these companies more than $23 million, $8 million of which will flow back to the U.S. Treasury. The Department developed a third simulator, MASTER, to assist the natural gas industry in evaluating miscible and nonmiscible gas-enhanced oil recovery processes. By 1994, more than 250 copies of the software package had been distributed. Studies indicate that use of these processes will generate a 3-billion barrel increase in potential reserves.

Foam Fracturing of Gas Reservoirs

Another technique for creating fractures in a gas reservoir is to inject foam under high pressure into the wellbore. Foam has an advantage over high pressure water injection because it does not create as much damage to the formation, and well cleanup operations are less costly. Before the mid1970s, use of foam fracturing was limited almost exclusively to Canada and the Rocky Mountain region. The Department's research in the late 1970s extended the technology to the Eastern region of the country, where effective fracturing is required to produce commercial quantities of gas from shale formations. More than 50 stimulation tests were conducted to apprise oil and gas operators in 8 Eastern States of the technique's merit. Once it was shown that the process **accelerates the rate of natural gas production from these wells by nearly 200 percent,** the foam fracture process became the dominant stimulation technique for marginal gas wells in the United States.

Enhanced Oil Recovery Predictive Models

The Department of Energy, in partnership with the National Petroleum Council and Software/Intercomp, has developed easy-to-use, predictive computer models for numerous enhanced oil recovery techniques. More than 1,000 copies of the PC-based predictive models have been distributed to oil field operators, drilling and service companies, consultants, researchers, and several major oil companies. The use of these models has **saved the industry $400 million** by screening out uneconomical projects.

Coal Use Technologies

Coal is the Nation's most abundant fossil fuel and is currently used to generate 57 percent of U.S. electric power. With coal projected to remain a dominant fuel for the power industry for many years, cleaner and more efficient coal-based technologies are becoming increasingly important for the Nation's energy and economic future. Working in close collaboration with industry, the Department's research and development efforts focus on improving the environmental acceptability of coal. These include developing technologies to burn coal more cleanly and efficiently, as well as technologies that can reduce the costs of producing liquid transportation fuels from coal.

Integrated Gasification Combined Cycle

Capitalizing on a successful gasification program, the Department of Energy has provided the foundation for an advanced power generation system that will be the powerplant of the 21st century. Advanced integrated gasification combined cycle (IGCC) technology will have system efficiencies ranging from 41 to 52 percent. Emissions of sulfur dioxide and nitrous oxide are limited to less than one-tenth of that allowed by New Source Performance Standards, carbon dioxide emissions are reduced by 35 to 45 percent, and solid waste is reduced by 40 to 50 percent. The IGCC powerplant is cost-competitive to build, in fact it is projected to be significantly less costly than conventional powerplants, while the cost of production would be reduced by 10 to 20 percent. At present, the Department's Clean Coal Technology program will provide the IGCC system entry into the global market as a top-ranking clean coal power generation technology with a **potential global market of more than $400 billion in capital investment by 2030, and about $150 billion in the domestic market.**

Super 9 Chrome Alloy

During the 1980s, Department of Energy research and development was instrumental in the development of a superstrong alloy called Super 9 Chrome, which is now used worldwide as an industry standard for