

3.7 ENVIRONMENT

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ENVIRONMENT

3.7.1 TECHNOLOGY SUMMARY

OVERVIEW

The primary mission of DOE's Oil and Gas Environmental Research and Analysis Program is to ensure that environmental protection efforts make technical, environmental, and economic sense. DOE is well-positioned between industry and regulators to champion balanced, cost-effective approaches to environmental protection and energy resource development. The Environmental Research and Analysis Program pursues improvements to the regulatory process, supports development of new technologies, and exercises key responsibilities for energy policies that encourage efficient oil and gas recovery and processing and ensure adequate, secure energy supplies.

To support more informed regulatory decisionmaking, the environmental program facilitates dialogue among Federal officials, State regulators, industry representatives and other stakeholders. Through its program activities, the environmental program provides assessments of costs or risks and benefits, lending an independent voice to policy debates. DOE also characterizes technical, analytical, and regulatory problems and possible alternative solutions, catalyzing and contributing to the process of achieving common-sense approaches.

Many times, more cost-effective environmental approaches hinge on development of new technologies. DOE supports such development by focusing on beneficial technology investments that could not be justified by a single company or small group of companies. Some of these technologies have longer-term payoffs or high risks; others may have widely diffused benefits that a single company could not fully capture, but that will be obvious only on a national scale.

DOE brings unique capabilities to its role, including the scientific capabilities of its national laboratories and modeling/analysis

tools developed specifically to address energy policy questions. A fundamental commitment to outreach and technology transfer enables the environmental program to generate maximum benefits for the Nation.

DEPARTMENT-WIDE PROGRAM

The Office of Fossil Energy (FE) provides policy direction on issues related to natural gas and undertakes studies related to regulatory obstacles that unnecessarily impede development of cost-effective gas use, impacts of emissions from vehicles and general use of fossil fuels, and broad economic impacts of activities proposed by the Administration or by Congress.

DOE's Office of Energy Efficiency and Renewable Energy (EE) invests in RD&D activities for use of natural gas technologies. Through partnerships with industry, EE develops and deploys innovative gas use technologies in the transportation, industrial, utility, and building sectors. Program objectives include: analyzing combustion optimization and catalysts, emphasizing emission reductions for natural gas and other alternative fuels; developing industrial technologies to help manufacturers meet current and future environmental regulations and quality objectives; and developing methodologies for gas Integrated Resource Planning (IRP) and coordinating with States. Environmental benefits of these technologies are greater efficiency and reduction in harmful air emissions (such as NO_x and CO_2) and other environmental effluents.

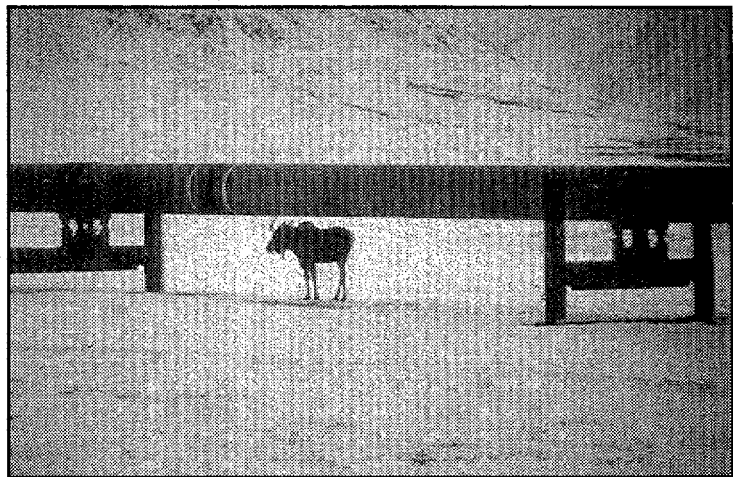
DOE's Office of Energy Research (ER) conducts fundamental research on the role of methane in global climate change, primarily through two initiatives: (1) development of improved global circulation models as the basis for global climate studies; and (2) studies of background methane emissions from agricultural activities and natural sources such as rice paddies, boreal peat bogs, and ruminant animals.

The Energy Information Administration, through its data collection, analysis, and forecasting programs, provides current and future market trends for natural gas from wellhead to burnertip.

Fossil Energy's environmental efforts focus on upstream oil and gas operations, and include four main activities: (1) fostering an understanding of environmental and energy challenges in the oil and gas exploration and production (E&P) sector, (2) streamlining regulatory requirements applicable to oil and natural gas exploration and production, (3) promoting risk-based decision making to help prioritize issues related to the E&P sector, and (4) developing lower cost environmental compliance and pollution reduction technologies for the E&P sector. Fossil Energy's gas program currently emphasizes RD&D in the areas of NORM, air emissions, waste treatment/disposal, and wetlands restoration.

Priority issues for these offices will change over time as legislative and regulatory agendas evolve, new knowledge develops, opportunities arise, and available technologies and industry practices change.

A View of the Trans Alaska Pipeline



PROGRAM ACTIVITY SUMMARY

The natural gas environmental program is focused on analyzing data to identify environmental constraints to gas resource recovery. It also supports aggressive outreach and technology transfer efforts to identify stakeholder needs and communicate availability and potential of new technologies to improve environmental performance and to resolve environmental constraints. This program also includes characterization of health and environmental risks posed by gas exploration and production operations; development and demonstrations of technologies to improve economics and environmental performance of gas exploration and production operations; and downstream gas compliance technologies.

FY 1996-1998 CROSSCUT BUDGET SUMMARY (\$ IN MILLIONS)

Projects	FY 1996	FY 1997	FY 1998
Fostering Understanding of Environmental and Energy Challenges	0.327	0.310	0.458
Streamlining Regulatory Requirements	0.395	0.320	0.300
Promoting Risk-Based Decisionmaking	0.468	0.315	0.428
Developing Lower-Cost Environmental Compliance Technologies	1.850	2.125	2.081
Total	3.040	3.070	3.267

PROGRAM SCHEDULE

Projects	1996	1997	1998	1999	2000	2001	2002
Fostering Understanding of Environmental and Energy Challenges	_____						
Streamlining Regulatory Requirements	_____						
Promoting Risk-Based Decisionmaking	_____						
Developing Lower-Cost Environmental Compliance Technologies	_____						

3.7.2 PROJECT DESCRIPTIONS

As highlighted in the budget summary, the Oil and Gas Environmental Research and Analysis Program divides its many functions into four key activity areas. These four activity areas, while not mutually exclusive, provide a useful framework for conceptualizing the design and implementation of projects undertaken by the environmental program. The four activity areas are:

- Fostering Understanding of Environmental and Energy Challenges
- Streamlining Regulatory Requirements
- Promoting Risk-Based Decisionmaking
- Developing Lower-Cost Environmental Compliance Technologies

Each of these four areas and examples of specific recent projects that fall within each are described in the following subsections.

3.7.2.1 FOSTERING UNDERSTANDING OF ENVIRONMENTAL AND ENERGY CHALLENGES

BACKGROUND

The collaborative process is a core component of all DOE Oil and Gas Environmental Research and Analysis Program activities. This involves building trust through sharing ideas and information, and the hard work of creating consensus, identifying needs, and finding solutions. When contentious issues are identified, the Office of Fossil Energy often serves as a facilitator between diverse parties such as industry, States, other Federal agencies, and the general public.

MAJOR GOALS

The major goals of DOE's efforts to foster understanding of environmental and energy challenges are to develop tools and analysis that can be used to illustrate to a broad audience links between costs of

environmental protection and costs of natural gas production, highlighting benefits of appropriate environmental regulation and technology.

PROJECT OBJECTIVES

Specifically, this project area seeks to:

- Provide the analytical basis for quantitatively demonstrating links between costs of environmental protection and natural gas production costs by developing analytical tools and applying them to analyzing cost/supply relationships under alternative cost and technology scenarios.
- Develop and report the inter-relationships between environmental production costs, gas production costs, and related supply impacts.
- Evaluate and report on relationships between environmental protection costs and potential abandonment rates of the Nation's marginal oil and gas wells and the resources associated with them.
- Assess potential environmental risks and resource recovery impacts of the Nation's orphaned and idle wells.
- Communicate information regarding relationships among environmental protection costs, gas production costs, environmental risks, and resource and supply implications to public and private decision makers and the general public.

EXPECTED BENEFITS

The benefits of public education and fostering an understanding of links between environmental protection and energy production are substantial. Through its advocacy of legislative and regulatory initiatives within the government, the environmental program is often able to prevent the costly mistakes of ill-informed environmental regulation.

Based on the Office of Natural Gas and Petroleum Technology's report entitled "DOE Oil and Gas Environmental Program Metrics: Analysis and Results," significant benefits can be expected from FE activities related to regulatory advocacy and consensus building. In fact, DOE expects that through these functions, it could accrue present value benefits of greater than \$3 billion through 2010.

PLANNED PRODUCTS

- Development of the Gas Systems Analysis Model's (GSAM) Environmental Module to incorporate environmental costs and benefits into its analysis of regulatory and technological changes affecting the gas industry.
- An annual report on the energy and economic importance of the Nation's marginal oil and gas wells.
- Nationwide studies of idle and orphaned wells, including State and Federal strategies for reducing environmental risk and ensuring more efficient resource recovery.

STRATEGY (FY 97 FUNDING: \$0.310 MILLION)

DOE's approach is to work with States and others to identify and address environmental challenges to sustained or increased gas production within States or regions. DOE will provide technical and economic analyses related to environmental and energy production interactions. DOE will communicate results of those analyses to States, other Federal agencies, and other stakeholders to provide rational, neutral inputs for policy debates.

RECENT ACCOMPLISHMENTS

FE's environmental program has been an active participant in the Green River Basin Advisory Committee. This committee is a forum for discussion and cooperative decisionmaking among oil and gas industry representatives, environmental

organizations, hunting and fishing advocates, and local and State officials. This committee was created by the Secretary of the Interior to develop recommendations to assist the Bureau of Land Management make decisions that ensure timely development of oil and gas resources, as well as protect wildlife and other environmental resources that exist in the Greater Green River Basin area of Colorado and Wyoming.

Fossil Energy is also currently working on issues related to industry's cost of compliance with increasingly stringent environmental regulations. FE actively supports research and development of new technologies that could increase industry's environmental compliance with these newer regulations at lower costs than currently possible. FE also supports development and use of economic analyses to identify optimal allocation of limited energy resources and to assess potential social costs and benefits of proposed programs and regulations affecting the oil and gas industry.

DOE is developing an environmental module to be incorporated into its Gas Systems Analysis Model model. This environmental module will allow DOE to estimate the costs and benefits associated with various environmental regulation and technology. In addition, because the environmental module will function as part of the larger GSAM, it will allow DOE to estimate the ripple effects of environmental technology and regulatory changes on natural gas production at virtually any level of aggregation (e.g., reservoir, state, nationwide).

COST SHARING (\$ IN MILLIONS)

Most of the work performed in this area is conducted by the Department of Energy through its headquarters staff and support contractors and by the Federal Energy Technology Center and its on-site management and operating contractors. Unlike technology research, development, and demonstration efforts, cost sharing is not an expected element of funding for analytical work of this nature.

PROGRAM FUNDING**DOE HISTORICAL SPENDING
(\$ IN MILLIONS)**

DOE Office	FY 1996	FY 1997	FY 1998
Environmental Analysis for Gas	0.000	0.060	0.025
GSAM Environmental Module	0.150	0.150	0.110
Program Support	0.177	0.000	0.033
Regulatory and Legislative Analysis	0.000	0.100	0.290
Total	0.327	0.310	0.458

SCHEDULE

Projects	1996	1997	1998	1999	2000	2001	2002
Environmental Analysis for Gas	_____						
GSAM Environmental Module	_____						
Program Support	_____						
Regulatory and Legislative Analysis	_____						

3.7.2.2 STREAMLINING REGULATORY REQUIREMENTS

BACKGROUND

Cooperative streamlining efforts focus on simplifying regulation without compromising environmental protection, and on eliminating duplicative, unnecessary, or overlapping regulations. These activities support industry and government priorities of cutting red tape and achieving common-sense regulation, as well as Congressional efforts to promote regulatory reform. The Oil and Gas Environmental Research and Analysis Program fosters interagency cooperation and facilitates dialogue and partnerships among industry, State, and Federal agencies, tribes, the public, and other affected parties. Regulatory streamlining is a win-win proposition: it reduces costs to oil and gas operators and to regulatory agencies, and promotes a healthy respect for the environment.

MAJOR GOALS

As part of its regulatory streamlining activities, the environmental program is investigating areas where the myriad of Federal, State, and local environmental regulations affecting E&P activities can be streamlined to avoid overlapping requirements. DOE has undertaken these activities as part of its responsibility, as directed by Presidential Executive Order 12866, to reform and make more efficient the current regulatory process. By promoting regulatory efficiency, both private and public resources can be freed to pursue more beneficial activities.

PROJECT OBJECTIVES

There are three primary objectives of the environmental program's regulatory streamlining activities: (1) to reduce regulatory duplication; (2) to promote Federal and State cooperation in environmental regulation; and (3) to reduce regulatory barriers to the use of more efficient technologies.

EXPECTED BENEFITS

The potential benefits of regulatory streamlining are enormous. By reducing the number of redundant environmental compliance regulations placed on natural gas producers, significant reductions in compliance costs can be realized. Based on the Office of Natural Gas and Petroleum Technology's report entitled "DOE Oil and Gas Environmental Program Metrics: Analysis and Results," present value benefits (through 2010) attributable to FE's regulatory streamlining efforts could be approximately \$2.9 billion.

PLANNED PRODUCTS

- Applied research on salt cavern disposal of naturally occurring radioactive materials (NORM).
- States Air Emission Compliance Manual.

STRATEGY (FY 97 FUNDING: \$0.320 MILLION)

DOE's approach is to reduce redundancy of environmental regulations through: (1) establishment of a dialogue between various State and Federal regulators, (2) conduct of basic research that can serve as inputs for policy debates, and (3) development of regulatory/technical guidance documents that can help gas producers to comply with the myriad of environmental regulations in the most cost-effective manner possible. DOE's focus is both on reducing redundancy and burden of future environmental regulations, while ensuring a healthy environment, and on improving the gas industry's ability to effectively comply with existing regulations.

RECENT ACCOMPLISHMENTS

DOE has supported the Interstate Oil and Gas Compact Commission (IOGCC) to improve State programs for regulating the management of oil and gas wastes. DOE is also sponsoring IOGCC's Public Lands Project, which is focused on simplifying regulatory requirements in four western

States – California, Colorado, New Mexico, and Wyoming – that contain large holdings of Federal land with oil and gas potential. Working together, representatives from government, industry, and environmental groups designed three common permit application and reporting forms to be used by the States and the Bureau of Land Management, and identified seven areas of regulatory responsibility that could be transferred from the Bureau to States as a way to reduce overlapping activities and requirements.

In an effort to improve environmental performance, DOE is also working with States and industry to ensure that industry understands its current environmental compliance responsibilities. This effort includes developing modern, on-line permitting and environmental compliance advisory systems; developing environmental guidance manuals and compliance handbooks for the States of Colorado, Kentucky, New Mexico, Texas, and Wyoming, which summarize all environmental requirements in a single document; and developing guidance and workshops for small operators facing new requirements. These efforts are being undertaken to simplify environmental compliance for industry while improving environmental performance.

DOE is also actively involved with other regulatory streamlining projects, frequently acting as a facilitator between industry, States, and other Federal agencies to identify burdensome and overlapping regulations. Examples of these activities include:

- A "Direct Dialogue" project to streamline oil and gas regulations in Indiana with citizen involvement as a model for other States.
- A dialogue group for Appalachian and Illinois Basin State regulators to share information on environmental problems, solutions, and regulatory innovation.

- Facilitating dialogue between States and the EPA on Community Right-to-Know and expansion of Toxic Release Inventory (TRI) requirements for oil and gas exploration and production through the Interstate Oil and Gas Compact Commission.
- Assisting the Bureau of Land Management with a National Performance Review of its onshore oil and gas regulatory program. This effort includes initiatives to simplify regulations for oil and gas operations on Federal lands, and incentives for increasing oil and gas production.

DOE is also working to eliminate existing regulatory barriers to use of innovative, more cost-effective technologies. For example, DOE is promoting use of synthetic drilling fluids, which were originally developed in response to prohibitions on discharge of conventional oil-based fluids and increasing restrictions on the discharge of mineral oil based fluids. Synthetic fluids offer increased drilling efficiency in addition to offering significant environmental and safety advantages over conventional fluids. The use of this new technology, however, is hampered due to the narrow construction of existing regulations. DOE is working with the Environmental Protection Agency and the Minerals Management Service to further evaluate synthetic drilling fluids and to eliminate any unnecessary regulatory barriers to their use and discharge.

In addition to promoting synthetic drilling fluids, DOE is sponsoring research on the potential use of salt caverns for disposal of nonhazardous oil field waste. DOE is sponsoring this research based on preliminary analysis showing that salt caverns, currently used for storage of crude oil, natural gas, and hydrocarbon products, may offer a lower-risk alternative to landfill and surface pit disposal of oil field wastes. DOE supports development of a regulatory structure to allow this practice as an alternative to riskier disposal methods.

PROGRAM FUNDING

**DOE HISTORICAL SPENDING
(\$ IN MILLIONS)**

Projects	FY 1996	FY 1997	FY 1998
State Air Emissions Compliance Manual	0.050	0.000	0.000
IOGCC Dialogue on TRI Expansion	0.040	0.000	0.000
Offshore Lease Workshop	0.005	0.000	0.000
Salt Caverns/Synthetics Research	0.150	0.160	0.150
IOGCC Environmental Training Workshops	0.150	0.160	0.150
Total	0.395	0.320	0.300

SCHEDULE

Projects	1996	1997	1998	1999	2000	2001	2002
States Air Emission Compliance Manual	_____						
IOGCC Dialogue on TRI Expansion	_____						
Offshore Lease Workshop	_____						
Salt Caverns/Synthetics Research							
IOGCC Environmental Training Workshops	_____						

3.7.2.3 PROMOTING RISK-BASED DECISIONMAKING

BACKGROUND

DOE assesses environmental risks associated with oil and gas E&P operations and develops data and tools to support risk-based regulation enforcement and compliance decisions. As a source of credible scientific data to support risk-based regulation, DOE has already been successful in influencing development of new regulations based on environmental risk, cost, and energy impacts, which have resulted in considerable savings for industry. The primary goal of the promotion of risk-based decisionmaking is to encourage use of credible science in the regulatory process.

MAJOR GOALS

DOE's Oil and Natural Gas Environmental activities seek to expand the capabilities of State and Federal government to make more cost-effective, risk-based regulatory decisions—promoting the application of sound science and common sense to the regulatory process. Ultimately, achievement of these goals should result in changes in State and Federal regulations and policies that will reduce environmental compliance costs and make more of the domestic resource base economical to produce.

PROJECT OBJECTIVES

DOE conducts technical studies that provide input into policy debates by quantifying risks, thereby allowing costs and risks of future legislation and regulation to be weighed. The environmental program's major risk-related objectives are to continue to provide credible data, analytical tools, and guidance to States, other Federal agencies, and industry.

EXPECTED BENEFITS

By adding credible scientific data on risks, costs, and benefits associated with various regulatory and technological decisions, DOE plays an important role that would otherwise

go unfilled. The impacts of DOE's risk analysis work are important because they provide input for regulatory streamlining activities and for activities related to fostering an understanding of environmental and energy challenges.

In addition, by conducting applied research on risk assessment, DOE is uniquely positioned to provide guidance to the industry on emerging issues of risk such as the proper handling and disposal of radiologically contaminated materials.

PLANNED PRODUCTS

- Radiological Risk Assessment Guidance Document for use in quality assurance during NORM disposal technology demonstration projects.
- *Eliminating Unnecessary Compliance Costs: Exemption from Area of Review Requirements:* Current Safe Drinking Water Act regulations require oil and gas producers to conduct a quarter-mile Area of Review analysis of disposal and injection wells. Under certain conditions, however, variances from this expensive requirement can be granted. DOE has supported the University of Missouri-Rolla in developing a system to be used by regulators to determine when such variances are appropriate. DOE is currently working with California, Kansas, Oklahoma, and Texas to implement this methodology.

STRATEGY (FY 97 FUNDING: \$0.315 MILLION)

DOE's approach is to provide sound, scientifically based inputs related to risk assessment. DOE will support applied research related to emerging safety/risk issues in the gas production sector. This research will be transferred to the private sector in the form of guidance documents and technical assistance. In addition, over the longer term, DOE will continue to support

efforts to develop more realistic and accurate means of assessing and quantifying environmental and human health risks associated with natural gas production.

RECENT ACCOMPLISHMENTS

A current area of focus of the environmental program is the risk posed by naturally occurring radioactive materials. The environmental program's NORM work is primarily conducted at Argonne National Laboratory (ANL). As part of this work, a guidance document for conducting radiological risk assessments was developed to assist industry in the assessment and management of risks associated with exposure to NORM.

In addition to designing guidance documents for performing risk assessments, the environmental program is providing funding for additional studies to estimate the health and environmental risks associated with discharges of produced water and sand in the

Gulf of Mexico region. Data on NORM, heavy metals, and hydrocarbons in water, sediment, and biota are being collected and evaluated. Health related impacts are being studied through field collections and analyses of commercially and recreationally important fish and shellfish tissues. Additionally, information on seafood catch, consumption, and use patterns for the Gulf of Mexico are being gathered and analyzed. The facilities being studied as part of this research include both offshore and coastal facilities in the Gulf Coast region. For the coastal sites, studies to determine the rate of ecological recovery of affected bays and wetlands are being undertaken to determine the long-term ecological risks posed by oil and gas production activities. Finally, all of these inputs are being used to inform decision making and to allow for a rational analysis of the costs and benefits of existing and proposed Federal and State effluent guidelines.

**PROGRAM FUNDING
DOE HISTORICAL SPENDING
(\$ IN MILLIONS)**

Projects	FY 1996	FY 1997	FY 1998
Radiological Risk Assessment	0.468	0.315	0.328
Tank Bottom Analysis	--	--	0.100
Total	0.468	0.315	0.428

SCHEDULE

Projects	1996	1997	1998	1999	2000	2001	2002
Radiological Risk Assessment	—————						

3.7.2.4 DEVELOPING LOWER-COST ENVIRONMENTAL COMPLIANCE TECHNOLOGIES

BACKGROUND

DOE supports development of more cost-effective environmental compliance technologies through its ongoing relationship with the national laboratories, through evaluation of technology performance, development of bench-scale and pilot demonstration projects, and by helping to remove regulatory barriers to development of these technologies. DOE's focus is on development of environmentally and economically beneficial technologies that could not be justified by a single company or a small group of companies. Some of these technologies have longer-term payoffs or higher risks than the private sector is willing to assume. In addition, because many benefits of these technologies are diffuse and societal in nature, individual companies are not likely to invest in their development. In addition, individual companies are often responsive to environmental regulations, rather than proactive in developing technologies that may reduce the need for future regulation.

MAJOR GOALS

DOE's primary goal in developing lower-cost environmental compliance technologies is to fill this crucial research and development niche that would go unfilled if left solely to the private sector. DOE strives to identify promising technologies that are unlikely to be developed in the private sector because the benefits are longer-term, the benefits of such technologies are diffuse but substantial, or for which future regulation could be reduced through the proactive development and implementation of technology.

PROJECT OBJECTIVES

DOE seeks to develop technologies that would otherwise go undeveloped by the private sector because of long payback periods or diffuse benefits. Following development of

these technologies, DOE will transfer these technologies to the private sector and will provide technical assistance to bring the new technology into field use. In addition, DOE will provide analytical data to environmental regulators to ensure that the newly developed technologies are approved for use.

EXPECTED BENEFITS

DOE's actions in developing and transferring environmental technologies to the private sector can have both immediate and long-term benefits for society. Although the benefits of these technologies might not outweigh the costs for a single company, when the benefits are spread across the entire industry they become cost-effective. By moving forward state-of-the-art in environmental compliance, DOE not only helps the environment, but also ensures that domestic natural gas production can be sustained or increased.

PLANNED PRODUCTS

- Development of an improved, remote-sensing methane leak detection system. This technology uses the Backscatter Absorption Gas Imaging (BAGI) technique combined with pulsed lasers and focal-plane array cameras to improve the ability to locate methane leaks by a factor of 100.
- Pilot project to demonstrate use of injected produced water into a gas reservoir to improve gas recovery and production economics with decreased disposal costs and improved environmental compliance.
- Pilot demonstration project by Greenhill Petroleum to prove that cuttings from gas exploration and development operations can be successfully used to reestablish wetlands in areas of old operations. Furthermore, this project hopes to demonstrate that native vegetation can be supported without adverse effects. The ultimate goal of the project is to gain approval by

the State for this alternative disposal method that reduces costs and improves the environment.

- Conduct bench-scale and field-scale testing of NORM treatment and disposal and simultaneously transfer radiological risk assessment guidance to the private sector.
- Development of NEPA compliance documents for both the bench-scale and field-scale NORM disposal demonstration projects.

STRATEGY (FY 97 FUNDING: \$2.125 MILLION)

DOE's approach is to fund development of environmentally and economically beneficial technology. Following development of these technologies, DOE supports both bench-scale and field-scale demonstration projects to help these technologies gain acceptance. Finally, DOE works with both State and Federal regulators (e.g., providing them with performance data from demonstration projects) to ensure the new technologies will be approved for use.

RECENT ACCOMPLISHMENTS

DOE has continued to conduct applied research and development of cost-effective environmental technologies. DOE is continuing the process of technology transfer and the process of negotiation with State and Federal regulators to ensure that newly-developed technologies will be accepted for full-scale use. A number of examples illustrate DOE's recent accomplishments in this area.

The environmental program is currently sponsoring a project that demonstrates the effectiveness of injecting produced water to improve natural gas recovery. This project not only increases effectiveness of production, but also improves production economics by reducing water disposal costs and improving environmental compliance.

DOE is also sponsoring both applied research and a pilot technology demonstration of the viability and cost-effectiveness of using drill cuttings from gas exploration and development to reestablish wetlands in areas of old production operations. In addition, the project will attempt to demonstrate that native vegetation can be supported through such activities without any adverse environmental effects. Finally, this pilot project will generate data that will be used to help convince State regulators that this process should be allowed to both reduce disposal costs and provide environmental benefits.

Another significant area of DOE-sponsored environmental research is development of advanced methane leak detection technologies to improve both the speed and efficiency with which the natural gas industry is able to detect and respond to natural gas leaks. As mentioned above, DOE is supporting research into remote-sensing technologies that use the Backscatter Absorption Gas Imaging technique combined with pulsed lasers and focal-plane array cameras to improve the leak detection rate.

DOE's single largest technology development area is currently the development of improved methods for treatment and disposal of NORM waste. While there is currently limited regulation of NORM waste, DOE expects treatment and disposal of NORM to become an increasingly important regulatory and technological issue in the coming years. Based on this expectation, DOE is currently funding a number of separate research projects related to NORM treatment and disposal. The environmental program is funding bench-scale treatment and disposal tests for NORM waste. In addition, DOE is facilitating the field-testing of various NORM disposal techniques, as well as providing risk assessment, quality assurance, and safety oversight for the test projects.

PROGRAM FUNDING**DOE HISTORICAL SPENDING
(\$ IN MILLIONS)**

Projects	FY 1996	FY 1997	FY 1998
Air Emission Detection	0.239	0.153	0.189
Environmental Impacts Mitigation/Coalbed Methane	0.086	0.000	0.100
Water Disposal/Gas Recovery	0.085	0.031	0.125
Use of Drilling Waste/Wetlands Restoration	0.155	0.175	0.291
NORM Treatment and Disposal	1.260	1.525	0.926
Research on Salt Cavern Oilfield Waste Disposal	0.025	0.091	0.000
Laboratory Partnership	0.000	0.150	0.450
Total	1.850	2.125	2.081

SCHEDULE

Projects	1996	1997	1998	1999	2000	2001	2002
Air Emissions Detection	_____						
Environmental Impacts Mitigation/Coalbed Methane	_____						
Water Disposal/Gas Recovery	_____						
Use of Drilling Waste/Wetlands Restoration	_____						
NORM Treatment and Disposal	_____						
Research on Salt Cavern Oilfield Waste Disposal	_____						
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 EE: Office of Energy Efficiency and Renewable Energy
 EI: Energy Information Administration

ER: Office of Energy Research
 FETC: Federal Energy Technology Center
 HQ: Headquarters
 PO: Office of Policy and International Affairs