below is a discussion of what was examined in 1994 and what is being proposed for this rulemaking. The Department is seeking comments on this approach. This approach is further discussed in the TSD.

| Alternatives examined in 1994 | Alternatives to examined |
|---|---|
| —No action ..... | —No new regulatory action. |
| —Consumer tax credits. | —Consumer tax credits. |
| —Manufacturer tax credits. | —Manufacturer tax credits. |
| —Performance standards. | —Performance standards. |
| —Consumer rebates | —Rebates. |
| —Prescriptive standards. | |
| —Voluntary standards | —Voluntary energy efficiency targets. |
| —Enhanced labeling and consumer education. | |
| | —Early replacement. |
| | —Mass government purchases. |

Comments on the alternative standard scenarios:

• The following are examples of possible alternative standards scenarios for consideration by the Department:

• A moderate standard at an early effective date. For example, a level at a 25 percent improvement, effective three years after the publication of the Final Rule.

• A stringent standard, at a later effective date. For example, a level at 45 percent improvement effective five years after the publication of the Final Rule.

• A two phase approach. For example, a level at 20 percent effective three years after the publication of the Final Rule (projected effective date—October, 2002) and a level at 40 percent effective eight years after publication of the Final Rule.

## V. Review Under Executive Order 12866

DOE provided to the Office of Information and Regulatory Affairs

(OIRA) in the Office of Management and Budget a copy of this document for comment. At the proposal stage for this rulemaking, DOE and OIRA will determine whether this rulemaking is a significant regulatory action under Executive Order 12866, Regulatory Planning and Review. 58 FR 51735 (October 4, 1993). Were DOE to propose amendments to the energy conservation standards for clothes washer, the rulemaking could constitute an economically significant regulatory action and DOE would prepare and submit to OIRA for review the assessment of costs and benefits required by Section 6(a)(3) of Executive Order 12866. Other procedural and analysis requirements in other Executive Orders and statutes also may apply to such future rulemaking action, including the requirements of the Regulatory Flexibility Act, 5 U.S. C. 601 *et seq.*; the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.*; and the Unfunded Mandates Act of 1995, Pub. L. 104–4; and the National Environmental Policy Act of 1969, 42 U.S. C. 4321 *et seq.*

The draft of today's action and any other documents submitted to OIRA for review have been made a part of the rulemaking record and are available for public review in the Department's Freedom of Information Reading Room, 1000 Independence Avenue, SW, Room 1E–190, Washington, DC 20585 between the hours of 9:00 and 4:00, Monday through Friday, telephone (202) 586–6020.

Issued in Washington, DC, on October 23, 1998.

**Dan W. Reicher,**

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