CHAPTER 2. ANALYTICAL FRAMEWORK

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 2. ANALYTICAL FRAMEWORK

In prescribing new or amended energy efficiency appliance standards, the Department must achieve the maximum improvement in energy efficiency that is technologically feasible and economically justified. This section provides a description of the analytical framework used by the Department in developing standards and assessing impacts. It discusses the major components of the analytical framework and the interrelationships among the components that ensure consistency throughout the analyses. A diagram of the analytical framework is shown in Figure 2.1.

The analyses performed are:

- A Market and Technology Assessment to characterize the relevant product markets and existing technology options including prototype designs. (Subtask 1 in Fig. 2.1)
- A Screening Analysis to review each technology option and determine if it is practicable to manufacture, install and service, would adversely impact product utility or product availability, or would have adverse impacts on health and safety. (Subtask 2 in Fig. 2.1)
- An Engineering Analysis to determine the maximum technologically feasible energy efficiency level and develop cost-efficiency relationships to show the manufacturer cost of achieving increased efficiency. (Subtask 3 in Fig. 2.1)
- LCC and Payback Analyses to calculate the savings in operating costs throughout the estimated average life of the covered product compared to any increase in the price, initial charges, or maintenance expenses for the product likely to result directly from the imposition of the standard. (Subtask 5 in Fig. 2.1)
- A National Impacts Analysis to assess the aggregate impacts at the national level of consumer payback, net present value (NPV) of total consumer LCC, national energy and water savings and national employment. (Subtask 8 in Fig. 2.1)
- A Consumer Analysis to evaluate variations in household characteristics (e.g., energy prices, appliance use behavior, installation costs) that might cause a standard to impact particular consumer sub-populations such as low-income households differently than the overall population. (Subtask 10 in Fig. 2.1)
- A Manufacturer Impact Analysis (MIA) to estimate the financial impact of standards on manufacturers and to calculate impacts on, employment, and manufacturing capacity. (Subtask 11 in Fig. 2.1)
- A Utility Analysis to estimate the effects of proposed standards on electric and gas utilities. (Subtask 12 in Fig. 2.1)
- An Environmental Assessment to provide estimates of changes in emissions of pollutants (sulfur and nitrogen oxides and carbon dioxide). (Subtask 13 in Fig. 2.1)
- A Regulatory Impact Analysis to present major alternatives to proposed standards that could achieve substantially the same regulatory goal at a lower cost. (Subtask 14 in Fig. 2.1)

2.1 BACKGROUND

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 also included a review of the: 1) economic models; 2) analytical tools; 3) methodologies; 4) non-regulatory approaches; and 5) prioritization of future rules. The Department will also take into account uncertainty and variability by doing scenario or probability analysis. For a more detailed discussion, see Appendix E.

The clothes washer standards rulemaking is the first rule to be developed under the Process Rule. The Department developed the analytical framework for the clothes washer rulemaking in response to stakeholder concerns regarding the application of the Process Rule to the clothes washer rulemaking. This analytical framework was presented during a clothes washer workshop held on July 23, 1997. It describes the methodology, the analytical tools and the relationship between the various analyses. The following sections provide a general description of the different analytical components of the rulemaking framework.

2.2 MARKET AND TECHNOLOGY ASSESSMENT

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

2.2.1 Market Assessment

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.

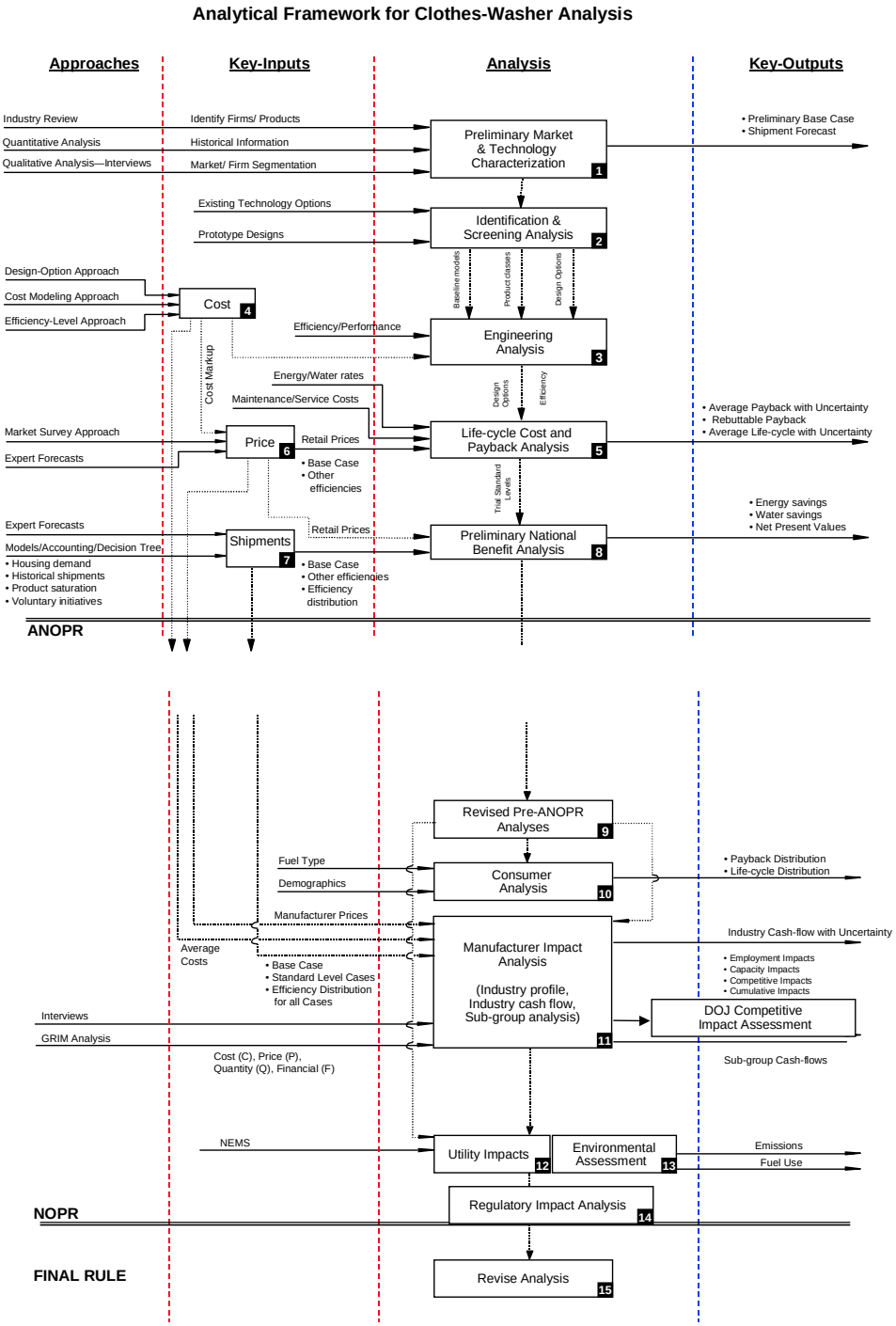

Figure 2.1 Clothes Washer Rulemaking Framework

2.2.2 Technology Assessment

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.

2.2.3 Base Case Shipments Forecast

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 distribution by energy efficiency is needed to the year 2030.

2.3 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.

2.3.1 Product Classes

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.

2.3.2 Baseline Units

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 the screening

analysis, the Department gathers information from trade organizations, manufacturers, and consultants with expertise in specific product types.

2.3.3 Design Options/Efficiency Levels

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, selects appropriate efficiency levels (or combinations of design options) for data collection.

2.3.4 Proprietary Designs

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.

2.4 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.

2.4.1 Energy Savings Potential and Manufacturing Costs

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; 3) and 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.

2.5 LIFE-CYCLE COST (LCC) AND PAYBACK ANALYSES

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 LCC 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 operating expense (usually decreased) and a change in purchase price (usually increased). The net effect is analyzed by calculating the change in LCC as compared to the base case. 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.

2.5.1 LCC Spreadsheet Model

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.

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.

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 affect). The output is a distribution of payback periods. The mean payback period is also reported. This data includes charts of cash flow taking into account the changing annual fuel prices.

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 the new standard becomes effective. 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.) 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.

2.5.2 Price

Manufacturer and retail prices are needed to determine how manufacturing costs and associated margins, are passed-through from manufacturers to consumers, as this has an impact on both consumers and manufacturers. Consumer and manufacturer economics are linked and inversely related. For this reason, retail prices used for the LCC analysis need to be reconciled with manufacturer prices. Chapter 6 provides a detailed description of the approach used to determine industry-average prices and mark-ups.

2.5.2.1 Retail Price

Retail prices are needed for a base case, absent new standards, and for all efficiency levels to be considered. Several approaches can be used to obtain these retail prices. Potential approaches include: 1) conducting a survey of existing prices on the market; 2) surveying manufacturers and

other market experts to predict consumer willingness to pay higher prices; and 3) applying various mark-ups over manufacturing costs. Consistent with the Process Rule, and building on the estimates generated by various approaches, retail prices are described within a range of uncertainty.

2.6 NATIONAL IMPACTS ANALYSIS

The national impacts analysis assesses the net present value (NPV) of total consumer LCC, energy (and water, if appropriate) savings and net employment impacts. An assessment of the aggregate impacts at the national level is conducted for the ANOPR and NOPR. 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 US 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.

Measures of impact reported include the net present value (NPV) of total consumer LCC, national energy savings (and water savings, if appropriate) and net 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 National Energy Savings (NES) Spreadsheet Model, which has been developed for standard rulemakings and tailored to each specific appliance rulemaking.

2.6.1 National Energy Savings (NES) Spreadsheet Model

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, if appropriate) and the national economic costs and savings from new standards. Input quantities can be changed within 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.

2.6.2 Shipments

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. For this rulemaking the shipment and national energy savings models are combined into a single spreadsheet model. Shipments are forecasted by using a accounting/decision tree model. This takes into account the 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. Details of this analysis are described in Chapter 9 of this document.

2.6.3 Net National Employment Impacts

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 net national 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 are discussed in the section on manufacturer impact analysis. Net national impacts are impacts on the entire national economy. Net national 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).

Net national employment impacts from standards are defined as net jobs eliminated or created in the general economy as a consequence of increased spending on 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 are estimated for major sectors of the U.S. economy. Public and commercially available data sources and software will be utilized to estimate employment impacts. Chapter 13 of this document discusses the net national employment impacts in greater detail. All methods and documentation are available for review.

2.7 CONSUMER ANALYSIS

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

The Department evaluates variations in regional energy prices, water and sewer prices, variations in energy use and variations in installation costs that might affect the net present value 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 performs sensitivity analyses to consider how differences in energy use will affect sub-groups of consumers. The impact on consumer sub-groups is determined using the LCC spreadsheet model.

2.7.1 Purchase Price Increases

The Department is sensitive to purchase price increases to avoid negative impacts to identifiable population groups such as low-income households. Additionally, the Department assesses the likely impacts of purchase price increases on product sales and fuel switching.

2.7.2 Consumer Participation

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.

2.8 MANUFACTURER IMPACT ANALYSIS

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

Prior to initiating the detailed manufacturing impact analysis the Department prepares an approach document. In the approach document, the Department describes and obtains comments on the methodology to be used in performing the manufacturer impact analysis. While the general framework serves as a guide, the Department tailors the methodology for each rule on the basis of stakeholder comments. 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-flows, and the design of an interview guide.

The manufacturer impact analysis is conducted in three phases (see Figure 2.2). 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 is 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, and identifying the

differing impact of standards on these sub-groups. Phase 3 also entails evaluating additional impacts on employment and manufacturing capacity.

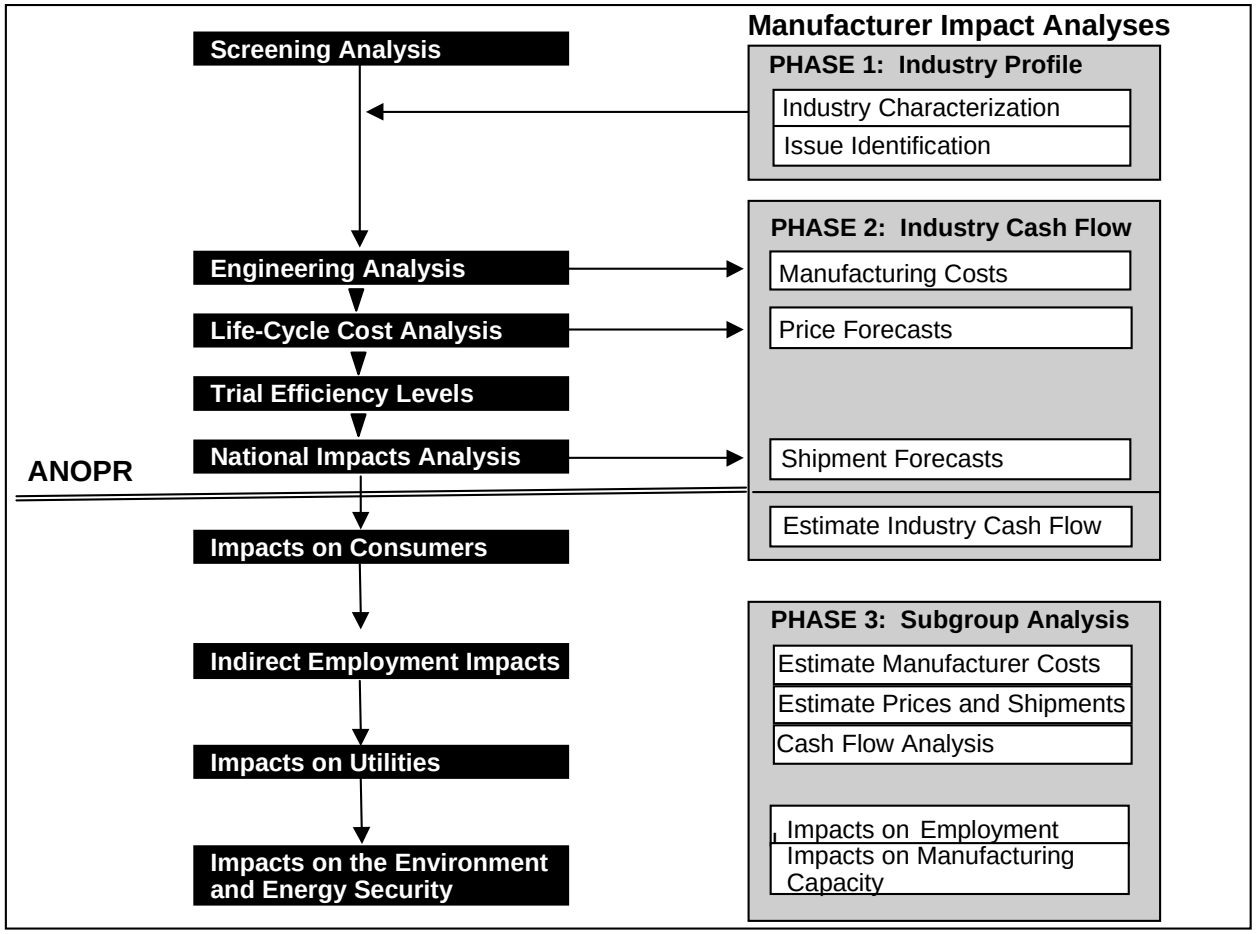

Figure 2.2 Flow Diagram of the Manufacturer Impact Analysis Methodology

2.8.1 Industry Cash Flow

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 cash flow analysis using the GRIM. Usually this analysis uses manufacturing costs, shipments forecasts, and price forecasts developed for the other analyses. Financial information, also required as an input to GRIM, is 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. Appendix P provides a description of GRIM's operating principles.

2.8.2 Manufacturer Sub-Group Analysis

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 uses 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 is 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 conducts detailed interviews with as many manufacturers as is possible to gain insight into the potential impacts of standards. During these interviews, the Department solicits the information necessary to evaluate cash flows and to assess employment and capacity impacts. Firm-specific cumulative burden is also considered.

2.8.3 Interview Process

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 manufacturer impact analysis process draws on multiple information sources, including structured interviews with manufacturers and a broad cross-section of interested parties. Interviews are conducted in any and all phases of the analyses as determined in Phase 1 of the MIA.

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 collects information from relevant industry and market publications, industry trade organizations, company financial reports, and product literature. This information is an aid in the development of detailed and focused questionnaires which are used in 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 solicits 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 also draw heavily on the information gathered during the interviews.

The questionnaires solicit both qualitative and quantitative information. Supporting information is requested whenever applicable. Interviews are conducted according to DOE procedures. Interviews are 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 are requested to identify all confidential information provided in writing or orally. Approximately two weeks following the interview, an interview summary is provided to give participants the opportunity to confirm the accuracy and protect the confidentiality of all collected information. All the information transmitted is considered, when appropriate, in DOE's decision-making process. However, confidential information is not made available in the public record.

2.9 COMPETITIVE IMPACT ASSESSMENT

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, from any lessening of competition. The competitive analysis focuses on assessing the impacts on smaller, yet significant, manufacturers. The analysis is based in part on manufacturing cost data and on information collected from interviews with manufacturers, consistent with Phase 3 of the manufacturer impact analysis.

DOE makes an effort to gather and report firm-specific financial information and impacts. The Department of Justice (DOJ) assisted in drafting questions used in the manufacturer interviews. These questions seek to assess the likelihood of increases in market concentration levels and other market conditions that could lead to anti-competitive pricing behavior. The manufacturer interviews focus on gathering information that would help in assessing asymmetrical cost increases to some manufacturers, increased proportion of fixed costs that could increase business risks, and potential barriers to market entry (proprietary technologies, etc.).

2.10 UTILITY ANALYSIS

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

The Department used a version of Energy Information Administration's (EIA) widely recognized National Energy Modeling System (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 is called NEMS-BRS, and is based on the AEO99 version with minor modifications.[a]

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-BRS 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).

2.11 ENVIRONMENTAL ASSESSMENT

The 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 main environmental concern addressed is emissions from fossil fuel-fired electricity generation. Power plant emissions include oxides of nitrogen (NOx) 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. NOx 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.

The Department uses EIA's widely recognized NEMS for the appliance environmental analyses. The version of NEMS used for appliance standards analysis is called NEMS-BRS, and

[a]For more information on NEMS, please refer to the U.S. Department of Energy, Energy Information Administration documentation. A useful summary is *National Energy Modeling System: An Overview 1998*, DOE/EIA-0581(98), February 1998. DOE/EIA approves use of the name NEMS to describe only an official version of the model without any modification to code or data. Because our analysis entails some minor code modifications and the model is run under policy scenarios that are variations on DOE/EIA assumptions, the name NEMS-BRS refers to the model as used here (BRS is DOE's Building Research and Standards office, under whose aegis this work has been performed).

is based on the *AEO99* version with minor modifications. NEMS-BRS is run exactly the same way 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 are 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 *AEO99* version of NEMS-BRS and those it estimates with a standard in place.

2.12 REGULATORY IMPACT ANALYSIS

DOE prepared 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). Eight major alternatives were identified by DOE as representing feasible policy options to achieve consumer product energy efficiency. Each alternativeis evaluated in terms of ability to achieve significant energy savings at a reasonable cost and will be compared to the effectiveness of the rule.

Under the Process Rule policies, the Department is committed to continually explore non-regulatory alternatives to standards. In Table 2.1 below is a discussion of what was examined in 1994 and what is examined for this rulemaking. The Department seeks comments on this approach.

Table 2.1 Comparison of 1994 and 2000 Non-Regulatory Alternatives to Standards

Alternatives Examined in 1994	Alternatives to Examine in 2000
-No action	-No new regulatory action
-Consumer tax credits	-Consumer tax credits
-Manufacturer tax credits	-Manufacturer tax credits
-Performance standards	-Performance standards
-Consumer rebates	-Consumer rebates
-Prescriptive standards	
-Voluntary standards	-Voluntary energy efficiency targets
-Enhanced labeling and consumer education	Enhanced Public Education & Information
	Low Income & Senior Subsidy
	-Mass Government purchases
	-Early Replacement