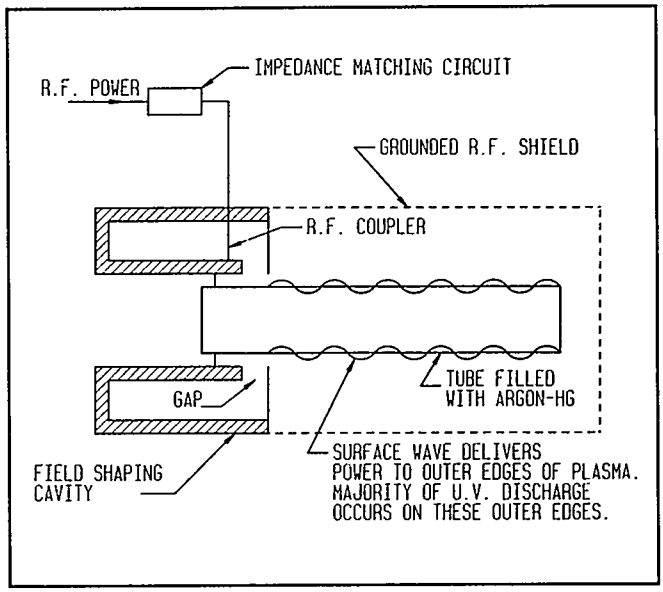
fer specimens with which to measure and label its products. Accurate heat transfer measurement eliminates the need for manufacturing insulation of excess thickness, thus reducing costs. In 1984, the U.S. Department of Commerce estimated that the improved measurement capability developed through this project saves consumers $90 million annually.

Appliance Efficiency Test Procedures

Legislation passed in 1975 required DOE to develop standard sets of test procedures to accurately measure the energy consumption and efficiency of thirteen categories of major household appliances. Since the testing and labeling program began, the average energy efficiency of new major appliances has increased significantly. As consumers reject less efficient models with higher operating costs, manufacturers are producing new designs with energy efficiency improvements of 50 percent over older models. Four national trade and professional associations representing manufacturers of major appliances have adopted the DOE appliance test procedures in their own industry guidelines and product certification programs.

Surface Wave Lamp

In 1980, DOE began a program directed at improving the efficiency of converting electrical energy to useful light. Fluorescent lamp efficiency is limited by electrode losses, by self-absorption of ultraviolet radiation within the lamp's plasma and by the efficiency of the lamp's phosphor in converting ultraviolet radiation into visible light. Several techniques to improve efficacy, including exciting fluorescent lamps using very high (gigahertz) frequencies, were explored. Unlike lower frequency lamp excitation, which concentrates ultraviolet radiation generation in the fluorescent lamp's center, very high frequency excitation using surface waves creates a greater ultraviolet generation close to the lamp's outer walls. Test results of surface wave lamps have revealed a 40 percent efficacy improvement over conventional fluorescent lamps. When fully developed, this concept is expected to result in a 50 percent reduction in electrical energy requirements for fluorescent lighting and to improve lamp life to over 40,000 hours.



Surface wave lamps promise a 50 percent reduction in energy use and over 40,000 hours of lamp life.

Supermarket Refrigeration Systems

Supermarkets consume about 4 percent of the nation's electricity, much of which is used in refrigerated display cases. To reduce this energy consumption, DOE and a leading manufacturer of supermarket refrigeration equipment developed a novel concept. An innovative design, featuring multiple parallel compressors and advanced microprocessor controls, reduced energy consumed in display cases by more than 40 percent. As a result of this DOE research, all leading manufacturers now offer advanced refrigeration systems with multiple unequal parallel compressors. Such systems accounted for 25 percent of the supermarket refrigeration equipment market in 1987. Advanced supermarket refrigeration systems are expected to save between 0.25 and 0.37 quads of primary energy in the year 2000.