

improved lighting quality, but has **saved consumers \$750 million in consumer energy bills from a \$3 million research and development investment.** This new industry's sales totalled \$275 million in 1992, accounting for 25 percent of total ballast sales. Electronic ballasts are expected to replace magnetic ballasts in at least 75 percent of applications by 2015.

Advanced Energy Efficient Windows

A 20-year Department of Energy research and development partnership with industry culminated in the development at Lawrence Berkeley Laboratory of an advanced energy-efficient window that uses low-emissivity coatings to block heat gain or loss. **No U.S. manufacturer had invested in this technology before the Department's R&D investment. Cumulative consumer energy savings attributable to using low-emissivity windows are \$1.8 billion.** This enormous savings was leveraged and catalyzed by a Department of Energy investment of just \$3 million through the early 1980s. The Department teamed with five window manufacturers (Andersen, Cardinal IG, OwensCorning Fiberglass, Pella, and Southwall Technologies) and the Bonneville Power Administration to convert the concept into commercial prototypes. Today, **every major glass and window manufacturer offers low-emissivity products.** Their market share is one-third of all residential windows.

Sulfur Lamp

In October 1994, the Department of Energy and a small Maryland company, Fusion Lighting Inc., unveiled the sulfur lamp, or S-Lamp, a revolutionary new type of light system in which microwaves are used to heat a sulfur core. The S-Lamp is a scientific and technological breakthrough, considerably more efficient than even fluorescent lights, with fewer associated environmental problems. The quality of light is vastly improved, more nearly approximating natural sunlight, and the installation costs are one-sixth that of conventional lighting. At present, the new system is being demonstrated at the Department's Headquarters, where it lights the outdoor entrance to the building, as well as at the Smithsonian Air and Space Museum. **Two S-Lamp bulbs have replaced 240 mercury bulbs, providing four times the light at one-third the cost.** Unlike other high efficiency lamps, the Sulfur Lamp uses no mercury and produces 50 percent less ultraviolet light. The United States uses 520 billion kilowatt hours annually for lighting. The S-lamp is expected to have enormous potential commercial and residential applications.

Computerized Analytical Tool for Energy Efficient Building Design

Department of Energy research and development has created a powerful analytical software tool, DOE-2, for reducing energy use in buildings. DOE-2 calculates hourly building energy use and cost from information on the building's construction, climate, operation, heating, ventilating, and airconditioning systems, and utility rate schedule. At least 5 percent of commercial buildings today are designed with DOE-2. **Use of the software accounts for \$1.9 billion in energy savings for buildings constructed through 1993.**

High-Efficiency Refrigerator/Freezer Compressor

From 1978 through 1980, the Department of Energy, through Oak Ridge National Laboratory, sponsored a contract with Columbus Products Co. to develop a high-efficiency compressor for household refrigerators. The resulting product achieved a 44% improvement over the compressor technology used in refrigerators at the time. The availability of high-efficiency compressors was a major reason that refrigerator energy use dropped from about 1,300 kilowatthour per year in 1980 to about 900 kilowatthour per year in 1990. Use of the improved compressors pioneered by this research effort has saved consumers at least **\$6 billion in energy costs from 1980 through 1990.**

Flame Retention Head Oil Burner

In the early 1970s, concern with oil supply and price volatility increased interest in improving the efficiency of oil use. The Department of Energy sponsored field testing by the Oil Heat Research and