Development Program at Brookhaven National Laboratory, which established the energy conservation benefits of the retention head oil burner. A second Department effort published the findings in a consumer-oriented information booklet. In several years the retention head burner achieved total dominance of the market for new and replacement oil burners. **Consumer energy cost savings to date from this innovation total more than $5 billion.**

Flame Quality Indicator

The flame quality indicator, developed by the Oil Heat Research and Development Program at Brookhaven National Laboratory, has been called the most significant advance in oil heating technology since the introduction of the flame retention head burner in the 1980s. The flame quality indicator ensures that the burner operates at peak efficiency throughout the year by monitoring the brightness of the oil burner flame and warning the consumer when the burner needs maintenance. From a Department of Energy investment of slightly more than $1 million, this technology potentially can **reduce oil use by 290 million gallons per year, which represents $3 billion to consumers over 10 years.** Currently, three licensed manufacturers have entered the market. **The flame quality indicator received the 1992 R&D Magazine R&D 100 award and the 1993 "Best of What's New" from Popular Science magazine.**

Compact Fluorescent Lamps With Convective Venting

Compact fluorescent lamps produce less light and operate at reduced efficiencies at the elevated temperatures often associated with constricted environments (such as within recessed fixtures). A Department of Energy laboratory has received a 1994 Federal Laboratory Consortium Award for Excellence for developing a convective venting method to alleviate this problem. The cooling action produced by the convective venting yields an approximate 18percent increase in lumen output, **while increasing lamp service life from 750 to 10,000 hours.** This approach has been adopted by several large fixture manufacturers (Delray Lighting, Lithonia, Kurt Versen, and Prescolite).

Softdesk Energy Building Software

A collaboration among the Department of Energy, the University of Oregon, and Softdesk, Inc., resulted in Softdesk Energy, a software building design system that incorporates energy-saving features into computer-based building designs. The program integrates specialized software, computer-aided drafting tools, and commonly used manual tools for energy-use estimation. Used during the design process, the one-of-a-kind system provides quick feedback on a building's future energy consumption. The system also determines energy use impacts from internal factors such as lighting, temperature, humidity, ventilation, and building use. Softdesk Energy requires minimal input from the architect, which significantly reduces design time and costs and encourages the exploration of energyefficient building designs. The system is designed and equipped to incorporate other energy design tools such as code and standards compliance, lighting design tools, detailed energy analysis packages, and heating, ventilation, and air-conditioning equipment selection tools. **Of 167,000 computer-aided building design users, 100,000 (60 percent) are Softdesk users.**

Appliance Efficiency Standards

The Department of Energy is required by law to set energy-efficiency standards for a number of appliances, including refrigerators and freezers, stoves and ovens, dishwashers, water heaters, and heating and cooling equipment. The Department updates the standards to ensure that models coming onto the market incorporate the best available efficiency technologies. **These standards have already saved U.S. consumers nearly $2 billion on their energy bills.** Consumers save $2.50 on energy bills for every extra $1 paid to purchase appliances meeting the efficiency standards.

Transportation Technologies