hypothetical firms in the industry under consideration. This model, the Manufacturer Analysis Model (MAM), is explained in the TSD. (See TSD, Appendix C.) The Manufacturer Analysis Model consists of version 1.2, dated March 1, 1993, of the Government Regulatory Impact Model (GRIM) which has been integrated into the earlier Lawrence Berkeley Laboratory (LBL) Manufacturer Impact Model (LBL–MIM). The GRIM model was developed by Arthur D. Little Consulting Company (ADL) under contract to AHAM, GAMA, and ARI. It provides a broad array of outputs, including shipments, price, revenue, net income, and short- and long-run returns on equity. An ''Output Table'' lists values for all these outputs in the base case and in each of the standards cases under consideration. It also gives a range for each of these estimates. The base case represents the forecasts of outputs without new or amended standards. A ''Sensitivity Chart'' (TSD, Appendix C) shows how returns on equity would be affected by a change in any one of the nine control variables of the model.

For consumers, measures of economic impact are the changes in purchase price and annual energy expense. The purchase price and energy expense, i.e., life-cycle cost, of each standard level are presented in Chapter 4 of the TSD. Under section 325 of EPCA, the life-cycle cost analysis is a separate factor to be considered in determining economic justification.

2. Life-cycle Costs. One measure of the effect of proposed standards on consumers is the change in operating expense and purchase price resulting from the new standards. For the average consumer, this is quantified by the difference in the life-cycle costs between the base and standards cases for the refrigerator classes analyzed. The life-cycle cost is the sum of the purchase price and the operating expense, including installation and maintenance expenditures, discounted over the lifetime of the appliance.

The life-cycle cost was calculated for the range of efficiencies in the Engineering Analysis for each class in the year standards are imposed, using a real consumer discount rate of 6 percent. The purchase price is based on the factory costs in the Engineering Analysis and includes a factory markup plus a distributor and retailer markup. Energy price forecasts are taken from the 1994 *Annual Energy Outlook* of the Energy Information Administration. (DOE/EIA–0383(94)). In the analysis for the final rule, energy price forecasts included in the most recent *Annual Energy Outlook* will be used. Appliance usage inputs are taken from the relevant test procedures.

3. Energy Savings. The Act requires DOE to consider the total projected energy savings that result from revised standards. The Department used the LBL Residential Energy Model (LBL–REM) results in its consideration of total projected savings. The savings for refrigerators, refrigerator-freezers and freezers are provided in the ''Analysis'' section of this NOPR, *supra*.

a. Determination of Savings. The Department forecasts energy consumption by using the LBL–REM, which forecasts energy consumption over the period of analysis for candidate standards and the base case. The Department quantified the energy savings that would be attributable to a standard as the difference in energy consumption between the candidate standard and the base case.

The Lawrence Berkeley Laboratory Residential Energy Model was used by DOE in previous standards rulemakings. (See TSD, Appendix B for a detailed discussion of the LBL–REM.) The LBL–REM contains algorithms to project average efficiencies, usage behavior, and market shares for each product. Long-term market share elasticities have been assumed with respect to equipment price, operating expense, and income. The effects of standards are expected to be lower operating expense and increased equipment price. The percentage changes in these quantities and the elasticities are used to determine changes in sales volumes resulting from standards. Higher equipment prices will decrease, and lower operating expenses will increase sales volumes. The net result depends on the standard level selected and its associated equipment prices and operating expenses.

The Lawrence Berkeley Laboratory Residential Energy Model is used to project energy use over the relevant periods for refrigerator products with and without amended standards. The Department estimated the projected energy savings during the period 1998–2030[4], by comparing the energy consumption projections at alternative standard levels against the projections at current standards which is the base case. The energy saved is expressed in quads, i.e., quadrillions of British thermal units (Btu), and exajoules (EJ). With respect to electricity, the savings are quads of source or primary energy, which is the energy necessary to generate and transmit electricity. From data that remain rather constant over the years, the amount of electrical energy consumed at the site is less than one-third of the amount of source energy required to generate and transmit the electrical energy to the site.[5]

The Lawrence Berkeley Laboratory Residential Energy Model projections are dependent on many assumptions. Among the most important are the responsiveness of household appliance purchasers to changes in residential energy prices and consumer income, future energy prices, future levels of housing construction, and options that exist for improving the energy efficiency of appliances.

b. Significance of Savings. Under section 325(o)(3)(B) of the Act, 42 U.S.C. 6295(o)(3)(B), the Department is prohibited from adopting a standard for a product if that standard would not result in ''significant conservation of energy.'' While the term ''significant'' is not defined in the Act, the U.S. Court of Appeals concluded that Congress intended the word ''significant'' to mean ''non-trivial.'' *Natural Resources Defense Council* v. *Herrington*, 768 F.2d 1355, 1373 (D.C. Cir. 1985).

4. Lessening of Utility or Performance of Products. In establishing classes of products and design options, the Department tried to eliminate any degradation of utility or performance in the products under consideration in this rulemaking. That is, to the extent that comments or research showed that a product included a utility or performance-related feature that affected energy efficiency, a separate class with a different efficiency standard was created for that product. In this way, the Department attempted to minimize any lessening of utility or performance resulting from amended standards.

5. Impact of Lessening of Competition. The Act directs the Department to consider any lessening of competition that is likely to result from the standards. It further directs the Attorney General to gauge the impact, if any, of any lessening of competition.

To assist the Attorney General in making such a determination, the Department studied the affected appliance industries to determine their

[4] The Lawrence Berkeley Laboratory Residential Energy Model was programmed to analyze a single standard level or alternate standard levels over the entire period. That is, the fact that a standard might be revised during subsequent rulemakings was not considered by the model. The Department believes that it is not possible to predict what result such reviews may have, and therefore it would be speculative to model any particular result. Therefore, for purposes of this rulemaking, each standard level that was analyzed was projected to have been in place from the time of implementation to the year 2030.

[5] Energy Information Administration, *Electric Power Annual 1987*, Tables 25 and 82, DOE/EIA–0348(87), 1987.