

The Fossil Report

Oak Ridge National Laboratory Fossil Energy Program

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Energy Technology for the Future...and for the World

Senate Subcommittee Supports Continuation of Clean Coal Program

The Energy Information Administration projects that coal will continue to increase in use, from the current level of 54 percent of U.S. electrical power generation, through Year 2020.

The Clean Coal Technology Program, begun in the mid-1980s, has resulted in the successful demonstration of technologies that will increase the efficiency of coal use and, at the same time, reduce the deleterious environmental factors often associated with the burning of fossil fuels.

Additionally, advanced technologies have been demonstrated for the utilization of substitute fuels, as well as the joining of conventional burning of coal with new-generation gasification and combustion technologies.

The last demonstration project under the Clean Coal Program received funding in 1992. Since that time, technology for the clean burning of coal has also continued on the laboratory scale. In the intervening

eight years, new considerations of global climate effects have placed in a new light the environmental concerns connected with the use of coal as a power source.

In its report on the FY 2001 Interior and Related Agencies Appropriations bill, the Senate Subcommittee on the Interior expressed a strong interest in maintaining the Clean Coal Program as a viable tool for the demonstration of forward-looking technologies.

The Committee indicated that the continuation of the Clean Coal Technology Program is necessary to "ensure the future use of...coal in the most environmentally benign and economically efficient manner."

The Committee recommended—and it subsequently was made part of P. L. 106-291—that no funds be rescinded from the Program, as had been proposed in the early budget language, and that \$67-million be deferred to FY 2002 for the continuation of the Clean Coal Program.

The Committee further directed the DOE Office of Fossil Energy to prepare a report, detailing the scope and direction of potential new Clean Coal Technology projects, should Congress appropriate funds for the Program in future years.

The Subcommittee has mandated that the report be submitted before March 31, 2001.

The report is to contain evaluations of criteria from previous clean coal technology solicitations, new criteria which should be part of any new solicitations, and goals for improving the performance of existing and new facilities.

For more information on activities at the Oak Ridge National Laboratory, conducted in support of the DOE Clean Coal Technol-

ogy Program, contact **Bob Miller**, Manager of the Environmental Analysis Support Program of the ORNL Fossil Energy Program.

Interior Bill Strengthens Fuel Cell Research

The Interior and Related Agencies appropriations bill for FY 2001, signed earlier this month by President Clinton, contains nearly \$100-million in funding for fuel cell research.

This enacted amount represents a \$10-million increase over the amount in the Administration's FY 2001 budget request to Congress.

The new funds are allocated to stationary fuel cell research [\$52.7-million]; fuel cell transportation alternatives [\$41.5-million]; and **DOE's Fuel Cells for Buildings Program** [\$5.5-million].

Industry, universities, and national laboratories are expected to compete for a share of the new funds.

Conference Dates Set

The Fifteenth Annual Conference on Fossil Energy Materials will be held in Knoxville, Tennessee, from April 30 to May 3, 2001. Additional details will be posted in the near future on the **Fossil Energy Program Web site**.

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Fuel Cells Go Farming

In the 1950s, long before energy conservation, ecology, and climate change effects were everyday words, Matt and Esther Freund of East Caanan, Connecticut, were focused on ways to save energy.

They insulated their house, abandoned the clothes dryer in favor of Mother Nature's air-drying, and returned to an ice box instead of the modern automatic-defrost refrigerator-freezer.

These dairy farmers, now farming with Matt's brother Ben, were following the time-honored tradition of Connecticut Yankee economy and frugality. Waste not, want not.

In 1997, the Freunds installed a device to extract methane from the more than 4,000 pounds of manure generated daily by the farm's 350 cattle.

The device, an anaerobic plug flow digester, uses microorganisms to extract the methane. The gas from the digester fuels a hot-water boiler, which in turn heats the farmhouse and offices.

Now, the Freunds have entered into a partnership with Tor Energy Company to install a fuel cell system to run the farm, permitting the farm to run independent of the electrical grid.

The Isis Biocell Project will demonstrate the manner in which fuel cell technology can benefit the agricultural industry.

The solid oxide fuel cell, to be engineered and installed by Tor Energy, uses ceramic-based electrodes and is capable of burning hotter than other versions using platinum or polymers.

The fuel cell will operate on the methane produced by the anaerobic digester and is expected to produce about 25 kW of elec-

tricity.

Hot water vapor and carbon dioxide by-products will be used in the operation of the farm.

The hot water vapor will be used for heat, and the carbon dioxide will be pumped into greenhouses for vegetables and bedding plants.



(COURTESY TOR ENERGY CO.)

The Freund farm in East Caanan Connecticut

Global Warming Could Affect Your Health

A recent study by the Department of Agriculture revealed that ragweed produces significantly more pollen as carbon dioxide levels increase. So hay fever sufferers, beware. Global warming could become much more personal.

USDA researchers have found that the weed makes nearly twice as much pollen as it did 100 years ago, and that the higher levels of CO₂, linked to increasing temperatures, may be responsible.

The bad news is that the researchers postulate that the current levels of pollen could double by the end of the century.

The study showed that pollen production increased by 400 percent with an increase

of 200 percent in the levels of carbon dioxide. To make matters worse, the ragweed now appears to start producing pollen earlier in the season, with high levels of carbon dioxide once again responsible.

Many researchers believe that global warming has been in progress for the past century, but its rate has increased significantly over the last 20 years.

Global warming effects on human health can also have more sinister effects.

As weather patterns are altered—as a result of global warming—human health can be affected.

Paul Epstein, Associate Director of the Center for Health and the Global Environment at Harvard Medical School, points out that with the warming of the atmosphere, droughts in arid areas have lasted longer, and, when rain finally comes, the resultant flash floods can bring—by a variety of well-documented pathways—infectious diseases.

Once established, reemerging or new diseases are difficult to eradicate and can easily spread to other areas.

An infectious disease or viral strain, can quickly find itself, by virtue of today's global community, thousands of miles from its birthplace and in a very hospitable environment for further growth. A good example is the West Nile virus which made its recent debut in North America.

IEA Report Available

The IEA Greenhouse Gas R&D Programme Annual report is now available. The report covers activities from April 1999 through March 2000.

Highlights of the report include projects on capture and sequestration of carbon dioxide, including injection of CO₂ in deep saline aquifers.

Contact [Louise Fazeli](#) if you would like a copy.

Ecological Risk Assessments Are Not Just Toxicity Tests Anymore

Rebecca Efroymson and Art Stewart, Oak Ridge National Laboratory

To provide energy for U.S. consumers, tens of thousands of square miles of land in the United States are owned, managed, drilled, or otherwise used by American petroleum and natural gas companies. As the petroleum or gas reserves in these areas are depleted, the land can be made available for other productive purposes, if no significant hazards remain.

The key question, of course, is "what constitutes a significant hazard?" States, the U.S. Environmental Protection Agency, the petroleum and natural gas industries, various non-governmental organizations, and the public sector are all important stakeholders in this situation.

Hydrocarbon cleanup levels promulgated by various states vary and are not always based on sound science.

There is a need to integrate ecological and toxicological information, so that criteria can be developed for determining when a comprehensive ecological risk assessment is not warranted.

And tools and methods to improve and simplify the ecological risk assessment process are needed, to make the ecological risk assessment process less expensive and more valuable.

Current research at Oak Ridge National Laboratory addresses these issues. In collaboration with Lawrence Livermore National Laboratory, an ecological framework

that can be used to evaluate the impacts of releases at petroleum exploration and production sites is in development.

The study site is the Tallgrass Prairie Preserve, a 37,000-acre region of the Flint Hills in northern Oklahoma. This ecosystem is maintained by prescribed burns and grazing and is home for more than 1,300 bison.

About 600 historic oil and gas wells are located on the Preserve, of which 120 are still

productive. At such sites, the spatial distribution of habitat in relation to the placement of wells, tanks, roads and brine spills may be at least as important as the concentration of petroleum hydrocarbons in the soils, in terms of potential risks to wildlife and vegetation.

The petroleum and natural gas companies

are interested in the types of risk assessments and mitigative or remedial measures that might be appropriate before transferring their reserve-depleted lands to other uses.

One focus of the research is the consideration of ecological factors such as the home ranges of wildlife and the dispersal patterns of vegetation, in relation to the size and distribution of areas impacted by the petroleum and natural gas exploration and production operations. Geographic Information System map layers of soils, meteorology, vegetation, well locations and spill lo-

cations are being collected and stored at LLNL.

ORNL is also collecting information that can be used for population viability analyses, and to model risks from food-chain transfers of chemicals associated with the petroleum and natural gas operations.

Ecological risk assessment issues also arise at refineries, pipeline spill sites, and petroleum land-farms, especially in rural areas where human contact with the petroleum is unlikely. The research aims to improve the ecological risk assessment process by developing (1) soil screening levels for ecotoxicity of hydrocarbon mixtures, (2) bioaccumulation models for metals found in wildlife foods at petroleum-contaminated sites, (3) spatially-explicit methods for estimating risks to wildlife and vegetation, and (4) a framework for net Environmental Benefit Analysis, suitable for use at petroleum-contaminated sites.

NEBA is the comparison of risks and benefits associated with three principal alternatives at petroleum-contaminated sites: (1) leaving contamination in place; (2) physically, chemically, or biologically remediating the environment through traditional means; and (3) improving ecological value through restoration alternatives that do not directly focus on chemical contamination.

Working on ecological risk assessments for hazardous waste sites at U.S. Department of Energy facilities has revealed that some remedial technologies (e.g., excavating soil) are environmentally harsh. Sometimes, natural recovery or creative restoration methods are equally effective, but more benign.

The framework of this research will help the petroleum and natural gas industry to make better remedial decisions and should influence state and federal regulatory agencies to take a more holistic approach to selecting remedies for spills and other contamination.

Contact **Rebecca Efroymson** or **Art Stewart** for more information on this work.



Bison on the tallgrass prairie. Courtesy **Konza Prairie Long Term Ecological Research Program**