improving the safety and reliability of equipment in coal-fired powerplants. This 9 percent chromium and 1 percent molybdenum alloy improves the life and performance of equipment under the severe operating temperature, pressure, and corrosion conditions typical of fossil fuel plants. Department of Energy scientists received the prestigious R&D 100 Award for this technology, which has since been incorporated into American Society of Mechanical Engineers Boiler and Pressure codes and transferred directly to industry for commercial applications. **Sales of this product exceed $100 million to date.** Use of this alloy has enabled an increase in coal-fired powerplant efficiency of more than 3 percent, which results in a **savings of more than $1.7 million per year in fuel costs in a typical 500 MW powerplant.** The higher efficiency also results in reduced emissions of sulfur dioxide, nitrogen oxides, and particulates, as well as reduced production of carbon dioxide by 280,000 tons per year.

**Atmospheric Fluidized Bed Coal Combustor**

The most significant advance in coal-fired boiler technology in more than half a century, the Fluidized Bed Coal Combustor has been the commercial success story of the last decade in the power generation business. This state-of-the-art, low-polluting combustion system technology has progressed into even larger scale utility applications. To date, **more than $6 billion in domestic sales and $2 billion in foreign sales** have been achieved through this Department of Energy investment. Domestic sales alone translate into nearly 250,000 jobs. Every major U.S. boiler manufacturer now offers a fluidized bed combustor in its product line.

**Low Nitrogen Oxide Burner**

With nitrogen oxides targeted for reduction by the 1990 Clean Air Act Amendments, Low Nitrogen Oxide Burner technology developed by the Department of Energy and Altex Technologies Company has rapidly found its way into the power market. **Domestic sales to date total more than $250 million, supporting 1,800 U.S. jobs.** For wall-fired boilers, nitrogen oxide reduction levels of 35 to 40 percent are achieved at a capital cost of about $20 per kilowatthour and a levelized cost of about $280 per ton of nitrogen oxide removed. For tangentially fired boilers, the same degree of nitrogen oxide reduction is achieved at a capital cost of $15 to $20 per kilowatthour and a levelized cost of $220 to $350 per ton of nitrogen oxide removed. These costs are significantly lower than other options.

**Pure Air Scrubber**

The first utility in the United States to meet new Clean Air Act standards for sulfur dioxide control did so using an advanced technology supported by the Department of Energy, the Pure Air Scrubber. The capital cost per unit was half of previous air scrubbers, and it produces a commercially marketable gypsum material, rather than the waste sludge commonly produced by older scrubbers (which causes landfill problems). In one year, the Pure Air Scrubber is eliminating 50,000 tons of sulfur dioxide emissions, turning an air pollutant into enough wallboard to construct nearly 19,000 homes. **The project earned Power Magazine's 1993 "Power Plant of the Year" award.**

**MicroMag Sulfur Removal Process**

Application of the MicroMag sulfur removal process removes 80 percent or more mineral-bound sulfur in coal. Scientists supported by the Department of Energy received a Federal Laboratory Consortium annual award for excellence for developing and transferring this technology to the private sector. This technology is central to a **$900 million coal preparation and slurry pipeline energy project in China.** The China project alone, developed by Custom Coals Corporation, will support 6,300 U.S. jobs.

**Advanced Instrumentation Development**

The Department of Energy's advanced instrumentation development efforts have generated and contributed to several commercial businesses, while fulfilling its role of supporting advanced and conventional power systems. The instrumentation developed in this program includes novel elemental