1996. For comparison, DOE's investment in the DOE-2 program totals $17 *million* through 1996.

High-Efficiency Refrigerator/Freezer Compressor

From 1978 through 1980, the Department of Energy, through a DOE National Laboratory, sponsored a contract with Columbus Products Company to develop a high-efficiency compressor for household refrigerators. DOE's investment of $8.3 million over this period ($15 million in $1996) supported the development of a new compressor that achieved a 44% improvement over the existing refrigerator compressor technology of that time. Refrigerator energy use declined from about 1,300 kilowatt hours per year in 1980 to about 900 kilowatt hours per year in 1990. The availability of high-efficiency compressors accounted for at least half of the drop in refrigerator energy use. Use of the improved compressors will save consumers a significant amount in energy costs throughout the life of these refrigerators. Considering only those refrigerators purchased through 1990, these high-efficiency compressors will save consumers at least $24 billion ($1996) in refrigerator life cycle energy costs.

Flame Retention Head Oil Burner

In the early 1970s, concern with oil supply and price volatility promoted interest in raising the efficiency of oil use. At this time, DOE sponsored research on the *Flame Retention Head Oil Burner*. This device, invented by others, offered a measurable improvement in oil use efficiency, yet it had languished for 9 years with no appreciable market penetration. This lack of market interest is remarkable during a period in which heating oil prices nearly quadrupled.

From 1977 to 1981, field tests were conducted by the Oil Heat Research and Development Program at a DOE National Laboratory. Results from this research established the validity of the energy conservation benefits of this technology. A second Department effort published the findings in a consumer-oriented information booklet. Due to DOE's critical investment during this period, totaling $8.8 million ($16.6 million in $1996), the retention head burner steadily achieved a growing market share and now accounts for over three quarters of the market for new and replacement oil burners. Before DOE's involvement in validating, testing and promoting this energy-saving technology, the Flame Retention Head Oil Burner had been largely ignored by the market and industry. Net consumer energy cost savings to date, from bringing this innovation to the marketplace, total more than $5 billion, (more than $8 billion in $1996). Using conservative estimates, assuming that DOE's involvement accelerated market acceptance by only 3 years, the Department's investment in this technology accounted for over $1 billion of these savings.

Energy Security

When discussing R&D investments by government agencies, most taxpayers want to see the "social good" that is achieved by performing the research. To make the public aware of the benefits achieved by its research, the DOE has published cost benefit analyses for selected R&D programs. The cost savings achieved provide excellent justification for performing the research in the context of alternative government investments. However, the true value of the the R&D, or "social good," is really best expressed in terms of the effect on our nation's energy security. The oil supply disruptions in the early 1970s demonstrated this nation's dependence on energy as a commodity. During the gas shortage of 1973, and to a lesser degree in 1980 and 1991, our transportation sector was crippled. When gas lines were over a mile long, our citizens were not concerned with cost savings, they wanted gas (and they wanted it in a hurry). Americans love their cars, and they do not like the idea of being susceptible to energy supply disruptions. It is in this context that the relevance of DOE investments in energy efficiency technology becomes apparent.

If we can acknowledge the impact of energy