

# The Fossil Report

Oak Ridge National Laboratory Fossil Energy Program

January-February 2000

## President Clinton Releases FY 2001 Budget

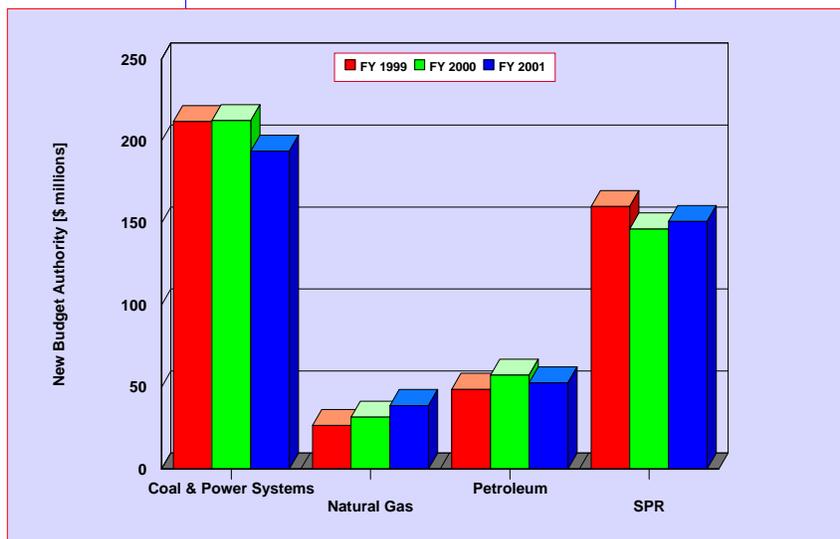
On February 7, President Clinton released the details of his Administration's budget for Fiscal Year 2001. In addition to a plan to pay off the national debt by 2013 and a proposed expansion of Medicare coverage, the budget also includes significant increases in discretionary spending for FY 2001.

Discretionary spending is the part of the Federal budget from which nearly all the federal support for research and development activities derives.

Caps for discretionary spending, enacted in 1997, have constrained budgets over the past

several years, and FY 2001 would have been similarly affected.

The budget, however, takes into account the President's intention to repeal the caps and



replace them with more generous ones. The replacement caps, if enacted, would allow for a 5.2% increase in discretionary spending in FY 2001, with the result that most R&D programs may increase.

Unfortunately, the Fossil Energy budget would not see a generous increase in FY 2001.

The Coal and Power Systems would decrease by \$18.8 million in FY 2001. In spite of this overall decrease, however, carbon sequestration activities would see an increase of \$10.3 million in the President's budget. Advanced Research would see a more modest increase of \$3.8 million.

As part of its goal to emphasize the removal and storage of carbon dioxide and other greenhouse gases from the emissions of power plants, DOE issued in call for pro-

## ORNL Wins in National Laboratory Competition

On February 18, the winners of the national laboratory competition for carbon sequestration research dollars were announced, and Oak Ridge National Laboratory was a winner in two categories of the competition.

In Category A—Multiple Laboratories With Industry Partners—ORNL will team with Lawrence Berkeley National Laboratory and Lawrence Livermore National Laboratory to study geologic sequestration of carbon dioxide in formations such as brine reservoirs, depleted oil reservoirs, and coal beds.

Industrial partners on the project will be Chevron, Texaco, Pan Canadian Resources, Shell CO<sub>2</sub> Company, Ltd., BP-Amoco, Statoil, and the Alberta Research Council Consortium.

ORNL was also a winner in Category B—Optional Private Sector Participation—and will be the lead laboratory, teaming with Pacific Northwest National Laboratory, in a study of the use of soil enhancers made from solid wastes to improve the uptake of carbon by lands which have been disturbed by mining.

The solid wastes to be considered are those from coal plants, sewage treatment facilities, and paper mills.

The Ohio State University and Virginia Polytechnic Institute will be partners in the two-year study.

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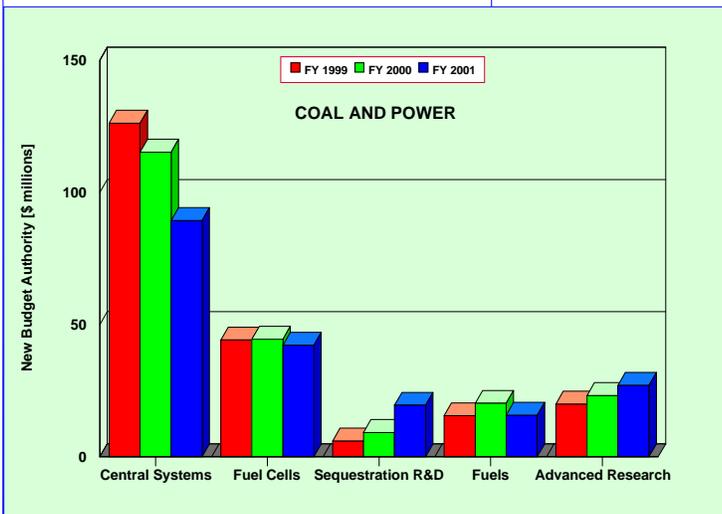
posals in 1999 from industry and national laboratories. The **winners** of that competition have been announced, and these new activities will be supported in the FY 2001 budget.

The Fuel Cell budget would show a decrease of \$2.3 million from its FY 2000 level, but still healthy at \$42.2 million in FY 2001. Of this amount, \$15 million is planned for activities which address Vision 21 goals.

In the Vision 21 concept, system integration is a critical objective—the ability to link together advanced gasifiers, turbines, fuel cells, and other energy devices to result in a pollution-free, high-efficiency power plant.

The Natural Gas budget shows an increase of \$7.2 million over FY 2000; however, \$13.2 million of the FY 2001 budget is slated for Infrastructure Reliability. Funding for other activities within the Gas budget will decrease in FY 2001, compared to FY 2000 levels.

Infrastructure reliability activities will focus on the development of advanced materials and technologies for high-strength, non-corrosive pipelines. In addition, these funds will support the development of systems and technologies to detect obstacles in the path of tunnels for gas distribution pipelines, and advanced sensors for leak

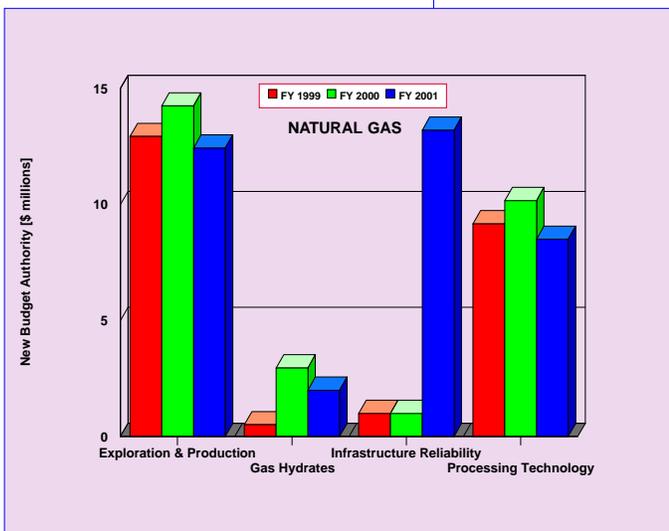
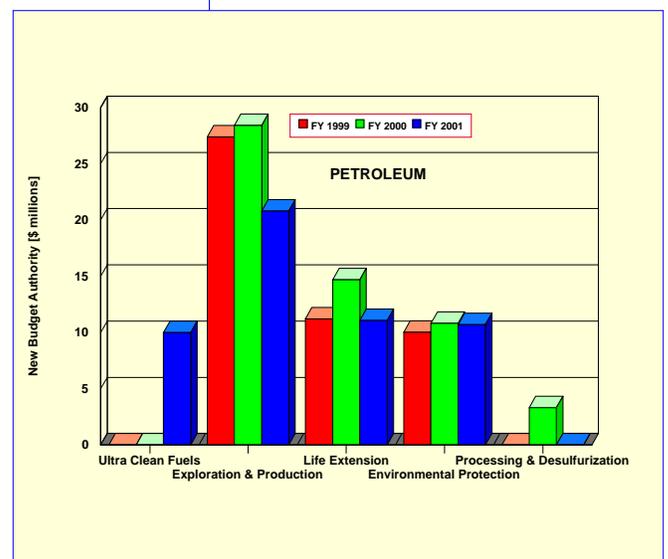


near-term priorities in FY 2001, DOE has deferred support for methane hydrate research. This decision is reflected in a decrease of support for methane hydrate activities in FY 2001 to \$2 million, down from nearly \$3 million in FY 2000.

DOE announced in February 2000 a major new initiative—the **Ultra**

detection and repair from within the pipeline. The FY 2001 budget will also provide funds for novel gas storage concepts, such as artificially-created hydrates and steel-lined rock caverns.

The focus on gas exploration in FY 2001 will be on smart drilling systems—drilling systems capable of monitoring the drilling



process and analyzing the surrounding rock and mineral structures during drilling.

A program plan on methane hydrates was issued in 1999 that called for laboratory studies with subsequent field tests. In consideration of more urgent,

**Clean Fuels Initiative**—designed to meet a sulfur emissions standard of 30 parts per million by 2005. The current average sulfur emissions level of domestic gasoline is 300 ppm. Funding for this new initiative is proposed at a level of \$10 million in FY 2001. Other activities within the Petroleum budget would decrease compared to FY 2000 levels.

Funding for the Strategic Petroleum Reserve operation and management activities remains virtually level from FY 2000 to 2001; however, the use of offsets from the Petroleum Account results in a lower level of new funds being requested in FY 2001.

### Molybdenum-Silicon-Boron Intermetallics Being Developed

[Joachim Schneibel](#) and [Hua-Tay Lin](#) are leading a project in the Metals and Ceramics Division to develop a new generation of corrosion-resistant Mo-Si alloys for use as components in advanced fossil energy combustion and conversion systems.

Alloys developed for the hostile environments of fossil power systems understandably require a high level of oxidation resistance, dependable fracture toughness, and significant creep strength.

It has been known for some time that boron-containing silicides possess high oxidation resistance, due to the formation of borosilicate glass. Boron-containing molybdenum silicides based on  $\text{Mo}_5\text{Si}_3$  have been developed and tested for oxidation resistance. Although the oxidation resistance of these alloys is good, they tend to be brittle.

Mo-Si-B alloys consisting of Mo,  $\text{Mo}_3\text{Si}$ , and  $\text{Mo}_5\text{Si}_3$  are being developed at ORNL. While the oxidation resistance of these alloys is inferior to that of  $\text{Mo}_5\text{Si}_3$  alloys, they have much better fracture toughness. And, their creep strength is much better than that of competing alloys based on  $\text{MoSi}_2$ .

More details on this exciting research can be found in the [Fossil Energy Program Annual Progress Report](#), or contact Joachim or Hua-Tay to learn more.

*"There is a single light of science, and to brighten it anywhere is to brighten it everywhere."*

Isaac Asimov

### Motorola Developing Tiny Fuel Cells

The drum-toting bunny may be thing of the past, if the latest in portable energy devices being co-developed by [Motorola](#) and [Los Alamos National Laboratory](#) is a success.

Motorola and LANL are developing a tiny fuel cell designed to power laptops, cell phones, and other electronic devices. The fuel cells are predicted to last ten times as long as conventional batteries.

The fuel cell, measuring a mere one inch square and less than one-tenth inch thick, uses liquid methanol and oxygen to produce electricity.

Developers predict that the device will power a cell phone for a month without recharging. And, when its power is exhausted, it would be replaced by a simple cartridge. So, the need for battery chargers disappears as well.

But don't look for the devices anytime soon. Motorola officials indicate that the devices are at least five years from commercial availability.

### FEP Staff Co-Editors of *Journal of Metals* Issue

[Mike Brady](#) and [Pete Tortorelli](#) are topic co-editors for the January 2000 issue of *Journal of Metals*. The focus of the issue is Combating Environmental Effects.

The two researchers have an article in the issue entitled "Alloy Design Approaches for High-Temperature Oxidation Resistance", which addresses the manner in which a fundamental understanding of oxidation reactions can lead to the development of oxidation-resistant alloys and coatings.

Tortorelli and Brady also have an article in this issue entitled "Alloy Design Strategies for Promoting Protective Oxide-Scale Formation." This article discusses general strategies for designing alloys to form protective oxide scales.

### 1GHz Coming

Intel predicts that we will see 1GHz Pentium IIIs by the fourth quarter of 2000, making it easier, one assumes, to procrastinate even longer in meeting those critical deadlines.

### High Pressure Combustion Kinetics Proposals Solicited

The [National Energy Technology Laboratory](#) has issued a solicitation for the development of high-efficiency coal combustion systems.

The systems envisioned by this solicitation would have low pollutant emissions, be attractive from the standpoint of costs and technical uncertainties, and, therefore, be acceptable for commercialization.

It is anticipated that the combustion systems developed as a result of this solicitation would operate in the range of 1600-3000 F, at pressures between 12-33 atmospheres, and would likely be oxygen-enhanced systems.

The objective is to obtain quantitative kinetic expressions for flow simulation, design, and operation of high-temperature and high-pressure combustion systems. The work is intended to form the basis of the design of advanced combustion systems.

Click [here](#) to access the solicitation.

### What's Going on in the Kentucky Hills?

To develop simple, but reliable, methods for characterizing the biological quality of oil exploration and production sites, investigators from Oak Ridge National Laboratory visited this site in South-Central Kentucky.

The objective was to field-test methods for sampling soil invertebrates and plant communities.

This activity is part of the research effort conducted in collaboration with the [Petroleum Environmental Research Forum](#) and funded through the DOE [National Petroleum Technology Office](#).

For more information on this work, contact [Art Stewart](#).



*“Every great advance in science has issued from a new audacity of imagination.”*

**John Dewey, *The Quest for Certainty***

### Fossil Materials Conference Coming

The [Fourteenth Annual Conference on Fossil Energy Materials](#) will be held April 25-27, 2000, at the Hilton Knoxville.

Current materials research on ceramic composites, iron aluminide alloys, advanced high-temperature alloys, inorganic membranes, filters, activated carbon absorbents, and solid oxide fuel cells will be presented.

To register, contact [Judy Fair](#) at 865-576-7270.

The Fossil Report is published bimonthly for Oak Ridge National Laboratory Fossil Energy Program staff.

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### Proposals Solicited for Ultra-Clean Fuels

The [National Energy Technology Laboratory](#) and the [National Petroleum Technology Office](#) have jointly issued a solicitation for research and development leading to the production of ultra-clean transportation fuels from fossil resources.

Proposed research can cover fuels produced directly from fossil resources or in combination with other hydrocarbon materials.

The solicitation is one of the first steps in the new Fossil Energy [Ultra-Clean Transportation Fuels Initiative](#).

The initiative marshals the forces of the three major segments of DOE Fossil Energy—Coal, Petroleum, and Gas—to meet the challenges of producing high-quality and environmentally-acceptable fuels for the nation's growing transportation sectors.

Click [here](#) to access the solicitation.