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The Domestic Natural Gas and Oil Initiative

First Annual Progress Report

U.S. Department of Energy
Washington, DC 20585

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ACRONYMS

AAPG	American Association of Petroleum Geologists
ACTI	Advanced Computational Technology Initiative
AFVs	Alternative Fuel Vehicles
AGA	American Gas Association
ANS	Alaskan North Slope
APE	Alternate Production Equipment
API	American Petroleum Institute
BLM	Bureau of Land Management
BOE	Barrel of Oil Equivalent
BPO	Bartlesville Project Office
BTU	British Thermal Unit
COST	California Oil Survival Team
CSI	Common Sense Initiative
CO_2	Carbon Dioxide
DOE	Department of Energy
DOI	Department of the Interior
DNGOI	Domestic Natural Gas and Oil Initiative
EIA	Energy Information Administration
E&P	Exploration and Production
EPA	Environmental Protection Agency
EPACT	Energy Policy Act of 1992
ETI	Environmental Technology Initiative
FERC	Federal Energy Regulatory Commission
FY	Fiscal Year
GBRN	Global Basins Research Network
GISB	Gas Industry Standards Board
GMP	Gulf of Mexico Program
GRI	Gas Research Institute
GWPC	Ground Water Protection Council
HBCU	Historically Black Colleges and Universities
H_2S	Hydrogen Sulfide
INEL	Idaho National Engineering Laboratory
IOGCC	Interstate Oil and Gas Compact Commission
LDC	Local Distribution Company
Mcf	Thousand Cubic Feet
MM	Million
MMcf	Million Cubic Feet
MMS	Minerals Management Service
MPSC	Maryland Public Service Commission

ACRONYMS (Continued)

MWD	Measurement-While-Drilling
NARUC	National Association of Regulatory Commissioners
NEPA	National Environmental Policy Act
NEPP	National Energy Policy Plan
NIPER	National Institute for Petroleum and Energy Research
NORM	Naturally Occurring Radioactive Materials
NOSR	Naval Oil Shale Reserve
NO_x	Nitrogen Oxides
NPC	National Petroleum Council
NPR	Naval Petroleum Reserve
NPRC	National Petroleum Reserves California
NREL	National Renewable Energy Laboratory
NRC	National Research Council
NPRA	National Petroleum Refiners Association
O&M	Operation and Maintenance
OPA	Oil Pollution Act of 1990
PC	Personal Computer
PERF	Petroleum Environmental Research Forum
PTTC	Petroleum Technology Transfer Council
R&D	Research and Development
RD&D	Research, Development, and Demonstration
RFP	Request for Proposal
RMOTC	Rocky Mountain Oilfield Testing Center
SEG	Society of Exploration Geophysicists
SEMP	Safety and Environmental Management Program
SERS	Spatial Energy Relationships System
SPE	Society of Petroleum Engineers
3-D	Three-Dimensional
TCF	Trillion Cubic Feet
UIPC	Underground Injection Practices Council
UIPRF	Underground Injection Practices Research Foundation, Inc.
UPRM	Uniform Production Reporting Model
USGS	United States Geological Survey

INTRODUCTION AND EXECUTIVE SUMMARY

This document is the first of a series of annual progress reports designed to inform the industry and the public of the accomplishments of the Domestic Natural Gas and Oil Initiative (the Initiative) and the benefits realized.

Undertaking of the Initiative was first announced by Hazel O'Leary, Secretary of the Department of Energy (Department or DOE), in April 1993. The Secretary underlined the importance of the Initiative by stating that:

> *"The end goal of this project will be to develop new and expanded opportunities for jobs in the domestic gas and oil industries, while fostering a climate which will increase production from domestic resource bases and reduce our reliance on foreign oil."*

Development of the Initiative was completed during the remainder of 1993 and released by the Administration in December 1993. The Initiative is industry driven and a result of many stakeholder meetings and information exchanges with all segments of the industry, both upstream and downstream, and large and small companies. The Department shaped the Initiative based on diverse industry stakeholder recommendations and will continue to seek input for future activities.

The Initiative is a comprehensive, focused effort providing technology programs, policies, scientific foundation, and institutional leadership to both industry and consumers. It flows directly from the Administration's national and energy goals:

National Goals:

- Promote responsible economic growth
- Create and sustain high-paying jobs
- Preserve environmental quality

Energy Goals:

- Efficiency of energy use
- Diversity in energy sources
- Economic productivity and competitiveness
- Improved environmental quality
- Energy security

What is DOE's Mission?

DOE, in partnership with its customers, is entrusted to contribute to the welfare of the Nation by providing the technical information and the scientific and educational foundation for the technology, policy, and institutional leadership necessary to achieve efficiency in energy use, diversity in energy sources, a more productive and competitive economy, improved environmental quality, and a secure national defense.

Prior to the Initiative, efforts to enhance the Nation's energy efficiency stopped short of examining the issues unique to the exploration, production, and refining of domestic natural gas and oil resources, and the particular economic and energy issues posed by our increasing reliance on imported oil. The Initiative specifically addresses these issues in the context of new federal

policies that reflect economic needs, including economic productivity and deficit reduction, job creation and security, and global competitiveness, as well as the need to preserve the environment, improve energy efficiency, and provide for national security.

The Initiative was developed with the understanding that economic, energy, and environmental objectives can be compatible, and that all activities affecting energy issues need to be integrated. A strategic combination of other efforts, such as the National Energy Policy Plan (see Information Box) and the provisions of the Energy Policy Act of 1992, will improve the overall effectiveness of how our Nation produces and uses energy, creates jobs, and enhances the quality of life for all Americans.

Department of Energy
Business Line: Energy Resources

Encourage efficiency and advance alternative and renewable energy technologies; increase energy choices for all consumers, assure adequate supplies of clean, conventional energy; and reduce U.S. vulnerability to external events.

The Initiative is an integral part of the Department's overall Strategic Plan that was published in April 1994. The Strategic Plan defined five business areas for the Department: Industrial Competitiveness, Energy Resources, Science and Technology, Environmental Quality, and National Security.

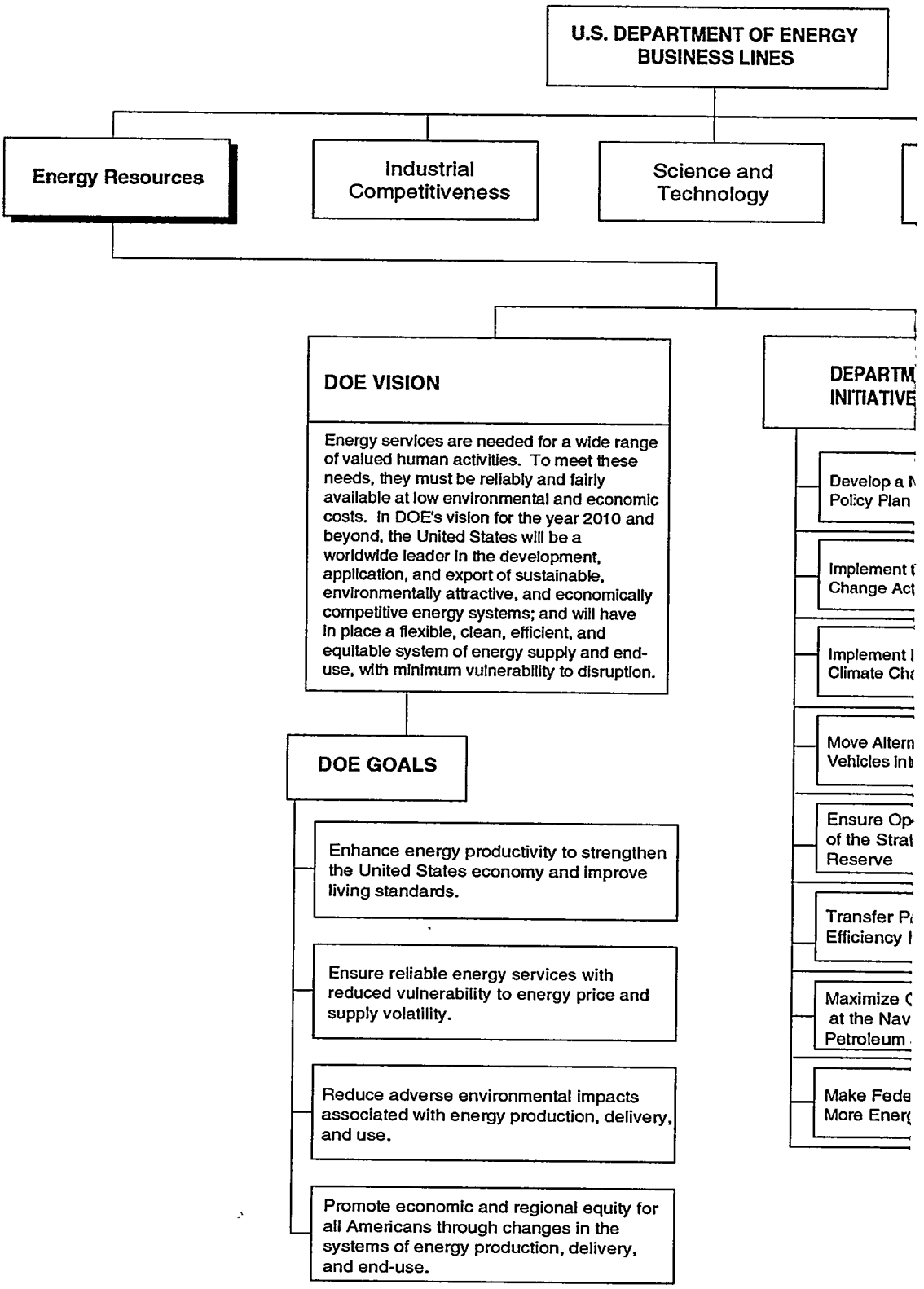
Implementation of the Initiative is one of the FY 1995 initiatives of the Department. This relationship is depicted in Exhibit 1. As highlighted in the Strategic Plan, the Department has shifted its energy research and development (R&D) focus to capitalize on domestic and international sustainable energy development. In this context, DOE strives to increase utilization of the Nation's fossil fuel resources and technologies to assure an ample, secure, clean, and low cost domestic supply of energy. The Department's research, development, and demonstration (RD&D) programs are redesigned in a way that they:

- Create U.S. jobs;
- Contribute to a stronger economy;
- Promote public-private partnership;
- Assure U.S. global leadership in fossil energy technology;
- Protect the local, regional, and global environment; and
- Merit public trust.

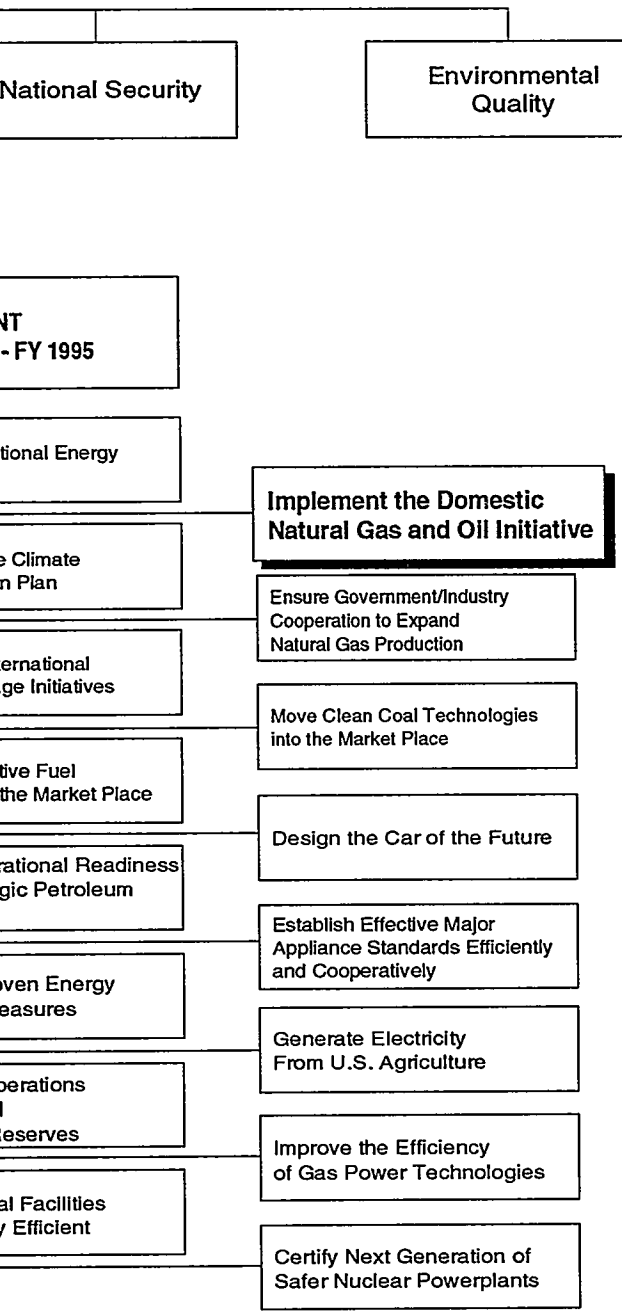
To achieve the above objectives, DOE has been encouraging its customers and stakeholders to participate in all areas of energy research and development, and to originate imaginative and innovative research ideas that will assist in the development and efficient use of reliable energy sources.

The Initiative is redirecting and refocusing the Department's programs and budgets. The success of this effort requires coordinated strategies that range far beyond policies primarily directed at natural gas and oil supplies. Strategies must seek to achieve a cooperative and effective balance between the public and private sectors and between federal and state governments. In achieving this balance, the Initiative proposed three

Exhibit 1 - The Domestic Natural Gas and Oil I



tiative Roadmap



major strategic activities comprising 48 actions:

- Strategic Activity I: Advance and Disseminate Natural Gas and Oil Technologies;
- Strategic Activity II: Stimulate Markets for Natural Gas; and
- Strategic Activity III: Improve Government Communication and Decisionmaking.

In addition, the Initiative includes a 49th action to reexamine the costs and benefits of increased oil imports through an interagency DOE study, coordinated by the National Economic Council, and the National Security Council.

Implementation of the Initiative involves not only the Department of Energy, but also coordination with other federal agencies and departments, states, and Native American Tribes. This relationship, and a listing of all actions, are summarized in Exhibit 2.

Although the Initiative was released almost three months into fiscal year (FY) 1994, DOE made a significant effort to restructure its existing oil and gas programs and initiate the actions without delay. The Initiative includes both new actions and actions that are expansions of ongoing gas and oil programs.

Many actions are planned to be completed during the first two years of the Initiative, by the end of 1995, and most by the end of 1996. Completion of some actions, those involving technology demonstration and commercial deployment, will take place during the period of 1997-2000. As of December 1994, 16 actions were considered complete -- mostly new actions, 29 were in progress, and four were awaiting funding approval. Shortly after the release of the Initiative, a team of experts was formed to plan and execute each action. The lead offices participating in the implementation of the Initiative include Fossil Energy, Policy, and the Energy Information Administration (EIA). Exhibit 2 also identifies the lead office for each action.

How Can DOE Assist Industry in Meeting U.S. Energy Needs?

DOE cannot take actions to influence market dynamics such as oil or gas prices. But DOE can help the petroleum industry reduce the cost of operations by funding industry-driven RD&D programs that develop advanced and cost-effective exploration, production, processing, and environmental compliance technologies. DOE has been and will continue to partner with other federal agencies, states, and industry to remove barriers to increased market competition, and reduce the regulatory burden on energy industry.

Exhibit 3 summarizes the FY 1994-1995 accomplishments. Major forthcoming and new actions of each strategic activity area are listed in Exhibit 4.

The report is structured to follow the original format of the Initiative in that the strategic activities and actions are presented in the same order and assigned the same action numbers to allow cross referencing. Potential benefits of actions under each strategic

The National Energy Policy Plan

Section 801 of the Department of Energy Organization Act of 1977 requires the President to submit a National Energy Policy Plan (NEPP) to Congress every two years. The 1993 requirement was waived because of the change in Administration, and the next NEPP is required in 1995. In developing this Plan, the Administration has been soliciting input from the public on all issues involved with energy. In order to gain input from a diverse set of stakeholders, DOE has been conducting a series of regional town meetings and roundtable discussions. Information from related outreach efforts of the Administration also will be compiled to expand the record of public input.

The kick-off meeting for NEPP was held in Washington, DC, in August 1994, and was followed by seven public meetings in cities across the United States. The last meeting was held in New Orleans, Louisiana, in January 1995. All meetings were open to the general public. The NEPP will be completed in May 1995.

activity are grouped under the five DOE business areas, and presented prior to the discussion of specific actions.

AREAS OF POTENTIAL BENEFITS

Industrial Competitiveness: In order for domestic petroleum industry to survive and increase economic productivity, it needs to be more efficient and reduce operating costs through utilization of cost-effective advanced exploration and production technologies. The Initiative actions will help in preserving the competitive advantage of the domestic natural gas and oil industry. The actions will assist industry in decreasing its operating costs, including, for example, expenditures for seismic data acquisition, processing, and interpretation, drilling and completion operations, and environmental compliance.

Energy Resources: The Initiative actions will increase productivity and domestic natural gas and oil supplies, and reduce the Nation's dependence on foreign oil. Increased productivity will make more domestic natural gas and oil resources economical to develop, and enhance capital formation and availability for further investment. New technologies also will be vital in developing the Nation's abundant, underutilized domestic natural gas resources to meet the widely expected increases in demand, and substitute for oil imports. Application of advanced technologies will help in tapping the large remaining domestic oil resources to meet a substantial portion of the Nation's oil needs.

Science and Technology: The Initiative will allow the industry and federal government to form partnerships and conduct high-tech basic and applied science research. These partnerships will provide the knowledge and technology to enhance the Nation's industrial competitiveness, supply of domestic natural gas and oil, national security, and environmental quality. The partnerships will also add value to the U.S. economy through the deployment of new and improved technologies, enhance technology development and deployment activities, and improve energy security and industrial competitiveness.

Environmental Quality: The Initiative actions and technology demonstration programs will enable domestic natural gas and oil producers and refiners to comply more cost-effectively with rapidly evolving environmental regulatory requirements. The actions will reduce uncertainties, prioritize risks, and eliminate barriers to exploration, production, and refining operations to improve environmental performance and quality; and increase cooperation between federal and state regulatory bodies and industry for streamlining of environmental regulations.

National Security: Energy independence is an integral part of the strategy to ensure national security, and a viable domestic natural gas and oil industry is key to economic growth and maintaining our national security. Development and deployment of advanced exploration, production, and processing technologies through industry, federal, and state partnerships will strengthen the natural gas and oil industry, increase domestic productivity, and decrease the Nation's dependence on foreign sources of energy.

Exhibit 2 - Summary of the Domestic Natural Gas and Oil Initiative Actions

	Action	DOE Action	Action by Other Federal Agencies	Legislative Action	Lead DOE Office	Coordinating Agencies
STRATEGIC ACTIVITY I: ADVANCE AND DISSEMINATE NATURAL GAS AND OIL TECHNOLOGIES						
1.0	**Promote the Advancement of Natural Gas and Oil Technologies**	■				
1.1	Develop an Advanced Computational Technology Initiative	■			FE	
1.2	Develop Advanced Rock Drilling Systems for Natural Gas	■			FE	
1.3	Fund Expanded Industry-Driven RD&D for Advanced Oil Recovery Technologies	■			FE	
1.4	Conduct Advanced Geologic Basin Analysis to Target Exploration for Bypassed Gas and Oil	■	■		FE	DOI
1.5	Target a Research Program at Specific, Basic Operating Issues of Small Natural Gas and Oil Producers	■			FE	
1.6	Develop a Commercialization Strategy for Natural Gas Technologies	■	■		FE	DOC, DOD, State/Tribe
1.7	Stimulate Development of a Nationwide, Regionally Based Natural Gas and Oil Technology Transfer Network and Assistance Program	■			FE	
1.8	Review Tax Treatment of Geologic and Geophysical Expenditures and Other Tax Provisions	■	■	■	PO	Treasury
1.9	Use the Naval Petroleum Reserves for Advanced Technology Testing, Evaluation, and Training	■			FE	
2.0	**Improve Environmental Technologies and Practices**					
2.1	Improve Environmental Compliance Technologies and Practices	■	■		FE	DOI, EPA
2.2	Improve Coordination on Environmental Research	■	■		FE	DOC, DOD, DOI, DOT, EPA, State/Tribe
2.3	Explore DOE's Role in Oil Spill R&D	■	■		PO	DOI, DOT, EPA, OMB, State/Tribe
2.4	Study Used Oil Recycling	■	■		PO	DOD, DOT, EPA, State/Tribe
STRATEGIC ACTIVITY II: STIMULATE MARKETS FOR NATURAL GAS						
3.0	**Improve the Natural Gas Infrastructure**					
3.1	Upgrade State Data Collection and Reporting on Natural Gas Production	■			FE	State/Tribe
3.2	Build a National Deliverability Capacity Model	■			EIA	
3.3	Enhance Real-Time Monitoring and Automated Systems	■	■		FE	FCC, FERC No regulatory action required due to Order 636 implementation

Exhibit 2 - Summary of the Domestic Natural Gas and Oil Initiative Actions (Continued)

	Action	DOE Action	Action by Other Federal Agencies	Legislative Action	Lead DOE Office	Coordinating Agencies
3.4	Build a System for Assessing Natural Gas Underground Storage Operations	■	■		EIA	State/Tribe, USDA
3.5	Match Natural Gas Storage to End-User Requirements	■			FE	State/Tribe
3.6	Demonstrate Natural Gas Storage Optimization Technology	■			FE	State/Tribe
3.7	Improve Natural Gas Storage Effectiveness for Problem Fields	■			FE	State/Tribe
3.8	Strengthen and Expand the Clean Cities Program	■	■		PO	DOT, EPA
4.0	**Support Natural Gas Regulatory Reform and a "Contract Portfolio" Approach**					
4.1	Ensure Robust Secondary Markets for Pipeline Capacity	■	■		PO	FERC
4.2	Encourage Open Access to the Electric Transmission Grid	■	■		PO	FERC, USDA
4.3	Expedite Construction of New Natural Gas Facilities	■	■		PO	EPA, FERC, USDA
4.4	Encourage Open Access for Natural Gas Transporters Through Distributors, to Resolve the "Contract Portfolio" Issue	■			PO	State/Tribe
4.5	Promote the Use of Efficient Natural Gas and Electricity Pricing	■			PO	State/Tribe
4.6	Encourage the End of Fuel-Specific Subsidies	■	■		PO	State/Tribe, USDA
4.7	Foster the Use of Incentive Rate Design	■			PO	State/Tribe
4.8	Encourage the Elimination of Regulations That Inhibit the Use of Natural Gas in Vehicles	■			PO	State/Tribe
4.9	Encourage the Use of Natural Gas for Electric Power Generation	■	■		PO	FERC, State/Tribe
5.0	**Provide Information Services**					
5.1	Develop an Energy and Resources Mapping and Information System	■			EIA	State/Tribe
5.2	Enhance the Energy Information Administration's Natural Gas Storage Data Collection	■	■		EIA	FERC, OMB, State/Tribe
5.3	Develop a "One-Stop-Shopping" Contact List Readily Accessible to a Clearinghouse for the Natural Gas and Oil Industry	■	■		EIA	DOC, DOD, DOI, DOT, EPA, FERC, OMB, State, USDA
STRATEGIC ACTIVITY III: IMPROVE GOVERNMENT COMMUNICATION AND DECISIONMAKING						
6.0	**Simplify Regulations Without Compromising Environmental Protection**					
6.1	Streamline State and Federal Regulation	■	■		FE	DOC, DOD, DOI, DOT, EPA, FERC, State/Tribe, USDA

Exhibit 2 - Summary of the Domestic Natural Gas and Oil Initiative Actions (Continued)

	Action	DOE Action	Action by Other Federal Agencies	Legislative Action	Lead DOE Office	Coordinating Agencies
6.2	Enhance State and Federal Regulatory Decisionmaking Capability	■	■		FE	DOI, EPA, State/Tribe
6.3	Progress Beyond Command-and-Control Regulation	■	■	■	FE	DOI, EPA, State/Tribe, USDA
6.4	Enhance Dialogue Through Industry/Government/Public Partnerships	■	■		FE	DOI, EPA, State/Tribe, USDA
6.5	Review the Findings and Recommendations of the National Petroleum Council's Report on U.S. Oil Refining	■	■		FE	EPA
6.6	Enhance the Scope of the National Petroleum Council	■			FE	
7.0	**Evaluate Production From Federal Lands**					
7.1	Continue the Interagency Energy Coordinating Group	■	■		DS	DOD, DOI, EPA, State/Tribe, USDA
7.2	Develop Natural Gas and Oil Resources of the Naval Oil Shale Reserves	■	■		FE	DOI
7.3	Increase Production on the Deepwater Outer Continental Shelf	■	■		PO	DOI
7.4	Assess Options for Developing Marginal Prospects on the Gulf of Mexico Outer Continental Shelf	■	■		FE	DOI
7.5	Enhance the Ability of Smaller Operators to Meet Outer Continental Shelf Financial Requirements	■	■		PO	DOI
8.0	**Work With States and Native American Tribes**					
8.1	Work With States on the Domestic Natural Gas and Oil Initiative	■	■		FE	DOI, State/Tribe, USDA
8.2	Increase Natural Gas and Oil Production and Environmental Protection on Native American Tribal Lands	■	■		PO	DOI, State/Tribe
9.0	**Address West Coast Production Constraints**					
9.1	Open Access to Crude Oil Pipelines in California	■	■		PO	DOI, DOJ, DOT, FERC, State agencies
9.2	Study Barriers to Export of Alaskan North Slope Crude Oil	■	■		PO	DOD, DOI, DOT, State/Tribe
THE QUESTION OF OIL IMPORTS						
10.1	**Study the Costs and Benefits of Oil Imports**	■	■		PO	CEA, DOC, DOD, NEC, NSC, OMB, State, Treasury, USTR

CEA Council of Economic Advisors
DOC U.S. Department of Commerce
DOD U.S. Department of Defense
DOI: U.S. Department of the Interior
DOJ: U.S. Department of Justice
DOT: U.S. Department of Transportation
DS: Deputy Secretary of Energy
EIA: Energy Information Administration
EPA: U.S. Environmental Protection Agency
FCC: Federal Communications Commission
FE: Office of Fossil Energy
FERC: Federal Energy Regulatory Commission
NEC: National Economic Council
NSC: National Security Council
OMB: Office of Management and Budget
USDA: U.S. Department of Agriculture
USTR: U.S. Trade Representative

EXHIBIT 3 - FY 1994-1995 ACCOMPLISHMENTS

The following are selected accomplishments that will:

Enhance Domestic Production

- Natural Gas and Oil Research and Development budgets increased 46 percent between 1993 and 1995, from $206 million to $302 million.

- The Advanced Oil Recovery Technology Program, a joint government/industry partnership program, has been expanded and is investing $290 million ($125 million in federal funds) in 33 demonstration projects in 15 states.

  - Lomax Exploration Co., Class I Uinta project, demonstrated the use of advanced well logs to characterize thin intervals resulting in profitable waterflooding of waxy oil that was previously considered ineffective. This demonstration resulted in several companies requesting state authorization to initiate 11 waterflooding projects, citing the Lomax project as justification for economic feasibility. This project alone will result in a public benefit of over $12.7 million in taxes and royalties based on revenues from producing 2.4 million barrels of oil.

  - The Columbia University Class I project developed evidence for the producibility of oil during the process of migrating up fault zones from deep sources in the Gulf of Mexico. This project already resulted in Pennzoil drilling a fault zone test in addition to the Columbia University project well.

  - University of Tulsa's Class I Glenn Pool field project in Oklahoma demonstrated that crosswell seismic tomography and advanced simulation techniques can successfully identify sandstone "packages" that have not been contacted by the existing waterflood. These packages are candidates for geologically targeted horizontal water injection technology to improve oil recovery.

  - Utah Geological Survey Class I project indicated: (1) oil recovery potential in overlooked producing intervals that may have waterflood potential similar to reservoirs in other parts of the Uinta Basin; and (2) evidence of better production associated with one of two fracture trends.

  - Texaco is conducting a field demonstration of the application of CO_2 flooding using horizontal injection wells for improved recovery in watered-out salt dome reservoirs. Although only 18 months into the project, the recovery has increased by about 400 barrels of oil per day.

- Lease sales in the Gulf of Mexico, under procedures jointly developed and reviewed by DOE, the Minerals Management Service (MMS), and industry representatives, have added additional acreage for gas and oil development. MMS, with DOE's support, will continue leasing under current procedures.

- Developed a royalty incentive proposal with MMS to stimulate development of new deepwater gas and oil projects.

EXHIBIT 3 - FY 1994-1995 ACCOMPLISHMENTS (Continued)

- Completed the National Petroleum Council (NPC) study that assessed the costs and benefits of incentives for maintaining production from marginal wells, and recommended the creation of marginal well tax incentives. DOE is working with the Administration and industry officials to develop revenue-neutral marginal well incentives.

- To encourage greater use of advanced technology in oil and gas exploration, DOE is recommending legislative changes in the tax treatment of geological and geophysical expenditures to allow them to be expensed in the same manner as intangible drilling costs.

Lower Costs of Exploration and Production

- Based on industry input, developed the Advanced Computational Technology Initiative (ACTI) program to enhance computational technologies for exploration, production, and processing.

  - Selected 31 projects worth $65 million. DOE funding for the projects in FY 1995 is $27 million, which will be leveraged by industry cost sharing totalling $38 million. In addition, $13 million in ongoing Laboratory/industry computational collaborations were grandfathered into the FY 1995 ACTI program, bringing the total DOE contribution to $40 million. Requested $48 million for FY 1996.

  - Project participants include 66 gas and oil companies, 38 service companies, 25 universities, six trade associations, and four state organizations. Of the 31 projects, 19 involve the acquisition and/or processing of three-dimensional (3-D) seismic data.

- Provided analytical modeling support to the Bureau of Land Management (BLM) to assess a proposal to reduce royalty rates for marginal gas and oil wells on federal and Native American lands. This work resulted in a change in regulations, allowing lower royalty rates for those wells (e.g., sliding scale royalty rates as production declines -- from 12.5 percent at 15 barrels/day to 0.5 percent at zero production).

- Provided analytical and modeling support to BLM to assess the costs and benefits of reduced royalty rates for heavy oil produced on federal and Native American lands. BLM decision to reduce royalty rates is pending; major heavy oil producing states include California and Texas.

- Developed a Uniform Production Reporting Model (UPRM) for petroleum and natural gas that states can use to reduce producers' reporting burden and administrative costs, increase natural gas deliverability, improve natural gas reliability, and improve the timeliness, accuracy, and consistency of state production data.

  - States of Oklahoma and Kansas are working together to adopt the UPRM to meet their respective state agencies' reporting requirements. Kentucky and Texas are reviewing the UPRM for possible application in their states.

EXHIBIT 3 - FY 1994-1995 ACCOMPLISHMENTS (Continued)

Cut Government Red Tape

- Created and funded a collaborative project involving the Interstate Oil and Gas Compact Commission (IOGCC), Department of the Interior (DOI), Department of Agriculture, industry, and environmental community to streamline regulations for gas and oil exploration and production (E&P) on public lands in Colorado, California, New Mexico, and Wyoming, and to advance dialogue with states on regulatory issues.

- DOE-sponsored workshops in California evolved in a government/state/industry consortium known as the California Oil Survival Team (COST). COST promotes information exchange and regulatory reform necessary to maintain gas and oil industry as a viable part of California economy and an important contributor to domestic production of gas and oil.

- Developed a Refinery of the Future Initiative with industry to facilitate dialogue, identify potential R&D and regulatory barriers and solutions, and develop cost-shared partnerships to implement a coordinated R&D program that is responsive to industry's needs.

  - To respond to industry's R&D needs, DOE's oil processing program funding is increased from $4.3 million in FY 1994 to $6.9 million in FY 1995. FY 1996 budget request is $10 million.

- Participating in the BLM Oil and Gas Performance Review of federal onshore oil and gas leasing program. Goal is to improve the leasing process for producers to promote both efficient and environmentally responsible development of federal lands.

- Established a DOE natural gas strategic planning organization to provide a DOE-wide focus for natural gas activities. Currently developing a Departmental natural gas strategic plan and program-specific implementation plans.

- Supported implementation of the Federal Energy Regulatory Commission (FERC) Order No. 636 to restructure interstate natural gas pipeline mercantile and transportation services, leading to reduced costs for consumers and end-users.

- FERC issued a new policy for natural gas gathering facilities, which is reducing regulatory burden and increasing flexibility in the use of gathering facilities, leading to increased use of natural gas.

- FERC is reviewing pricing rules for new pipeline capacity to streamline the regulatory processes for permitting new pipeline construction. Changes in policy are designed to expedite construction of new natural gas pipeline capacity.

- Participated in discussions among industry and state and federal agencies to improve and streamline regulations for exploration and production under the jurisdiction of California's Environmental Protection Agency.

EXHIBIT 3 - FY 1994-1995 ACCOMPLISHMENTS (Continued)

Protect the Environment and Increase Production

- The integrity of the Nation's oil pipeline infrastructure and risk assessment of oil spills are being evaluated through DOE-funded environmental projects.

- Deputy Secretary was instrumental in inclusion of refining industry in EPA's Common Sense Initiative to review environmental regulations. DOE is participating in this initiative and will work with EPA, industry, states, and public interest groups to develop innovative, alternative environmental compliance strategies for the refining industry.

- Secretary tasked NPC to review the proposed MMS rulemaking to assess effects of increased financial responsibility requirements for offshore facilities under the Oil Pollution Act of 1990. DOE is working closely with MMS to develop more sensible financial responsibility requirements for offshore facilities to ensure minimum impact on small operators.

- Initiated discussions with BLM on a long-term partnership in which DOE would support BLM in developing its Resource Management Plans. DOE will identify energy and economic benefits of developing resources on public lands.

- Initiated projects involving state and federal agencies, industry, and others to streamline regulations affecting gas and oil E&P, including a government/industry dialogue on synthetic drilling fluids.

- Based on recommendations of the California Oil Survival Team, new state and local requirements relating to spills from pipelines will be based on environmental risks assessed through a new DOE-supported study.

- DOE, MMS, and industry are cooperatively demonstrating a Safety and Environmental Management Program (SEMP) for small to medium size operators as an alternative to new offshore regulations.

- The underground injection control risk-based data management system developed by the Underground Injection Practices Research Foundation, Inc. (UIPRF) under DOE grants is being implemented by the states (e.g., Ohio, California, and Oklahoma). This system benefits states, EPA, and industry through a more efficient risk-based approach to regulatory decisionmaking.

- DOE's participation in the underground injection control Federal Advisory Committee helped to develop compromises that included variances from Class II Injection Well Area of Review requirements in low environmental risk areas.

    - Subject to EPA approval, variances have been granted by the Texas Railroad Commission for a county within the East Texas Field, based on data gathered and analyzed by the University of Missouri-Rolla. This is particularly beneficial to small independent producers.

EXHIBIT 3 - FY 1994-1995 ACCOMPLISHMENTS (Continued)

- DOE's participation in an industry consortium for hydrocyclone development through Michigan State University led to new patents and technology commercialization for produced water treatment.

- In October 1994, Pennsylvania State University demonstrated the computer software, developed under a DOE-funded project, designed for treating low volume produced water surface discharges in the Appalachian Basin, to 54 local independent oil and gas operators, regulators, and industry representatives.

- DOE has supported workshops and conferences with UIPRF, IOGCC, American Petroleum Institute, Gas Research Institute, Society for Petroleum Engineers, and others for state and federal governments and industry personnel relating to naturally occurring radioactive materials, H_2S, Class II injection wells, Appalachian regional issues, and California regional issues.

- DOE's Gulf of Mexico Discharge Project studies have benefitted the industry by working with EPA in its determination of offshore effluent discharge requirements, and with the State of Louisiana in its Environmental Quality Act requirements for open bay produced water discharges.

    - Based on data provided by DOE from two ongoing Gulf of Mexico Discharge Project studies, the Louisiana Department of Environmental Quality issued a variance from Louisiana Environmental Quality Act requirements for open bay produced water discharges that are covered under existing permits. This extends a deadline of January 1, 1995, for continuing discharges until January 1, 1997. "Zero discharge" requirements for coastal areas have the potential to significantly affect small businesses -- producers, service companies, and consulting firms.

... and Promote Industry/Government Partnerships

- Secretary tasked NPC, an advisory board for the Secretary of Energy, to study industry R&D needs and capabilities. NPC study, to be completed in 1995, will drive future DOE gas and oil programs and budgets.

- Enhanced diversity of NPC by adding 55 new members representing regulators, academia, and environmentalists. Added members will provide new perspectives to industry and also gain valuable insight into industry's concerns and R&D needs.

- Supported creation of the Petroleum Technology Transfer Council, a national clearinghouse, to disseminate technology to independent producers through 10 regional centers.

    - DOE provided $3 million during FY 1994-1995 to create five regional centers to provide access to a library, technical and referral assistance, and computer workstations with reservoir data and analytical software. FY 1996 funding request for this activity is $3.2 million to create the remaining five centers.

EXHIBIT 3 - FY 1994-1995 ACCOMPLISHMENTS (Continued)

- Enhanced the Energy Information Administration's natural gas storage data collection in order to provide more timely storage information for natural gas industry and markets.

- Continued outreach to state energy and environmental officials on natural gas issues through conferences, workshops, and collaboratives.

- Assisting the Commerce Department in devising regulations for granting licenses for export of California heavy crude oil.

- Cosponsored and organized the 4th Annual DOE/National Regulatory Utility Commissioners (NARUC) Natural Gas Conference in Orlando, Florida, in February 1995.

- Participated in an interagency group, in support of the Commerce Department, to examine the national security implications of imported oil under Section 232 of the Trade Expansion Act. The group concluded that oil imports are hurting our national security; recommendations of remedies to deal with this finding include:

  - Increased government regulatory efficiency to make domestic oil and gas industries more competitive by lowering costs.

  - Increased government investment in technology to lower costs and increase production of natural gas and oil.

  - Expanded utilization of natural gas to increase our reliance on this clean, abundant, domestic fuel.

- Completed analysis of exporting Alaskan North Slope (ANS) crude oil, concluding that exports will provide economic benefits for producers, consumers, and state and federal governments. DOE supports statutory changes to allow for the export of Alaskan North Slope crude oil. Legislative language is under Administration consideration for possible submission to Congress in 1995.

  - Exporting ANS crude will partially relieve the downward pressure on West Coast prices of both Alaska and California crude oils. Accordingly, higher crude oil prices will lead to better oil producer profitability and raise investment in domestic oil production.

  - Improving conditions for West Coast oil producers will raise royalty revenues for the federal government, and tax and royalty revenues for the States of Alaska and California.

  - Exporting ANS crude oil will increase production in Alaska and California by up to 110,000 barrels per day, and also generate up to 25,000 new domestic jobs by the year 2000.

- Initiated a collaborative study with the Maryland Public Service Commission on the issue of local distribution company natural gas access and supply purchasing.

EXHIBIT 3 - FY 1994-1995 ACCOMPLISHMENTS (Continued)

- Established a center at the Naval Petroleum Reserves No. 3, in Casper, Wyoming, for advanced technology testing, evaluation, and training. This facility, called the Rocky Mountain Oilfield Testing Center, is suitable for testing new applications that lead to increased production, lower operating costs, and improved environmental compliance costs in small oil and gas fields.

  - National Parakleen treated four wells with nutrients to suppress H_2S production by sulfate-reducing bacteria.

  - Hosted the first of several planned Native American training courses in November, which were attended by the Osage, Arapahoe, Apache, and the Bureau of Indian Affairs.

- Currently developing a commercialization strategy to assist manufacturers in promoting and selling natural gas technologies and competing worldwide. The strategy includes all sectors of the natural gas industry, from production to end-use.

  - Supported and provided funds for establishment of the International Energy Agency's Center for Gas Technology Information.

- Signed an agreement with the Gas Research Institute to ensure that government and industry work together in the most effective manner, and to improve communication, cooperation, and coordination between industry and government on R&D agendas and activities.

- Initiated the first DOE-wide strategic plan for oil. The plan is industry driven, responds to industry research and development needs, and will impact future DOE programs and associated funding.

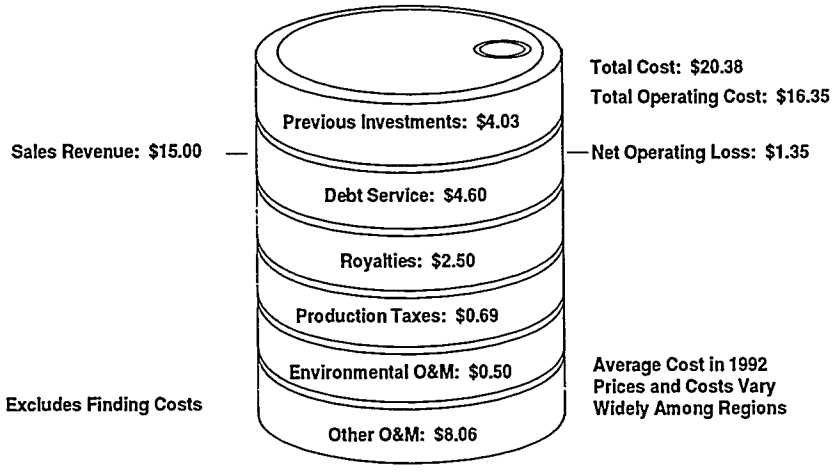
- Established a DOE/Industry Minority Business Development Working Group to help minority businesses compete in the natural gas marketplace. Held meetings and workshops to initiate and advance minority gas marketing programs.

- Developed an alternative transportation fuels program, including the Clean Cities Initiative, which promotes investments in alternative fuels for transportation.

WHAT DOES THE INITIATIVE REALLY MEAN?

The Initiative targets price and cost components of exploration, production, refining, and distribution, and gives industry access to DOE program information and funding. Locating, producing, upgrading, and distributing natural gas and oil in the United States is rapidly becoming cost-prohibitive. For example, at prevailing gas and oil prices, operators are losing money on every barrel of oil and thousand cubic feet of gas produced. The schematic diagram below, for example, shows the average costs associated with producing a barrel of oil in West Texas in 1992. Each one of the 49 action items of the Initiative targets one or more of these cost components. One could draw a similar "barrel" for gas processing, oil refining, or pipeline operations.

Low production rates (14 barrels/day) and high operating costs for lifting and treating the oil and disposing of production wastes, including significant amounts of produced water, make West Texas production uneconomic on average at $15/barrel West Texas Oil price. As indicated, operators are losing $1.35 on average for each barrel of oil produced. Better than average wells, those with higher production or lower costs, will still generate operating profits, but production from a majority of wells will not cover their full cost of operations. Debt service paid to financial institutions and investors requires $4.60 on average due to the high investments, significant costs, and relatively slow payback involved in economically developing and producing complex West Texas reservoirs. Previous investments, for drilling wells and installing facilities needed to produce oil, are considered sunk costs and may have been partially or totally recaptured by previous production at higher oil prices. However, looking forward to new projects that could add reserves and production, operators face the loss of over $5 per barrel on a full cost basis. Even that understates the total cost of production by excluding the initial finding costs for often very risky exploration activities that discover new fields and reservoirs. But gas and oil prices and costs vary widely from region to region. For example, in California, environmental operation and maintenance (O&M) costs vary from $0.50 per barrel of oil equivalent (BOE) to $2.55/BOE in four different regions. The federal government cannot interfere in the marketplace and does not wish to, but DOE can assist industry in developing improved and advanced technologies that can mitigate risks, decrease business costs, and increase efficiency.



Low Prices and High Costs Affect the Margin and Impede Production

Exhibit 4 - Forthcoming and New Actions of the D

DNGOI Strategic Activities

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Major Accomplishments
(See Exhibit 3)

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Strategic Activity I
Increase domestic natural gas and oil production and environmental protection by advancing and disseminating new exploration, production, and refining technologies.

Actions:

1.0 Promote the Advancement of Natural Gas and Oil Technologies

2.0 Improve Environmental Technologies and Practices

- Issue 2nd Call for Proposals for the ACTI Program in June 1995; expand the Requesting $48 million for FY 1996 (1.1).
- Issue the Class IV solicitation for the Oil Recovery Field Demonstration Prog Conduct Class V feasibility study (1.3).
- Establish and activate up to five PTTC regional centers (1.5).
- Sign the implementing agreement of the International Energy Agency's *Cent*
- Identify an appropriate legislative vehicle to include a proposal for changing t
- Initiate field demonstrations of NORM and produced water treatment and dis analysis of discharges in coastal and offshore Gulf of Mexico (2.1).
- Complete the NPC Industry R&D Needs study in Spring 1995 and incorporat

Strategic Activity II
Stimulate markets for natural gas and natural gas-derived products, including their use as substitutes for imported oil where feasible.

Actions:

3.0 Improve the Natural Gas Infrastructure

4.0 Support Natural Gas Regulatory Reform and a "Contract Portfolio" Approach

5.0 Provide Information Services

- Work with States of Oklahoma and Kansas to adopt the Uniform Production I in their review of the UPRM for application to their states (3.1).
- Publish the Proceedings of the 4th Annual DOE/NARUC Natural Gas Confer
- Expedite certification and construction of natural gas transportation and stora
- Complete the DOE/Maryland Public Service Commission collaborative study
- Initiate a collaborative with the Illinois Commerce Commission to investigate I

Strategic Activity III
Ensure cost-effective environmental protection by streamlining and improving government communication, decisionmaking, and regulation.

Actions:

6.0 Simplify Regulations Without Compromising Environmental Protection

7.0 Evaluate Production from Federal Lands

8.0 Work with States and Native American Tribes

9.0 Address West Coast Production Constraints

- Complete the first phase of the IOGCC study on streamlining regulations for g with Phase II incorporating additional states if the first phase is successful (6.
- Complete the BLM National Performance Review and propose legislative cha
- Expand assistance to 29 oil and gas producing states to support risk-based re
- Complete development of the Refinery of the Future Initiative, and assist in fo of EPA's Common Sense Initiative (6.3).
- Establish reduced royalty rates for heavy oil production from federal and Nativ
- Pursue passage of legislation for enactment of deepwater royalty relief incenti
- Work closely with MMS to develop common sense financial responsibility requ
- Establish a grant program to assist Native American Tribes with natural gas a
- Pursue legislation to lift the ban on export of Alaskan North Slope crude oil (9.
- Develop revenue-neutral policies for congressional consideration to sustain pr

The Question of Oil Imports

Action:

10.0 Study the Costs and Benefits of Oil Imports

nestic Natural Gas and Oil Initiative (DNGOI)

NGOI
ghts

coming
ns

New Action Items

lustry Review Panel to include downstream representation.

in March 1995; award and initiate projects in December 1995.

r Gas Technology Information in April 1995. Ten countries are participating (1.6).

tax treatment of geological and geophysical expenditures (1.8).

al technologies, and complete

ne results in DOE program implementation plans (2.2).

- *Deep Water Technologies :* develop strategy and implementation plan.
- *Investment Capital Plan :* develop strategy to lower the cost of capital for producers.

orting Model (UPRM) guidelines; assist Kentucky and Texas

e, and the results of analysis of issues (4.0).

facilities (4.3).

d publish the results (4.4).

grated Resource Planning in that state (4.9).

- *Secondary Gas Markets :* issue a report on the operation of the secondary market for interstate natural gas pipeline capacity.
- *Electricity Restructuring :* issue a report on the impact of electricity industry restructuring on natural gas demand.

and oil E&P on federal lands in CA, CO, NM, and WY; make decision to proceed

es to simplify the onshore gas and oil leasing program (6.1).

latory decisionmaking (6.2).

ulation of alternative compliance strategies for the refining industry as part

American lands (7.1).

s (7.3).

ements for offshore facilities to minimize impact of OPA 90 on small operators (7.5).

oil development (8.2).

uction from marginal wells (10.0).

- *Outreach Initiative for Industry and States :* develop new strategy to improve communications with stakeholders. Streamline industry access to the Department by establishing regional energy specialists.
- *"Class I-1/2" :* investigate the feasibility of reinjecting some refinery liquid streams into wells that are regulated similar to Class II wells (the Safe Drinking Water Act).

STRATEGIC ACTIVITY I

ADVANCE AND DISSEMINATE NATURAL GAS AND OIL TECHNOLOGIES

The goal of this activity is to increase domestic natural gas and oil production and environmental protection by advancing and disseminating new exploration, production, and refining technologies. Specific actions are grouped under two areas: Action 1 - Promote the Advancement of Natural Gas and Oil Technologies; and Action 2 - Improve Environmental Technologies and Practices.

POTENTIAL BENEFITS OF STRATEGIC ACTIVITY I ACTIONS

Industrial Competitiveness: Strategic Activity I actions are designed to preserve the competitive advantage of the domestic natural gas and oil industry, and to help industry decrease its operating costs, including expenditures for environmental compliance. For example, through the Advanced Computational Technology Initiative (ACTI) Program (Action 1.1), cutting-edge computational technologies developed and enhanced at the National Laboratories will be transferred to the petroleum industry for more efficient and cost-effective natural gas and oil exploration, production, and processing. In order for domestic petroleum industry to survive and maintain profitability, it needs to be more efficient and reduce operating costs through utilization of cost-effective advanced exploration and production technologies. Industry-driven cooperative RD&D programs for the development of advanced rock drilling systems for natural gas (Action 1.2), and field demonstration of advanced oil recovery methods (Action 1.3) will leverage resources and help industry maintain its technological edge in international energy markets. Implementation of the commercialization strategy for natural gas technologies (Action 1.6) will allow deployment of more efficient and cost-competitive technologies in all market sectors. This, in turn, will result in enhanced profit margins, and also increase the demand for natural gas. More efficient advanced technologies will also create foreign markets for the U.S. industry. Development of improved environmental compliance technologies (Actions 2.1, 2.2) will allow cost-effective environmental protection and regulatory compliance. Keeping U.S. technologies on the cutting edge will ensure that they are technologies of choice worldwide, and contribute to maintaining and expanding advanced technology export opportunities.

Energy Resources: Action 1 activities are designed to increase productivity and domestic natural gas and oil supplies, and therefore reduce the Nation's dependence on foreign oil. Increased productivity will make more natural gas and oil resources economical to develop, and will enhance capital formation and availability for further investments. New technologies will also be vital in developing the Nation's abundant, underutilized natural gas resources to meet the widely expected increases in demand, and substitute for oil imports. Application of advanced technologies will help in tapping the large remaining oil resources to meet a substantial portion of the Nation's oil needs.

Science and Technology: The actions of Strategic Activity I will allow industry and the federal government to form partnerships and conduct high-tech basic and applied science research. These partnerships will provide the knowledge and technology to enhance the Nation's industrial competitiveness, supply of domestic natural gas and oil, national security, and environmental quality. This will also add value to the U.S. economy through the deployment of new and improved technologies. For example, the ACTI Program (Action 1.1) is specifically designed to provide industry access to the unique resources and capabilities of the National Laboratories. Advanced technology testing, evaluation, and training at the Rocky Mountain Oilfield Testing Center (Action 1.9) will enhance the scientific and technical understanding of mechanisms for improved natural gas and oil recovery, and also help provide a technically trained and diverse industry workforce.

Environmental Quality: Action 2 activities are designed to conduct aggressive technology development and demonstration programs that will enable natural gas and oil producers and refiners to comply more cost-effectively with rapidly evolving environmental regulatory requirements. These actions will also reduce uncertainties, prioritize risks, and eliminate threats of exploration, production, and refining operations to improve environmental performance and quality. For example, Action 2.1 will explore opportunities to form technology partnerships between industry and the National Laboratories to address environmental issues; expand research, development, and field testing of cost-effective environmental compliance technologies; and support industry activities to establish programs to promote and institutionalize waste reduction. Action 2.2 will identify mechanisms to improve coordination on natural gas and oil environmental research and technology transfer activities among industry, government, and other stakeholders. Actions 2.3 and 2.4 will lead to improved environmental technologies for prevention and management of oil spills, and processing, refining, and disposal of used oil.

National Security: Energy independence is an integral part of any strategy to ensure national security. A viable domestic natural gas and oil industry is key to economic growth and maintaining our national security. Development and deployment of advanced exploration, production, and processing technologies through industry, federal, and state partnerships established under the Strategic Activity I actions will strengthen the natural gas and oil industry, increase domestic productivity, and decrease the Nation's dependence on foreign sources of energy.

ACTION 1.0
Promote the Advancement of Natural Gas and Oil Technologies

Actions under this area are designed to advance the development of natural gas and oil technologies, including computational analysis of geologic and geophysical data to improve exploration and development success rates, rock drilling systems for natural gas, advanced oil recovery technologies, and analyses of geologic basins to recover bypassed oil.

Actions

1.1 Develop an Advanced Computational Technology Initiative
1.2 Develop Advanced Rock Drilling Systems for Natural Gas
1.3 Fund Expanded Industry-Driven RD&D for Advanced Oil Recovery Technologies
1.4 Conduct Advanced Geologic Basin Analysis to Target Exploration for Bypassed Gas and Oil
1.5 Target a Research Program at Specific, Basic Operating Issues of Small Natural Gas and Oil Producers
1.6 Develop a Commercialization Strategy for Natural Gas Technologies
1.7 Stimulate Development of a Nationwide, Regionally Based Natural Gas and Oil Technology Transfer Network and Assistance Program
1.8 Review Tax Treatment of Geologic and Geophysical Expenditures and Other Tax Provisions
1.9 Use the Naval Petroleum Reserves for Advanced Technology Testing, Evaluation, and Training

Can Advanced Technology Result in Lower Energy Prices?

Historically, technological progress has expanded the economically recoverable oil and natural gas resource base and reduced effective exploration and development costs. Therefore, it has become increasingly clear that changes in technology have a large impact on energy, similar to that of oil price increases and economic growth.

According to DOE's Energy Information Administration (EIA), improved technology will limit projected price increases for most fuels. In its *Annual Energy Outlook-1995*, EIA projects faster penetration over the next 15 years of new technology, such as 3-D seismology and horizontal drilling and completion techniques, that will both increase the amount of economically recoverable oil and gas resources and reduce production costs. With advanced technology and moderate economic growth, oil and natural gas production levels are projected to be 8 and 12 percent higher, respectively, in 2010. Without advanced technology, production will decline 8 to 12 percent below current levels in 2010.

Accomplishments to Date

1.1 Develop an Advanced Computational Technology Initiative: This action will enhance, apply, and transfer technologies developed at the National Laboratories to industry for cost-effective exploration, production, and processing of natural gas and oil. This program is part of the Natural Gas and Oil Technology Partnership (Partnership), which was formed in 1988.

ACTI will use cutting-edge computing capabilities at the nine National Laboratories to enhance the competitiveness of the U.S. gas and oil industry by providing capabilities -- many defense related -- that have not been readily available to the industry in the past. After extensive program planning and meetings with stakeholders, an ACTI program plan was published in May 1994. In June 1994, three DOE-sponsored ACTI informational seminars were held in San Francisco, New Orleans, and Houston to introduce the ACTI program to industry and present the National Laboratory capabilities. Additional information was provided to the public on the ACTI program in response to

questions raised at the seminars. The Industry Review Panel, comprising 14 members from independent producers, major companies, and the service industry, was also formed in June. This panel evaluates joint industry and National Laboratory proposals based on overall industry needs. ACTI program structure and funding details were completed by the end of August and $40 million was appropriated for FY 1995. In September 1994, at the request of the Secretary of Energy, the National Petroleum Council (NPC) initiated an industry R&D Needs Assessment Study, which will help to focus the ACTI program strategic direction besides other Partnership and DOE R&D programs. Management and implementation of the ACTI program is under the direction of a DOE Management Group comprising members from the Offices of Fossil Energy, Energy Research, and Defense Programs. These offices also provide the ACTI program funds.

The dissemination of information on the availability and capability of technologies developed under the ACTI program will be accomplished through an aggressive technology transfer program. In addition, the Petroleum Technology Transfer Council (PTTC) will provide a focused information transfer and feedback loop primarily for the independent producers (see Action 1.7 for additional information on PTTC). Industry has indicated to DOE that ACTI already is facilitating information exchanges.

A call for ACTI proposals was released on September 1, 1994, with a November 1st submittal deadline. DOE received 122 proposals that included industry-proposed teaming arrangements with all nine National

The Natural Gas and Oil Technology Partnership and the National Laboratories

The Natural Gas and Oil Technology Partnership is an expansion of the successful Oil Recovery Technology Partnership, a DOE-funded program that was created in 1988 by Los Alamos and Sandia National Laboratories. The mission of the Partnership is to stimulate, facilitate, and coordinate the development and transfer of technology to the U.S. natural gas and oil industry through technical interactions and collaborations with DOE's National Laboratories. The Partnership provides industry with a mechanism to access the expertise, equipment, facilities, and cutting-edge technologies developed at the National Laboratories for national defense purposes.

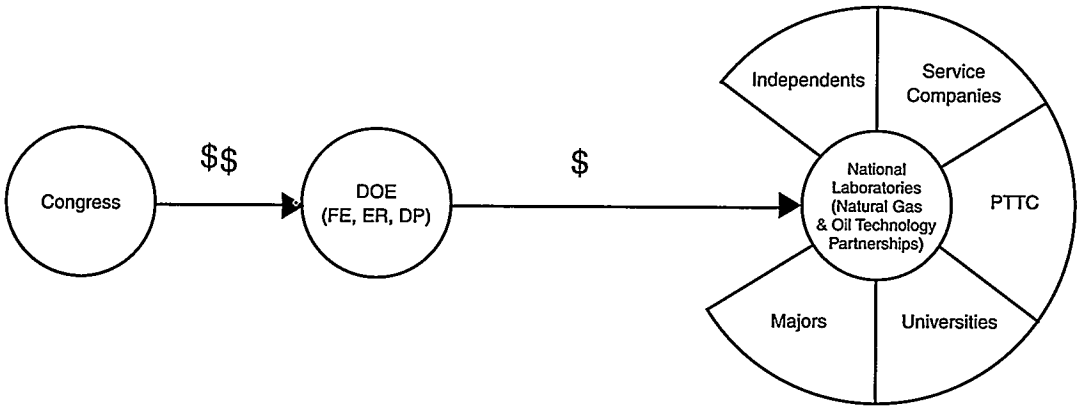
The Partnership has four technology focus areas that are important to industry: Oil Recovery Technology, Borehole Seismic Technology, Drilling and Completion Technology, and Advanced Computational Technology. By entering into a partnership with government and the National Laboratories, major and independent producers can address technical limitations, and ultimately accelerate market entry of new technologies.

The National Laboratories and production plants represent an investment in world-class intellectual, research and development, and computing capability that was cultivated for five decades and would be difficult to redevelop. The National Laboratories are now redirecting some of their world-class talents and equipment to partnerships with industry and to meeting non-defense government requirements. Through its partnerships with industry, the Department helps to maximize the value of the public investment in National Laboratories by increasing the prospects of getting taxpayer-financed innovations to the marketplace.

HOW MUCH TIME DOES IT TAKE TO LAUNCH INDUSTRY-DRIVEN R&D PROGRAMS?
ACTI: EXAMPLE OF A "FAST-TRACK" PROGRAM

A frequently asked question by industry stakeholders is: "Why does it take so much time for some government programs to start?" A simple answer would be: "It takes time to plan, design, fund, and implement targeted major R&D programs." One to two years for a program initiation may seem a long time for some industry stakeholders. But in a federal government environment, where program planning and definition, congressional approval and funding, and procurement are usually the steps involved, one to two-year time frame would be considered a "fast-track" program. An example is DOE's Advanced Computational Technology Initiative (ACTI) program. Development of an ACTI program was first announced in the Domestic Natural Gas and Oil Initiative in December 1993, but discussions with industry on application of advanced computational technologies to oil and gas exploration and production were first initiated in early 1992. Since its announcement in June 1994, the ACTI program implementation was placed on a fast-track schedule. DOE received congressional approval of the program's FY 1995 funding and the first call for proposals was released on 9/1/1994. The first group of ACTI projects are slated to start in February 1995.

As shown in the diagram below, the ACTI program funds are appropriated by Congress and transferred to the National Laboratories by DOE for projects cosponsored by major and independent producers, service companies, and universities.



ACTI TIMELINE

October	1988	The Oil Recovery Technology Partnership formed with two Laboratories: Los Alamos National Laboratory and Sandia National Laboratories.
March	1992	Initiated discussions with industry on application of advanced computational technologies to oil and gas exploration and production.
November	1992	Application of advanced computational technology described by Los Alamos and Lawrence Livermore National Laboratories.
January	1993	Petroleum Technology Transfer Council formed.
June	1993	Initiated a series of stakeholders meetings with independent producers, majors, service companies, National Laboratory personnel, and nonprofit research organizations to determine industry technology needs and concerns.
August	1993	Chartered a DOE-wide and National Laboratory Advanced Computational Technology Initiative (ACTI) team to define the goals, partnership structure, and technical focus of the ACTI program.
September	1993	Developed a proposed partnership structure for the ACTI program.
October	1993	Developed an ACTI action plan and drafted a preliminary program. Drafted the ACTI option paper for the Domestic Natural Gas and Oil Initiative.
December	1993	The Administration announced the Domestic Natural Gas and Oil Initiative, with ACTI as a major component.
January	1994	Expanded the Oil Recovery Technology Partnership to include ACTI. The partnership was renamed the Natural Gas and Oil Technology Partnership. ACTI program participation increased to four Laboratories; added Lawrence Berkeley Laboratory and Lawrence Livermore National Laboratory.
May	1994	Draft ACTI Program Plan completed and released for industry review and comment.
June	1994	ACTI Industry Review Panel formed. Secretary of Energy tasked the National Petroleum Council to conduct a study to assess industry R&D needs. ACTI information seminars held in San Francisco, New Orleans, and Houston.
August	1994	ACTI Program Plan finalized. ACTI funding appropriated $40 million for the first year.
September	1994	1st Call for Proposals announced.
October	1994	National Laboratory participation in the ACTI program is expanded to include all nine Laboratories.
November	1994	ACTI proposals received.
January	1995	First group of ACTI projects selected.
February	1995	Selection of 31 ACTI projects announced ($65 million in total value).
March-April	1995	Expand the ACTI Industry Review Panel.
June	1995	Issue the 2nd Call for Proposals.

Laboratories. Proposal participants included 62 independent producers, 13 major producers, and 86 service companies, consulting firms, and hardware and computer manufacturers. In addition, 47 universities and eight natural gas transmission companies were partners in proposed prospective projects. Proposals showed a wide range of interest from the gas and oil industry in using the Laboratories' computing capabilities and expertise.

In January 1995, 31 projects were selected for funding. DOE funding for these projects in FY 1995 is $27 million, which will be leveraged by industry cost sharing totalling $38 million. Average cost sharing is 58 percent. In addition, $13 million in ongoing Laboratory/industry computational collaborations were grandfathered into the FY 1995 ACTI program, bringing the total DOE contribution to $40 million. Of the 31 projects selected, 19 are in the area of seismic data acquisition, processing, and interpretation. A total of 149 project participants include eight National Laboratories; 66 gas and oil companies; 38 service companies, consulting firms, hardware and computer manufacturers; 25 universities; six industry associations; and four state and two federal government entities.

Future Actions

- Initiate a full slate of FY 1995 projects in February 1995.
- Conduct a postmortem analysis of the 1st Call for Proposals, and the process for evaluation, selection, and funding of projects.
- Develop the 2nd Call for Proposals in June 1995 with input from the NPC study on industry R&D needs.
- Expand the ACTI Industry Review Panel, by adding representatives from the downstream sector and increase representation from the various regional producing and refining areas.

1.2 Develop Advanced Rock Drilling Systems for Natural Gas: Goal of this action is to ensure future supplies of natural gas to consumers at a reasonable price by lowering the costs of drilling through the overburden rock to the target zone. Implementation of this action is coordinated with the DOE-wide natural gas RD&D strategic plan and program development effort currently underway. As part of the natural gas supply strategic planning process, a breakout session on drilling was held with industry stakeholders. Greater coordination is sought among various concurrent actions such as the ACTI program and other initiatives pursued by and with other federal agencies and the private sector.

This action is fully integrated with the National Advanced Drilling and Excavation Technology program, a joint government/industry effort. This effort is aimed at capitalizing on the drilling and excavation advances being realized both within the natural gas and oil industry and other geoscience-related industries, such as mining and environmental monitoring and restoration. No incremental funding was requested for this program; however, currently unobligated funding is targeted for projects that will address the problems of drilling through deep, hard rock -- the current most significant obstacle to lowering drilling costs.

Future Actions

- Document current efforts by other federal agencies related to drilling technology.
- Identify, design, and prioritize technology transfer outreach efforts between this action and Action 1.7.
- Design RD&D projects for advanced drilling technologies (e.g., commercial measurement-while-drilling (MWD) systems, slim-hole drilling, near-bit sensors, and steerable air percussion drilling systems).

1.3 Fund Expanded Industry-Driven RD&D for Advanced Oil Recovery Technologies: This action continues DOE's existing program of cost-shared field demonstration of technologies in geologic classes to increase advanced oil recovery capabilities and reduce the rate of well abandonment. Reservoir classes are defined by the depositional system, in which the reservoir was formed, based on the fact that reservoirs with similar depositional origins have similar architecture that defines the way recovery technologies respond. This similarity allows technologies successfully demonstrated in one reservoir to be more easily transferred to other reservoirs in the same class. The classes were prioritized on the basis of the resource recovery rate, risk of abandonment, and the number of operators likely to apply any successful technology.

The program's thrust is to provide matching federal funds of up to 50 percent to oil operators and other organizations that agree to demonstrate existing or novel advanced technologies and actively transfer the results to other operators of similar reservoirs. A total of 33 projects were selected in three reservoir classes: fluvial dominated deltaic sandstone (Class I), shallow shelf carbonate reservoirs (Class II), and slope and basin clastics (Class III). Although the program is in its infancy, there have already been significant results, especially from the following projects:

- The Lomax Exploration Co. Uinta Basin waterflood has produced 216,000 barrels of additional oil and 200 million cubic feet of additional gas (as of 6/30/94) and the demonstration has resulted in Balcron Oil Company, PG&E Resources, and Lomax (in areas outside the DOE project) requesting state authorization to

The Class Oil Recovery Field Demonstration Program

Of the 33 Class projects (24 in Class I and II and 9 in Class III), 20 projects are cost-shared with independent producers. Of the 20, 14 are near-term and six are mid-term projects. Although near-term projects are targeted to independents, both large independents and majors participate in mid-term projects.

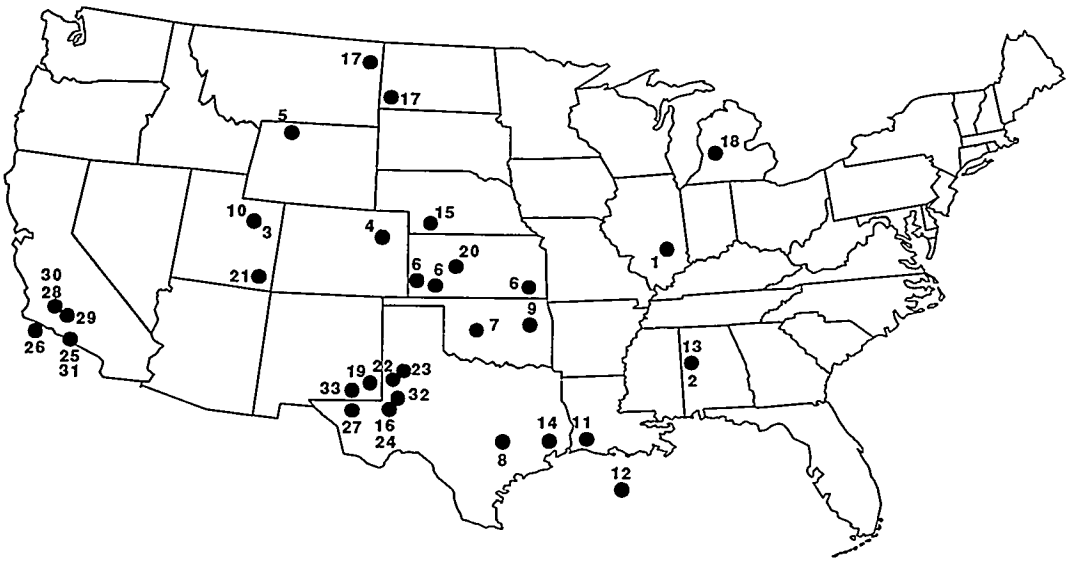
Cost summary of the Class projects is as follows:

Class I - 14 projects:
Total Cost: $113 Million (MM)
(DOE: $48MM, industry: $65MM)

Class II - 10 projects:
Total Cost: $89 Million
(DOE: $39MM, industry: $50MM)

Class III - 9 projects:
Total Cost: $88 Million
(DOE: $38MM, industry: $50MM)

CLASS OIL RECOVERY FIELD DEMONSTRATION PROJECTS



Currently, 24 cost-shared projects in two reservoir classes are underway, and nine additional projects for a third class were selected in September 1994. Total value of 33 projects under the three reservoir classes is $290 million with almost 57 percent cost sharing (federal funds: $125 million, industry funds: $165 million). In addition, industry participants have paid 100 percent of all cost overruns, and a number of participants have donated additional research or field work to the class projects at no cost to the government. Listing of the Class projects is as follows:

Class I - Fluvial Dominated Deltaic Sandstone Reservoirs

1. American Oil Recovery, Inc., Mattoon, IL (near-term)
2. Anderman/Smith Operating Company, Vernon, AL (near-term)
3. Lomax Exploration Company, Roosevelt, UT (near-term)
4. Research and Engineering Consultants, Inc., Fort Morgan, CO (near-term)
5. Sierra Energy Company, Powell, WY (near-term)
6. University of Kansas Center for Research, Inc., Chanute, KS; Hamilton, KS; and Garden City, KS (near-term)
7. University of Oklahoma, Norman, OK (near-term)
8. University of Texas - Bureau of Economic Geology, Austin, TX (near-term)
9. University of Tulsa, Tulsa, OK (near-term)
10. Utah Geological Survey, Roosevelt, UT (near-term)
11. Amoco Production Company, Lake Charles, LA (mid-term)
12. Columbia University, Lamont-Doherty Geological Observatory, Eugene Island Area Block 330, LA (mid-term)
13. Hughes Eastern Corporation, Vernon, AL (mid-term)
14. Texaco Exploration and Production, Inc., Port Neches, TX (mid-term)

Class II - Shallow Shelf Carbonate Reservoirs

15. Beard Oil Company - Gemini Division, McCook, NE (near-term)
16. Laguna Petroleum Corporation, Odessa, TX (near-term)
17. Luff Exploration Company, Bowman, ND and Sidney, MT (near-term)
18. Michigan Technological University, Crystal Lake, MI (near-term)
19. Texaco Exploration and Production, Inc., Hobbs, NM (near-term)
20. University of Kansas, Bazine, KS (near-term)
21. Utah Geological Survey, San Juan, UT (near-term)
22. Fina Oil and Chemical Company, Seminole, TX (mid-term)
23. OXY USA, Inc., Welch, TX (mid-term)
24. Phillips Petroleum Company, Odessa, TX (mid-term)

Class III - Slope and Basin Clastics Reservoirs

25. City of Long Beach, Long Beach, CA (near-term)
26. Pacific Operators Offshore, Inc., Santa Barbara Channel; Offshore, CA (near-term)
27. University of Texas at Austin-Bureau of Economic Geology, Orla, TX (near-term)
28. University of Utah, Taft, CA (near-term)
29. ARCO Western Energy, Maricopa, CA (mid-term)
30. Chevron USA, Inc., Taft, CA (mid-term)
31. City of Long Beach, Long Beach, CA (mid-term)
32. Parker and Parsley Development Company, Midland, TX (mid-term)
33. Strata Production Company, Loving, NM (mid-term)

initiate 11 waterflooding projects in the same basin. Prior to the Lomax demonstration, waterflooding of the waxy oil was considered ineffective. The Lomax project alone will result in a public benefit of over $12.7 million in taxes and royalties based on revenues from producing 2.4 million barrels of oil. The 11 additional waterfloods should generate additional minimum reserves of 31 million barrels of oil, resulting in a larger public benefit than the cost of the entire reservoir Class program. Since these 11 projects will only evaluate 13 percent of the area, reserves in this area could easily double or triple.

- Lamont-Doherty Geological Observatory of Columbia University, working with seven universities, three corporate affiliates (in the computer service business) and 12 oil companies in the Global Basins Research Network (GBRN) has demonstrated the capability to locate fault zones where oil is migrating up into reservoirs, using advanced seismic, geochemistry and geologic modeling. The project well, which was unable to establish commercial production within the fault zone (although it did provide significant oil samples, core and pressure data -- the original objective), is expected to start production from the reservoir adjacent to, and possibly fed by the fault zone, early in 1995. A nearby well (but not a part of the DOE project) that penetrated a seismic target identified by the GBRN analysis has been producing 1,500 barrels per day for several months. Other project participants include the University of Santa Barbara, University of Colorado, Cornell University, Louisiana State University, Massachusetts Institute of Technology, Michigan Tech, Pennzoil Exploration, Texas A&M, and Woods Hole Oceanographic Institute.

- Application of crosswell seismic tomography and advanced simulation techniques has been successful in determining sandstone "packages" that have not been contacted by the existing waterflood in the University of Tulsa's Class I Glenn Pool field project in Tulsa County, Oklahoma.

- Utah Geological Survey Class I project indicated oil recovery potential in overlooked producing intervals that may have waterflood potential similar to reservoirs in other parts of the Uinta Basin. It also provided evidence of better production associated with one of two fracture trends.

- Phillips' Permian Basin Class II project in Texas is demonstrating the use of horizontal wells to inject CO_2. This method shows promise in improving recovery efficiency and reducing capital outlays, making the technology an economically attractive option for Permian Basin operators.

- Texaco is conducting a field demonstration of the application of CO_2 flooding using horizontal injection wells for improved recovery in watered out salt dome reservoirs. Although only 18 months into the project, the recovery has increased by about 400 barrels per day.

In addition, several technology transfer products are being developed:

- GBRN has released AKCESS.BASIN, a finite element, geological basin modeling system. The program models basin evolution using seismic data, well logs, and other data.

- Participants are conveying project results to operators of similar fields through project newsletters, field study reports, and exhibits at producer meetings.

- Quarterly, annual, and topical reports are being printed and distributed to over 1,000 interested individuals. (Any report developed by the Oil Program can be obtained free of charge by calling Herb Tiedemann at (918) 337-4293.)

- Participants are delivering technical presentations and publications to professional and trade associations including the American Association of Petroleum Geologists (AAPG), Society of Petroleum Engineers (SPE), and Society of Exploration Geophysicists (SEG).

In September 1994, DOE announced the selection of nine projects to conduct field demonstration in Class III reservoirs (slope and basin clastics), including those containing heavy oil. Most of these projects envision teams of oil field producers, service companies, and universities carrying out the demonstration projects. DOE is working with the participants to negotiate and award all of the cooperative agreements by the middle of 1995; several are expected to be awarded as early as March 1995. The two remaining Class II projects are expected to be awarded in March 1995.

Future Actions

- Issue the Class IV Solicitation upon appropriation of funds (Strandplain and Barrier Island reservoirs) in March 1995.
- Work with the National Institute for Petroleum and Energy Research (NIPER) to develop workshops, computer products, and information services (on Internet) to supplement the technology transfer being presented by the industry participants in the Class program. These activities will utilize PTTC to disseminate information and target independent-operator audiences.
- Conduct technology transfer for Class I projects, including workshops, expert systems, and field tours in addition to the traditional technical papers and presentations. Announce workshops through Internet, Fossil Energy Techline, and trade journals.
- To help better address specific field demonstration needs of very small independent operators, DOE has initiated two projects through NIPER: (1) solicit, with the help of the PTTC's regional lead organizations, industry participation in reservoir management demonstration projects, in which technical experts at NIPER and appropriate service contractors will work with groups of operators to improve the production and cost-efficiency of existing producing fields; and (2) provide technical assistance to small operators to demonstrate the value of applying a variety of technologies in marginally economic fields. These programs will be

announced in trade journals during January and February 1995.

- Conduct advanced follow-up work for highest priority reservoir classes. By 1996, the program will have generated sufficient information to evaluate the Class I mid-term projects to determine areas of research that require additional investigation. Possible research areas common to these projects that are expected to be important to many Class I operators include: (1) improved seismic interpretation techniques for modeling near-salt reservoirs; (2) improved 3-D geologic models for use with thermal, compositional, or depositional simulators; (3) advanced well logs to identify behind-pipe reserves; and (4) improvements in enhanced recovery processes, especially in combination with various methods.

1.4 Conduct Advanced Geologic Basin Analysis to Target Exploration for Bypassed Gas and Oil: This action was initiated to produce geologic analyses of oil and gas-bearing basins that may lead to new hydrocarbon discoveries. In April 1994, DOE, with the assistance of personnel from the U.S. Geological Survey (USGS) and MMS, developed an exploration implementation program that includes, as a major part, basin analysis in areas likely to contain undiscovered or bypassed hydrocarbons. Included in the actual analysis of the first basin (Black Mesa, Arizona) is the investigation of new technologies in areas such as computer-assisted design, remote sensing, geochemical analysis, and geophysical and hydrologic development. These technologies are used to model the developmental history of potential migration pathways, tectonic disturbances, structural traps, and unconventional and potential deep hydrocarbon sources. Independents are uncomfortable with some of the basin analysis technology and many do not have the expertise to conduct such analyses. The Department will encourage explorationists in the industry to use DOE-generated information to conduct their own exploration programs in the basins analyzed.

A review of the work being done by other agencies and industry was completed to determine the basins that could yield the most promise. Areas that are already under significant exploration scrutiny and drilling activity were moved to a lower priority for the program evaluations. The program has selected several priority basins based on estimates of oil-in-place and other such factors. In 1994, DOE initiated a comprehensive geologic basin analysis of the Black Mesa Basin in Northeast Arizona as the first study. The Basin has been under an exploration moratorium for the past 30 years due to land disputes between the Hopi and Navajo Tribes, which were settled in 1993.

Support is being given to a National Research Council (NRC) study on the geodynamics of sedimentary basins. This effort will assess opportunities for multi-disciplinary research by scientists in academia, industry, and government on the origin and evolutions of sedimentary basins.

Future Actions

- Initiate work with other state, federal, and university groups to begin analysis of other priority basins as funding is

available, and provide results to industry explorationists. Discussions are underway to work with a group in the Gulf Coast for such studies in Mississippi, Alabama, and Florida.

- Identify prospective regions in the Black Mesa Basin and transfer information to the public.
- Identify new technologies that are economic and useful to independents and majors to identify prospects as a result of comprehensive basin analysis, and publish the results of testing their use.
- Respond to the results of the NRC Study and adjust DOE's program if necessary.

1.5 Target a Research Program at Specific, Basic Operating Issues of Small Natural Gas and Oil Producers: Under this action, DOE added a component to its oil research program that specifically addresses the technical needs of smaller independent producers who lack research facilities and, therefore, need access to these facilities to more efficiently recover oil. Included in this work is access to low cost recovery methods such as gelled polymers, microbial work, slim-hole drilling, and improved waterflooding techniques. Program goals are quick-turnaround and problem resolution. Specific programs initiated support the independents with urgent production problems (FY 1994: $0.5 million; FY 1995: $0.56 million), the reservoir management demonstration projects (FY 1994: $0.7 million), and the technology transfer component offered through PTTC (FY 1994: $0.9 million; FY 1995: $0.7 million). All of these programs are cost shared at an average of 50 percent. Information on urgent production problems was made public in early FY 1995 with further announcements to be made for specific reservoir types in mid-FY 1995. The first contract awardee selection for the urgent production problems program will be made in mid-year 1995. The reservoir management program was announced in January 1995. "Notice of intention to participate" responses for the reservoir management demonstration projects are due March 1, 1995, with proposals due shortly thereafter. Contract awards are planned to be made in mid-1995. These two programs are in contrast to other field demonstration projects, which may take up to two years before the projects are initiated. The PTTC work was begun in FY 1994. Phase I is complete and Phase II has been initiated. Activation of 10 PTTC regional lead organizations for technology transfer will be accomplished during Phase II.

Future Actions

- Assemble information on production problems of small operators.
- Support establishment and operation of PTTC regional lead organizations.
- Continue to support small operators with outreach activities such as exploration, drilling, and production "hands-on" workshops.

1.6 Develop a Commercialization Strategy for Natural Gas Technologies: This action resulted in a DOE strategy for commercialization of natural gas technologies that range from the "wellhead to the burnertip." Market introduction of new technologies (post-demonstration phase) is often impeded by the high cost of initial units and the reluctance of the marketplace to accept risk associated with a new product.

Historically, commercialization or market entry support has been primarily the role of private industry. Presently, the gas industry is actively encouraging a partnership with the Department to cooperatively foster the market introduction of advanced natural gas technologies. Where government is providing financial assistance for R&D efforts and where the benefits flow across society, industry believes that government-industry cooperation will facilitate the deployment of advanced gas technologies. The gas industry, including the Gas Research Institute (GRI) and the American Gas Association (AGA), is supporting cost-shared funding with DOE to foster the commercialization of phosphoric acid fuel cells, heating and cooling equipment, and natural gas vehicles. DOE signed an agreement with GRI in 1994 to ensure that government and industry work together in the most effective manner, and to cost share and improve communication, cooperation, and coordination between industry and the government on R&D for advanced gas technologies.

As part of its natural gas R&D program and technology commercialization strategy, DOE also is supporting the International Energy Agency's Center for Gas Technology Information (Center). The primary goal of the Center is to promote the widespread commercialization of gas-related technologies by providing an international forum in which information dissemination and international cooperation and collaboration can take place. Gas Technology Information, Inc., a joint corporation formed between the Gas Research Institute and the Danish Gas Technology Centre, acts as the operating agent for the Center. The startup costs of the Center were provided by DOE and the Danish state-owned Dansk Olie og Naturgas A/S. Current member countries, which are financing the Center activities, include the United States, Denmark, Italy, Japan, Portugal, Spain, Russia, France, Germany, and the Netherlands. Center services will include technology information exchange, technology analysis, and technology transfer. The final Implementing Agreement of the Center is expected to be signed in April 1995.

DOE is currently developing a Departmental natural gas strategic plan and program-specific implementation plans, and implementation of this action is coordinated with that effort. A technology market entry panel was formed in October 1994 to develop and implement the commercialization strategy. A comprehensive information gathering and library research effort on natural gas technologies was completed in November 1994. Industry stakeholders such as GRI and AGA have participated in this activity and provided information and recommendations.

A draft natural gas technology commercialization strategy was developed in December 1994, which includes the following goals and strategies for deployment of advanced natural gas technologies:

- Overcome market barriers to commercialization and deployment of advanced natural gas technologies and stimulate markets for natural gas and natural gas-derived products. This will be accomplished by: reducing consumers' concerns over price, reliability, and availability of natural gas; implementing outreach programs; continuing participation in cost-shared, cooperative

RD&D with industry for technology development; and supporting direct federal purchase of energy-efficient end-use technologies.

- Cooperate with industry to ensure that all technology barriers are overcome for advanced gas technologies, and that first-of-a-kind technologies have been properly adapted for commercial deployment. This will be accomplished by: continuing RD&D assistance after product introduction; supporting demonstration programs and innovative financing mechanisms; maximizing incentives to aggressively deploy technologies; and supporting infrastructure development for promising technologies.

- Reduce regulatory/policy impediments to adoption of new gas technologies. This will be achieved by: defining criteria to be used to qualify technologies for federal support; working with industry and states to expand programs to improve efficiency, increase productivity, and reduce cost; advocating and supporting resolution of competing regulatory requirements; ensuring that codes and standards do not constrain technologies; and reviewing and adjusting federal procurement procedures.

- Make significant contributions to the reduction of worldwide environmental emissions through development and commercial deployment of advanced technologies. This will be achieved by: reducing uncertainty of future environmental regulations that may be impediments to technology deployment; developing pollution control measures that are fuel neutral; ensuring consistent regulatory requirements; and supporting cooperative programs with industry to increase the competitiveness of U.S. technologies.

Future Actions

- Finalize the commercialization strategy for natural gas technologies, and define government's role in cooperation with industry to overcome market entry barriers.
- Design programs to implement the commercialization strategy.
- Request funding to support commercialization through federal procurement and government/industry cost-shared technology deployment.

1.7 Stimulate Development of a Nationwide, Regionally Based Natural Gas and Oil Technology Transfer Network and Assistance Program: Under this action, DOE is coordinating the development of a nationwide technology transfer network. The network is an industry-driven, client-focused, and self-supporting system comprising members of all sectors of the industry. The network provides for the exchange of gas and oil-related information and technology, and involves coordinating various ongoing and new activities at DOE.

As part of the network, DOE supported the creation of PTTC and provided substantial funds to create 10 regional centers. PTTC will be used for dissemination of technology to gas and oil producers, particularly the

independent producers. The regional centers will provide producers access to a library, technical and referral assistance, and computer workstations with reservoir data and analytical software. Now in its second phase of development, PTTC is initiating technology transfer activities through its 10 regional lead organizations. DOE interaction with the PTTC will involve coordination of various ongoing and new activities in the Department. DOE funding, anticipated at approximately 60 percent of about $30 million over five years, is vital to the continued activity of the PTTC.

Additional nationwide technology transfer efforts include establishment of a Bartlesville Project Office (BPO) Home Page. The Home Page, providing electronic access to various types of technical and program information for gas and oil stakeholders, will be accessible through the DOE Internet and other systems, including New Mexico Tech's GO-TECH, and will be integrated with the PTTC regional organization network.

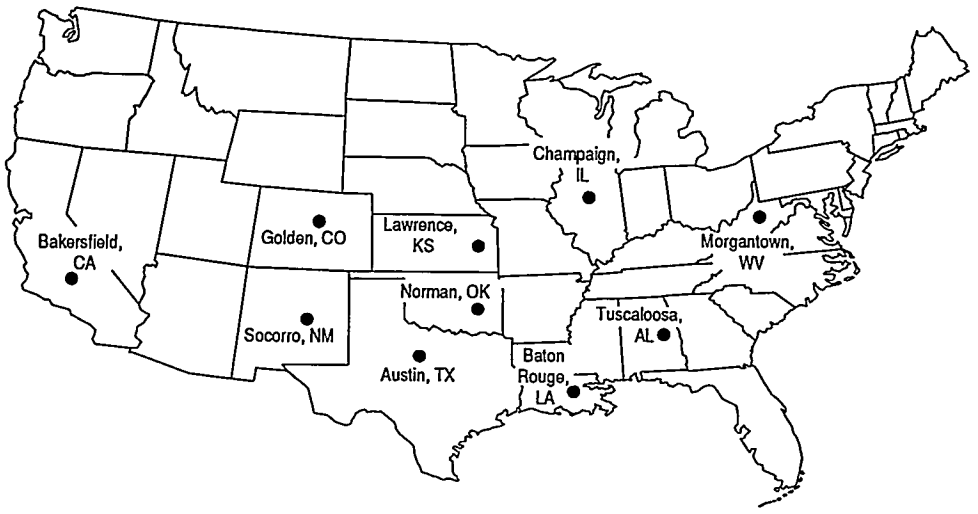
In an expanding outreach to Native American Tribes, DOE held meetings with the Bureau of Land Management in October 1994 on gas and oil technology transfer to and training for tribal personnel. In November and December 1994, BPO and the Rocky Mountain Oil Testing Center (RMOTC) at the Naval Petroleum Reserve No. 3 (NPR-3), Casper, Wyoming, held oil technology and environmental compliance training for Osage, Hopi, Jicarilla Apache, and Arapahoe personnel. BPO also initiated a project with the Osage Tribe to assess use of 3-D seismic technology for exploration, and to assist in vertical integration of tribal management of mineral resources. In December 1994, a Memorandum of Understanding was signed for the establishment of a field laboratory on the Osage Tribal Land. Contacts have been made with 26 tribes holding gas and oil resources for other possible future projects and for basic oilfield technology and environmental compliance training in FY 1995 at BPO/NIPER and RMOTC.

Future Actions

- Continue and expand coordination and assistance efforts with PTTC, transfer DOE-developed technology, and integrate electronic technology transfer system with PTTC regional organizations.
- Expand training projects and activities to accelerate resource development with Native American Tribes and other minority groups, including Historically Black Colleges and Universities.
- Develop a comprehensive electronic system for technology transfer via Internet Home Page, with appropriate connections to related systems.

1.8 Review Tax Treatment of Geologic and Geophysical Expenditures and Other Tax Provisions: Under this action, DOE and the Department of Treasury completed a review of the tax treatment of geological and geophysical expenses and intangible drilling costs with the goals of: (1) promoting the use of new and advanced exploration technologies (e.g., 3-D seismic); and (2) simplifying those tax provisions. This process, which was initiated with a DOE/Department of Treasury meeting in March 1994, has continued as a joint effort with these two agencies through 1994. A series of options has been considered and weighed with respect to: promoting new

PTTC REGIONS AND LOCATIONS FOR MAIN RESOURCE CENTERS



The Petroleum Technology Transfer Council (PTTC) has divided the Nation into 10 regions to facilitate the work of PTTC and to ensure that the needs and interests of all the oil and natural gas producing regions are served. Some single-state regions reflect the size and significance of the oil and natural gas production in the state. Others are multi-state regions with great geological and demographics diversity.

PTTC Region	Resource Center Location	States	Regional Lead Contacts
Appalachia	Morgantown, WV	Kentucky (Eastern), New York, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia	Doug Patchen (304) 293-2867
Central Gulf	Baton Rouge, LA	Louisiana	Bob Baumann (504) 388-4400
Eastern Gulf	Tuscaloosa, AL	Alabama, Florida, Mississippi	Ernest Mancini (205) 349-2852
North Mid-Continent	Lawrence, KS	Kansas, Missouri	Lanny Schoeling (913) 864-4491
South Mid-Continent	Norman, OK	Arkansas, Oklahoma	Charles Mankin (405) 325-3031
Midwest	Champaign, IL	Kentucky (Western), Illinois, Indiana, Michigan	Don Oltz (217) 333-5116
New Mexico	Socorro, NM	New Mexico	Dave Martin (505) 835-5408
Rockies	Golden, CO	Arizona, Colorado, Montana, Nebraska, Nevada, North Dakota, South Dakota, Utah, Wyoming	Roger Slatt (303) 273-3822
Texas	Austin, TX	Texas	Ray Levey (512) 471-1534
West Coast	Bakersfield, CA	Alaska, California, Oregon, Washington	N/A

exploration technologies, simplifying tax accounting, stimulating new industry activity, and cost to the Treasury. A final report has been circulated within the National Economic Council for review.

Future Actions

- Approve final report and submit recommendations to the National Economic Council in the Executive Branch.
- Find an appropriate legislative vehicle to present this proposal. It has not yet been determined whether this would be attached to a larger piece of legislation, or stand alone as a separate legislative action.

1.9 Use the Naval Petroleum Reserves for Advanced Technology Testing, Evaluation, and Training: This action is designed to provide opportunities for advanced technology testing and evaluation, and for training in new oil field and environmental technologies. Two videos and a brochure were produced to announce the opening of the Rocky Mountain Oilfield Testing Center. The videos have been shown to numerous industry and government officials to inform interested participants that DOE will provide the resources and facilities of the Naval Petroleum Reserve No. 3 (NPR-3) on a cost-sharing basis for testing or demonstration of new or advanced oil field technologies that will enhance production or reduce costs. For example, National Parakleen treated four wells with nutrients to suppress H_2S production by sulfate-reducing bacteria. RMOTC also tested and evaluated several energy-related inventions, and is close to publishing results. Four in-house inventions are being considered for patents. These are Low Cost H_2S Flaring System, Down Hole Nozzle, Alternate Production Equipment (APE), and Sand Pump and Bailer Unloading Valve with Air Port. RMOTC is working with BPO, Naval Petroleum Reserves California (NPRC), private companies, National Laboratories, and universities to develop partnerships and combine resources for selected projects. The State of Wyoming has contributed $500,000 toward a five-year plan for RMOTC implementation.

RMOTC hosted the first of several planned Native American training courses in November, which were attended by the Osage, Arapahoe, Apache, and the Bureau of Indian Affairs. A program is being developed for DOE's Historically Black Colleges and Universities (HBCU) program to allow petroleum or environmental engineering students internships at NPR-3 for hands-on experience. RMOTC is negotiating with the National Renewable Energy Laboratory (NREL) to demonstrate a wind turbine for remote stripper oil fields.

Funding of $2.5 million is requested for FY 1996 RMOTC activities. No funding was appropriated for FY 1995 operations, however, Congress approved the use of NPR-3 for RMOTC purposes, and allowed use of $1.4 million of carryover funding for projects that would benefit NPR-3.

Future Actions

- Continue to form partnerships with industry and government agencies to pool resources and to ensure transfer of the resultant technology to industry.

- Continue to develop production and environmental training for Native Americans.
- Continue to develop internships for HBCU students. Two positions are scheduled to be filled for the Summer of 1995. One petroleum engineer and one geologist will be selected.
- Establish a line of communications with PTTC.

ACTION 2.0
Improve Environmental Technologies and Practices

Domestic natural gas and oil producers and refiners face increasing costs of compliance with environmental regulations. Under this action, DOE is expanding its environmental RD&D program to advance technologies that serve the dual needs of environmental protection and cost-effective regulatory compliance. It is estimated that the U.S. petroleum industry spent nearly $10.5 billion in 1992 on activities to protect the environment and comply with existing environmental regulations. As environmental concerns become increasingly complex and global, it is critical that industry, with government assistance, develop and utilize advanced, cost-effective environmental compliance technologies.

A federal environmental research program can help reduce costs in three ways. First, it can develop and transfer to industry lower cost environmental compliance technologies. Second, it can provide regulators and government decisionmakers with technical information and data management tools to make laws, regulations, and policies that are: flexible; based on sound, scientific understanding of environmental risks (risk-based); and that balance environmental, economic, and energy impacts. Finally, it can furnish industry with information that enables operators to improve their environmental management strategies.

What is DOE's Environmental Vision and Program?

DOE advocates risk-based, site-specific multi-media industry regulations and technologies that minimize costs, promote maximum production and ultimate recovery, reduce potential liabilities, and improve environmental performance. DOE seeks rational decisions by regulators, and works toward collaboratively developed and enforced regulations that are based on sound technical data.

DOE's program identifies high priority environmental issues with the industry, and then conducts research to better understand environmental risks; develops new, more cost-effective compliance technologies; and promotes sound environmental practices through outreach and assistance to the industry. Most importantly, the Clinton Administration has strongly encouraged that DOE activities be coordinated with the Environmental Protection Agency, Department of the Interior, state regulatory agencies, and other stakeholders. DOE interacts with federal and state regulators to ensure a proper balance between environmental protection and economic and energy impacts. Additionally, DOE is working to develop coordinating mechanisms with nonprofit organizations whose efforts are focused on advancing environmental technologies.

Actions

2.1 Improve Environmental Compliance Technologies and Practices
2.2 Improve Coordination on Environmental Research
2.3 Explore DOE's Role in Oil Spill R&D
2.4 Study Used Oil Recycling

Accomplishments to Date

2.1 Improve Environmental Compliance Technologies and Practices: This action, which is an expansion of an ongoing DOE environmental R&D program, enhances the capability of natural gas and oil producers and refiners to reduce environmental compliance costs and liabilities, and improve environmental performance. This program consists of research, development, and analysis in the areas of risk assessment, streamlining regulations, development of lower cost environmental compliance technologies, and outreach and technology transfer.

Particular emphasis has been placed on produced water research, including risk assessment, and on the treatment and disposal of naturally occurring radioactive materials (NORM). During 1994, a request for proposals (RFP) was issued for field demonstrations of NORM treatment and disposal, aimed at reducing the cost of NORM disposal from the current $1,000 per barrel of waste to $300 per barrel. A related quality assurance effort was initiated at Argonne National Laboratory. Also, in a cooperative effort with the Minerals Management Service, an RFP was released for the development of a safety and environmental management plan for offshore operations, to serve as a pilot for a national program that would rely on such voluntary plans in lieu of mandatory regulations. In the area of produced water research, studies have been conducted on produced water discharges in the Gulf of Mexico that characterize the constituents in the discharges and their transport in the Gulf. These studies, along with related risk assessments, have been used by the State of Louisiana in developing its regulations governing such discharges.

In addition, the injection of produced water has been the focus of cooperative efforts with the American Petroleum Institute (API) and various states in developing risk assessment methodologies that are expected to result in savings for industry and the states under forthcoming Environmental Protection Agency (EPA) regulations.

Implementation of this action is coordinated with the DOE-wide natural gas RD&D strategic plan and program development efforts currently underway.

Future Actions

- Assess industry and environmental trends and impact of environmental regulations in order to help guide research strategy, anticipate research needs, and set program priorities.
- Obtain additional stakeholder input and coordinate efforts with other relevant organizations in order to understand the research and information needs of industry and regulators.
- Conduct Ground Water Protection Council (GWPC)/DOE seminars on underground injection control

requirements, and Interstate Oil and Gas Compact Commission (IOGCC)/DOE environmental workshops for industry and state personnel.

- Continue to assist states in preparing to obtain variances from EPA under forthcoming underground injection control regulations.
- Initiate field demonstrations of NORM treatment and disposal technologies for producers along with risk assessment and public outreach activities.
- Complete analysis of produced water discharges in coastal and offshore Gulf of Mexico to help regulators implement cost-effective requirements in this area.
- Initiate demonstrations of lower cost produced water treatment technologies to help lower the cost of environmental compliance for producers.

2.2 Improve Coordination on Environmental Research: Goal of this action, which is an expansion of ongoing DOE programs, is to improve coordination among industry, government, and other stakeholders on environmental research and technology transfer activities related to natural gas and oil exploration, production, and refining. This action assures that DOE is aware of related research being conducted and considered by other research organizations and that DOE's program is coordinated with theirs to minimize duplication and to take advantage of synergies. In April 1994, DOE attended a meeting of the exploration and production discussion group of Petroleum Environmental Research Forum (PERF). DOE participated in BLM's Onshore Oil and Gas Performance Review, including review of environmental regulations.

Petroleum Environmental Research Forum (PERF)

PERF was created in 1986 by a group of major petroleum companies under the auspices of the National Cooperative Research Act to research and develop technology, environmental pollution control, and waste treatment for the petroleum industry. PERF also provides a forum to discuss and develop proposals for cooperatively funded projects related to environmental pollution control and waste treatment. About 10 new proposals are presented to the PERF membership each year.

In July 1994, representatives of the U.S. Geological Survey convened with DOE on the topic of future environmental research plans. A strategy for establishing a DOE/EPA working group on upstream gas and oil environmental issues is currently being developed. Such a working group will facilitate the transfer of sound scientific information from DOE for EPA's regulatory development processes, improve the communication of energy policy issues to that process, and lower compliance costs borne by industry by encouraging regulations based on scientific understanding and risk assessment.

At the request of the Secretary, NPC initiated a study on natural gas and oil industry R&D needs assessment, including environmental research. In April 1994, DOE conducted a meeting with industry representatives in Metairie, Louisiana, on research needs related to NORM. DOE also participated in an agreement on EPA's Gulf of Mexico Program (GMP). GMP, since 1992, is dedicated to restore and maintain

Future Actions

- Finalize oil spill R&D program proposal and submit to the Office of Fossil Energy for approval and funding (2/1995).
- Incorporate the INEL study recommendations in program strategy (9/1995).
- Prepare and issue request for proposals (competitive procurement) in focused areas for the National Laboratories, industry, and others to assist the industry in meeting environmental goals and avoiding costs of spills (7-9/1995).

2.4 Study Used Oil Recycling: Under this action, DOE is examining various policy alternatives to significantly increase the recycling of used lubricating oil. DOE conducted a study to investigate used oil recycling. During the course of the study, DOE worked closely with several private and public sector organizations. Among them are the American Petroleum Institute, Filter Manufacturers Council, the National Oil Recyclers Association, and several state oil recycling officials. The following reuse hierarchy has been devised from a preliminary assessment of used oil technologies: (1) source reduction; (2) re-refining; (3) processing in primary refinery; (4) processing; (5) burning; and (6) disposal. The energy impact and disposition of key used oil contaminants (lead, sulfur, and polynuclear aromatic hydrocarbons) have been estimated for each level of this hierarchy.

A draft report, completed in the Fall of 1994, concluded that there is still a significant amount of oil dumped in landfills, on the ground, and into sewers. Of the 2.3 billion gallons of lubricating oil sold in the U.S. in 1991, it is estimated that 140 million gallons went into landfills and 185 million gallons were dumped. The report proposed several classes of policy options: (1) *Behavioral Modification*: change "do-it-yourself" and off-road user behavior through increasing the effectiveness and availability of collection programs for those users; (2) *Source Reduction*: automotive engine design changes, reduce volume of oil required by engines; and (3) *Greater Use of Re-refined Oils*: used oil as an input at the primary refineries, more dedicated re-refineries, and used oil as an input to primary lube oil refineries. The report also suggested that, as feasible, research should be conducted cooperatively with lubricating oil formulators and manufacturers, industrial lubricating oil consumers (e.g., automobile engine and parts manufacturers), used oil collectors, processors, and re-refiners. There are still outstanding issues, however, that indicate the need for a second draft, currently scheduled for the Summer of 1995. Two of these issues are the actual or potential environmental damage from dumping used oil, and fundamentally different approaches to changing engine oil that would all but eliminate the incentive to dump used oil.

Future Actions

- Complete the second draft report (Summer 1995).
- Make recommendations to the Secretary for possible DOE initiatives, e.g., joint programs with states and industry for demonstration programs.

STRATEGIC ACTIVITY II

STIMULATE MARKETS FOR NATURAL GAS

Domestically produced natural gas provides environmental, economic, and national security benefits to the Nation. This strategic activity is designed to maximize these benefits by stimulating markets for natural gas and natural gas-derived products, including their use as substitutes for imported oil, where feasible. Power generation and transportation are the two market sectors with the greatest potential for significantly increasing the use of natural gas in the United States. During the past year, the federal government has established and implemented programs which will stimulate markets for natural gas.

The Federal Energy Regulatory Commission (FERC) completed the implementation of its Order No. 636 on all interstate natural gas pipelines. This restructuring of the pipeline industry has increased competition and improved service for pipeline customers, and has expanded and enhanced natural gas markets. Department of Energy's objective is to develop policies and programs that build on the success of FERC Order No. 636, and to assist the states in examining changes in their regulations and policies which will make available to all natural gas consumers the benefits of increased competition in natural gas markets.

The President's *Climate Change Action Plan* directs DOE to accelerate the commercialization of high-efficiency natural gas technologies, such as fuel cells, gas turbines, and natural gas vehicles, through joint ventures with utilities, research organizations, and technology developers in order to fund demonstrations and market-entry initiatives. DOE's objective is to comply with the President's directives and to stimulate markets for natural gas by maximizing the environmental benefits of natural gas use.

Specific actions are grouped under three areas: Action 3 - Improve the Natural Gas Infrastructure; Action 4 - Support Natural Gas Regulatory Reform and a "Contract Portfolio" Approach; and Action 5 - Provide Information Services.

FERC Order No. 636

FERC Order No. 636, issued in 1992, and known as the Restructuring Rule, was designed to allow more efficient use of the interstate natural gas transmission system by fundamentally changing the way pipeline companies conduct business.

Order 636 requires interstate pipeline companies to unbundle, or separate, their sales and transportation services in order to increase competition among gas sellers. It allows secondary markets for capacity by requiring pipelines to institute capacity releasing and reassignment programs that permit capacity to be resold on a non-discriminatory basis. In addition, Order 636 requires establishment of electronic bulletin boards to provide all shippers with equal and timely access to data on the availability of transportation service.

POTENTIAL BENEFITS OF STRATEGIC ACTIVITY II ACTIONS

Industrial Competitiveness: A reliable, properly functioning, competitive natural gas market requires distribution and information systems that will meet the demands of the market. Competition will improve when timely and accurate information is readily available to allow buyers, sellers, and transporters to make better informed decisions. Better knowledge of gas deliverability and availability of alternative storage methods will stimulate the use of natural gas to generate electricity. The policies resulting from the Strategic Activity II actions will strengthen natural gas distribution capabilities, support continuing gas regulatory reforms, and encourage regulators to permit companies to enter into a variety of contracting arrangements that facilitate lower cost or lower risk deliveries, such as long-term contracts and hedging, and provide better information services.

Energy Resources: Strategic Activity II actions are being implemented using market-oriented mechanisms, in cooperation with the elements of the natural gas industry that most aggressively produce and market gas. For example, DOE advocates FERC's efforts to expedite pipeline construction, allow gas-fired electric generation to compete for market share, and encourage effective marketing of pipeline facilities. These measures are expected to boost the consumption of this low cost, clean burning, relatively plentiful natural gas. Increased accuracy in gas production data will lead to better long-range planning for gas use and further long-term contracting by gas users, which will lead to increased gas production.

Science and Technology: Under Action 3 activities, DOE has been supporting the industry's efforts to improve the real-time capabilities for monitoring and modeling natural gas availability and flows, and assisting in development of advanced natural gas storage and distribution technologies. Technologies involved include advanced computing, geologic modeling and reservoir simulation, propellent fracturing, chemical treatment (surfactants/foams), hydraulic stimulation, and horizontal drilling. New and advanced technologies for transporting natural gas will add value to the U.S. economy, increase natural gas deliverability, improve efficiency, reduce operating costs, and streamline gathering and dissemination information.

Environmental Quality: Strategic Activity II actions are designed to encourage and increase natural gas use which, in turn, will result in reduction of greenhouse gas emissions and environmental compliance costs, especially in the electric utility and transportation sectors. The Clean Cities program (Action 3.8) will promote investment in alternative fuels for transportation and be a catalyst for the national goal of replacing 10 percent of transportation petroleum with alternative fuels by the year 2000. The actions will help remove barriers to environmentally sound construction of additional natural gas pipeline and storage facilities. In addition, more accurate monitoring of gas production in a specific state (Action 3.1) would allow the development of more responsible production schedules and a corresponding reduction in drilling wastes.

National Security: The substitution of domestically produced natural gas for energy purchased in the form of imported oil will increase our energy security, and also help the national economy by keeping domestic jobs. Strategic Activity II actions will result in increased natural gas use and its substitution for petroleum through efficient delivery of natural gas, a well functioning physical distribution infrastructure, and availability of accurate and timely supply and demand information.

ACTION 3.0
Improve the Natural Gas Infrastructure

This action addresses weaknesses in the present infrastructure, including the physical capabilities for gathering, transporting, storing, and distributing natural gas, and the capabilities for producing accurate and timely information on natural gas supply and demand. To help improve the physical infrastructure, DOE supports removing barriers to environmentally sound construction of additional natural gas pipeline and storage facilities. DOE is encouraging increased access to existing facilities, and will accelerate the development and use of advanced technologies in natural gas storage and distribution. DOE also supports the industry's efforts to improve real-time capabilities for monitoring and modeling natural gas availability and flows, and to match natural gas storage to end-user requirements.

Actions

3.1 Upgrade State Data Collection and Reporting on Natural Gas Production
3.2 Build a National Deliverability Capacity Model
3.3 Enhance Real-Time Monitoring and Automated Systems
3.4 Build a System for Assessing Natural Gas Underground Storage Operations
3.5 Match Natural Gas Storage to End-User Requirements
3.6 Demonstrate Natural Gas Storage Optimization Technology
3.7 Improve Natural Gas Storage Effectiveness for Problem Fields
3.8 Strengthen and Expand the Clean Cities Program

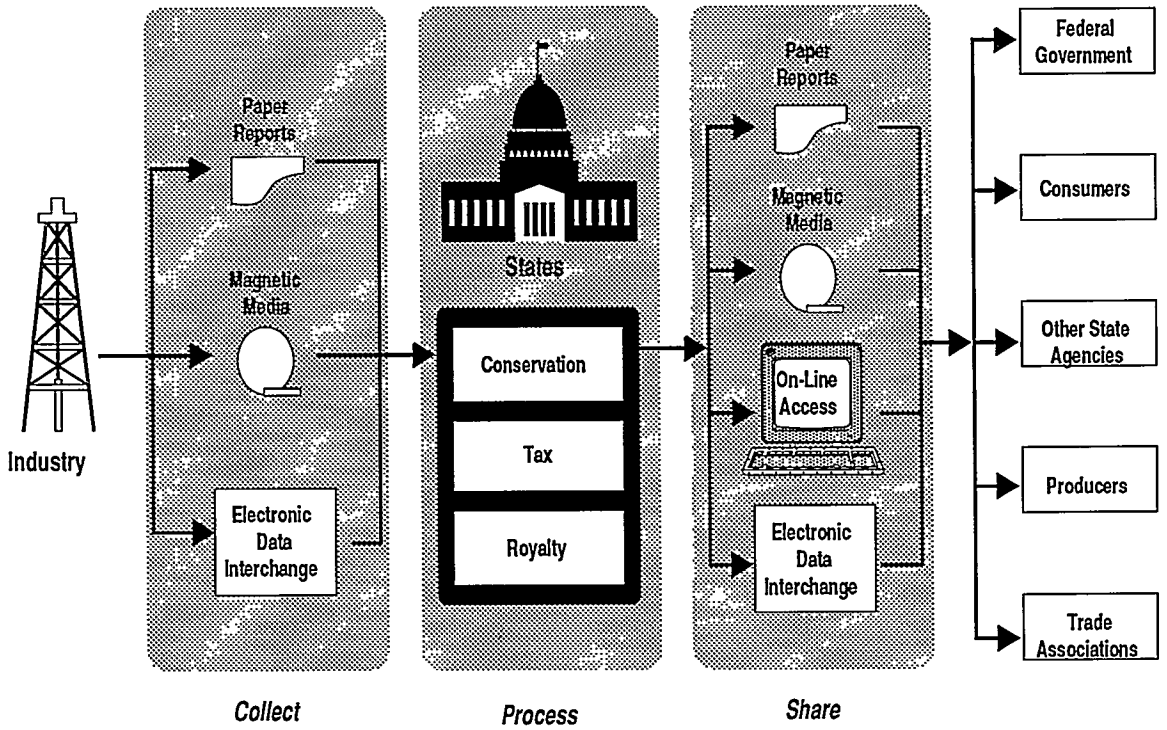
Accomplishments to Date

3.1 Upgrade State Data Collection and Reporting on Natural Gas Production: This action is designed to develop an application of the Uniform Production Reporting Model (UPRM) guidelines for natural gas and petroleum. The Uniform Production Reporting Model study, prepared by the University of Oklahoma under grants from DOE and the Governor's Office of the State of Oklahoma, was released in June 1994. The goal of this study was to develop model guidelines for the best practices and procedures of the producing states related to the gathering, management, and dissemination of production data. Currently, uncertainty exists about the availability of natural gas supplies. This uncertainty stems from a lack of timely and accurate production data and information. Production data is the essential component required by natural gas and oil producers in order to make effective

UNIFORM PRODUCTION REPORTING MODEL (UPRM) STATE DATA COLLECTION AND DISTRIBUTION PROCESS

State agencies are the optimal gatherers, processors, and repositories for onshore and state waters production data. State governmental entities also are the historical collectors and disseminators of those data. Producing states have enormous investments in production data gathering and processing infrastructures. Data collection responsibility for federal onshore and offshore production does exist within two federal agencies, the Minerals Management Service and the Bureau of Land Management.

State agencies have a substantial incentive to maintain systems that meet the key objectives of timeliness and accuracy because state tax and royalty revenues are dependent upon sound production data. The current flow of information from industry to the state governments and, ultimately, to the users of data is the appropriate approach. Rather than duplicate existing reporting to state and federal agencies, the selected approach for UPRM was to build a model that could be uniformly applied within producing states. The approach of the UPRM capitalizes on the historical perspective obtained by upgrading existing processes and systems. Charted below is a simplified presentation of data flow as contemplated under the UPRM.



business decisions. Timely and accurate production data is the cornerstone of natural gas deliverability. Improved natural gas deliverability data will play a significant role in the development of an efficient, national, competitive market for natural gas. In an open competitive market, prices are set by the intersection of the commodity supply and demand curves. The market participants' perceptions and opinions of natural gas supply are based, in part, on deliverability data. Inaccurate deliverability data may lead to inaccurate estimates of natural gas supply, causing mispricing in the marketplace. This results in economic inefficiency, misallocation of resources, and decline in supply reliability. The implementation of the model will allow states to increase natural gas deliverability, improve the knowledge of natural gas supply and extend the life of the reserve base. The model also will reduce producers' reporting burdens and administrative costs, give states a mechanism for ensuring that all state severance fees are remitted, and improve the timeliness, accuracy, and consistency of state production data.

The ultimate goal is to create a single information collection point in each state for data on natural gas and petroleum production, and make state and federal production data and information more compatible. Kansas and Oklahoma are participating in an assessment of the commonalities in their respective reporting system needs, and are developing a plan for the implementation of the Uniform Production Reporting Model guidelines. Other states, such as Kentucky and Texas, along with the gas and oil industry, continue to show a significant interest in adapting and incorporating the Uniform Production Reporting Model guidelines for their production reporting systems. Over 700 copies of the *Uniform Production Reporting Model-Volume 1* have been mailed to date to state agencies and industry representatives that participated in the development of the model. The Interstate Oil and Gas Compact Commission (IOGCC) distributed 175 copies to its respective committee members, delegates, and state contacts.

Future Actions

- Distribute and promote UPRM guidelines and concepts through workshops and meetings with states.
- Continue to develop state and industry support for the national implementation of the UPRM guidelines.

3.2 Build a National Deliverability Capacity Model: The goal of this action is to create a model that will estimate the U.S. capability to deliver natural gas to consumers, linking wellhead productive capacity estimates with pipeline capacity on a state-by-state basis. The model development efforts were initiated in October 1994, and an initial specification of the model is scheduled for completion in September 1995. This methodology will allow the evaluation of the overall system to deliver natural gas, including considerations of wellhead and pipeline capacity constraints. All segments of the industry, from producers to consumers, will benefit from the increased information about the ability of the natural gas system to produce and deliver natural gas. Government decisionmakers and analysts will have readily available and consistent information on which to base analyses and decisions.

Future Actions

- Distribute deliverability model system design document to DOE staff and other stakeholders for comment.
- Publish report on the national deliverability capability.
- Demonstrate model and analytical capabilities to DOE staff and interested stakeholders.
- Distribute the system and documentation to DOE personnel and interested stakeholders.

3.3 Enhance Real-Time Monitoring and Automated Systems: This action is designed to provide new and advanced technologies for transporting natural gas to increase deliverability, improve efficiency, reduce operating costs, and streamline gathering and disseminating information on natural gas flows and pressures. Under this action, DOE supported the recommendations of the Natural Gas Council to establish a Gas Industry Standards Board (GISB) in order to develop electronic information exchange standards that will permit more efficient market transactions. GISB was formed on July 28, 1994. It is an independent and voluntary organization open to all segments of the natural gas industry. The mission of GISB is to promote standards initially through improving and expanding electronic communications. These standards will assist the natural gas industry in improving customer service, enhancing the reliability of natural gas service, and increasing the efficiency and competitiveness of natural gas markets. The purpose of GISB is threefold: (1) to efficiently and effectively develop and maintain voluntary standards governing the electronic communications for business transactions within the natural gas industry; (2) to serve as a forum for cross industry communications necessary to formulate consensus-based and market-responsive solutions; and (3) to enhance the reliability of gas service through promotion of easy access to uniform standard information needed for critical business transactions.

Currently, GISB has 160 members from all segments of the industry. The Board of Directors and Executive Committee have been formed, as well as many subcommittees and task forces, to develop standards. The strategies and tactical implementation plans have been developed for its first year of operation. Some of GISB's goals for 1995 include: membership of 250 corporations, testing of three standards, implementation of four standards, distribution of documentation on 10 proposed standards, and adoption of a model trading partner agreement for exchange of electronic information between trading partners.

In addition, the industry is in need of new sensors which can be cost-effectively installed in existing transmission and distribution facilities for monitoring gas flow, quality (composition and BTU), and total energy flow. Optical (near infrared) technologies appear to hold great promise for these applications. A total energy flow meter for the industry would result from research aimed at a transmission application of determining gas compositional and energy content data.

This action will be initiated when funds are made available. The fiscal year (FY) 1996 budget request is $0.2 million.

Future Actions

- Obtain program funding in FY 1996.

3.4 Build a System for Assessing Natural Gas Underground Storage Operations: This action will result in the creation of an information system to: evaluate domestic storage capacity and deliverability of natural gas on a site-specific basis; document and assess new technologies for developing and managing gas storage; and examine the role of gas storage in meeting variable demand patterns. A draft systems design was developed in August 1994, and currently is under review. System development will be ongoing through July 1996.

Information regarding storage is increasingly important as a result of the unbundling of storage from pipeline transportation services. All segments of the industry, from producers to consumers, will benefit from the increased information about the ability of the natural gas system to store and deliver natural gas. This information will result in a more efficient functioning of the industry and, ultimately, provide lowest cost service to consumers. Government decisionmakers and analysts will have readily available and consistent information on which to base analysis and decisions.

This system will provide DOE, the industry, state officials, and other stakeholders the capability to track and evaluate easily the progress of domestic storage and deliverability capability. The system will be available to the public, subject to the requirement that proprietary data limitations are observed.

Future Actions

- Establish site-specific storage information and databases and merge databases into the existing Energy Information Administration (EIA) geographical information system, Spatial Energy Relationships System (SERS). Prototype system to be completed July 1995.
- Demonstrate the system and its analytical capabilities to DOE staff and stakeholders.
- Distribute the system and documentation to DOE personnel and interested stakeholders.

3.5 Match Natural Gas Storage to End-User Requirements: The goal of this action is to identify market areas where new and expanding natural gas capacity can meet increasing industrial and power generation demand. There is a need to understand the storage requirements to meet the forecasted increase in gas use in industrial and power generation sectors.

The power generation facilities which will be targeted for this increase in gas demand must be identified, at least on a regional basis, so that new or increases in storage capacity can be planned (matched) for these regions. This is important to the gas storage operators who plan for capacity increases or new fields in the future; to the utility companies to meet requirements of the Clean Air Act Amendments of 1990 by burning natural gas; and to the public in having a reliable source of power through the use of natural gas.

A program strategy is being developed to identify market areas where new and expanding natural gas capacity can meet industrial and power generation demand. This effort will also examine advanced concepts to develop alternative storage reservoirs in areas where conventional storage is not promising.

The review of existing and new storage capacity was completed in August 1994, and a new gas market demand estimation currently is underway. The results of this action will be transferred to industry by professional meetings of the Society of Petroleum Engineers, government contractor review meetings, and technology transfer by published government sponsored contractor reports.

FY 1995 funding for this activity is $0.079 million, and the FY 1996 budget request is $0.372 million.

Future Actions

- Develop storage design criteria for expected demand (FY 1995).
- Conduct a study to determine storage potential and identify new capacity (FY 1995).
- Assess the alternative gas storage methods with potential to meet future natural gas needs (FY 1996).
- Demonstrate alternative gas storage systems (FY 1996).

3.6 Demonstrate Natural Gas Storage Optimization Technology: This action is designed to develop, in partnership with industry, new and improved storage technologies and techniques to maintain the

Natural Gas Storage

Natural gas storage is integral to the efficient and reliable distribution of natural gas in the United States. Storage provides the means to supply consumer needs at times when their requirements exceed total gas production capability. Market forces and regulatory changes during the past decade have led to increased awareness of the importance and value of natural gas storage. Storage has always been an essential component of the transmission and distribution system, augmenting pipeline supplies from the producing regions to meet short-term peak seasonal demands. Storage is an important tool for managing the risks associated with the elimination of bundled sales and transportation service, as directed under FERC Order No. 636. It is the critical link in ensuring supply reliability.

The three principal types of underground storage sites used in the United States today are: depleted gas and oil fields, aquifers, and salt caverns. Each type has its own physical characteristics (porosity, permeability, retention capability) and economics (site preparation costs, deliverability rates, cycling capacity), which govern their suitability to particular applications. Depleted gas and oil reservoirs are the most common underground storage sites, and are also the least expensive to develop, operate, and maintain. Aquifers are usually used as storage reservoirs only when depleted gas or oil reservoirs are not available. In general, aquifer storage is more expensive to develop and maintain than depleted reservoirs. Salt caverns, either in a salt bed or a salt dome, are two to three times more expensive to develop than depleted field or aquifer storage. Salt cavern storage, with its high deliverability, is well suited for meeting dramatic swings in demand.

Principal owners of underground storage facilities are interstate pipeline companies, local distribution companies, intrastate pipeline companies, and independent storage service providers. Several natural gas producers and large industrial users also own a limited amount of storage. Interstate pipeline companies account for over 60 percent of all working gas capacity.

industry's natural gas system capability and reduce overall storage costs. In September 1994, DOE awarded a contract to conduct deliverability revitalization field tests. Efforts are underway to determine the level of fracture stimulation treatments by industry over the last few years, and to identify gas storage operators that are willing to participate in field tests. As many as 10 field tests using three wells for each test will be conducted from 1995 through 1997. Potential project sites include reservoirs in nine different states. Other activities include the joint partnership with the Gas Research Institute (GRI) for storage deliverability improvement, and the DOE/Morgantown Energy Technology Center in-house support for Cooperative Research and Development Agreement (CRADA) activities, including reservoir modeling of horizontal wells in storage fields.

Work on this action was initiated in October 1994. The FY 1995 budget is $0.689 million, and FY 1996 budget request is $1.275 million.

Future Actions

- Conduct deliverability revitalization and optimization studies and field tests and demonstrations with GRI by FY 1996.
- Perform deliverability revitalization field tests (FY 1995-1997), and deliverability optimization demonstrations (FY 1996-1998).

3.7 Improve Natural Gas Storage Effectiveness for Problem Fields: Action goals include development and demonstration of new and improved technologies for detecting and inhibiting natural gas migration from the storage area, and development of methodologies to reduce costs associated with managing underground natural gas storage fields. DOE is conducting an "Underground Natural Gas Storage Reservoir Management" study using the Energy Information Administration Form 191 (Underground Natural Gas Storage Report) database. This database reports the locations, ownerships, capacities, and operations of all active underground storage facilities in the United States. This study will be conducted in two phases. Phase I requires gathering, reviewing, and summarizing data and information on gas storage operations in the U.S. by reservoir type. [DOE recognizes the confidential nature of this information; individual company data will not be reported in any form.] Phase II will incorporate the results of Phase I, and an engineering and geologic evaluation will be conducted to propose recommendations to enhance gas storage operations. A comprehensive listing of all U.S. gas storage fields has been compiled.

Activities under this action were initiated in October 1994. FY 1995 budget is $0.117 million, and the FY 1996 budget request is $0.400 million.

Future Actions

- Conduct a study to assess the extent of gas loss from storage reservoirs, and analyze the gas loss mechanisms (FY 1995).
- Develop strategies and designs for prevention of gas loss (FY 1995).
- Develop real-time monitoring systems (FY 1998).

3.8 Strengthen and Expand the Clean Cities Program: The action objective is to accelerate and expand the use of alternative fuel vehicles (AFVs) in communities throughout the country, and to provide refueling and maintenance facilities for their operation. Through the establishment of locally based government and industry partnerships, and coordinated with federal guidance and leadership in vehicle acquisitions, the Clean Cities program seeks to build a sustainable, nationwide alternative fuels market. To carry this initiative forward, the Clean Cities program established a systematic process of working with cities to develop local plans for creating an alternative fuels market.

The program advises cities through the goal-setting, coalition-building, and commitments process, and works directly with city stakeholders, fuel suppliers, and vehicle manufacturers to encourage the commercialization of AFVs and the development of an alternative fuel infrastructure.

The program mission is in direct response to Section 505 of the Energy Policy Act of 1992 (EPACT), which recognizes that voluntary commitments from fuel suppliers, vehicle suppliers, and fleet owners will form the critical partnerships necessary for successful AFV market commercialization and achievement of replacement fuel goals.

Moreover, the Clean Cities program provides a supporting network for all of DOE's alternative fuels programs. Outside of DOE, the Clean Cities program seeks to advance the Clean Air Act Amendments of 1990, and other federal legislative and regulatory initiatives to promote nationally the public and private sector use of alternative fuel vehicles.

Since September 1993, the Clean Cities program has advanced the alternative fuels market in 34 cities throughout the country. These "pioneer" Clean City programs feature approximately 30,000 operational AFVs -- reducing oil consumption and tailpipe emissions. The programs comprise over 1,200 stakeholder organizations nationwide, committed to significant increases in vehicle acquisitions and infrastructure investment over the next five years. Currently, the program covers over half of the serious, severe, and extreme ozone non-attainment areas and continues to gain momentum.

Future Actions (See Information Box)

- Additional City Designations.
- Validate Vehicle Acquisition Schedules.
- Expand Local Refueling Infrastructure.
- Expand Regional Refueling Infrastructure -- "Clean Corridors."
- Increase Public Awareness of the Program.
- Support Regulated Fleets.

ACTION 4.0
Support Natural Gas Regulatory Reform and a "Contract Portfolio" Approach

This action focuses on improving access to natural gas distribution facilities; boosting the use of natural gas for transportation; and encouraging the removal of subsidies that work against energy efficiency goals, cost-cutting by distributors, and efficient pricing for electricity and natural gas. DOE

The Clean Cities Program Future Actions

Additional City Designations: Actively continue to recruit critical areas in addition to the already designated and petitioning Clean Cities, which currently represent most of America's major metropolitan areas and problem airsheds. As the program successes build momentum, capture the interest of neighboring cities in Clean City regions.

Validate Vehicle Acquisition Schedules: Work toward transforming pledged vehicle acquisitions into validated acquisition schedules useful to manufacturers challenged to develop market-driven production lines.

Expand Local Refueling Infrastructure: Continue to identify and catalyze the alternative fuel vehicle market in order to expand commitments to refueling infrastructure. Work toward making currently reserved private refueling stations for public use.

Clean Corridors: Build links between existing Clean Cities to ensure that refueling facilities will be available for local transit (e.g., Denver/Colorado Springs; Pennsylvania Turnpike; Chicago, St. Louis)

Increase Public Awareness: Deliver marketing assistance to the AFV market transition, and provide the Clean Cities program with necessary materials and guidance for market development. Conduct a Clean Cities conference to provide local operatives with opportunity for national project resolution.

Support Regulated Fleets: In order to help fleet operators comply with EPACT's AFV acquisition and utilization requirements, provide local assistance to a "federal" requirement through the Clean Cities program, and facilitate acceptability and compliance.

supports federal and state efforts to revise electricity, natural gas, and demand-side pricing policies and regulations. DOE believes that these efforts can help to clarify true operating costs and lead to greater economic value and a cleaner environment. DOE is also working to explore with affected stakeholders new contract approaches that could lead to improved natural gas availability and market performance. New types of contracts and financial instruments for natural gas distribution companies and end-users can lead to improved natural gas availability and market performance, but only if all parties understand and use these new tools. DOE is expanding its outreach activities in these areas without attempting to prescribe specific state or customer contracting policies.

Actions

4.1 Ensure Robust Secondary Markets for Pipeline Capacity
4.2 Encourage Open Access to the Electric Transmission Grid
4.3 Expedite Construction of New Natural Gas Facilities
4.4 Encourage Open Access for Natural Gas Transporters Through Distributors, to Resolve the "Contract Portfolio" Issue
4.5 Promote the Use of Efficient Natural Gas and Electricity Pricing
4.6 Encourage the End of Fuel-Specific Subsidies
4.7 Foster the Use of Incentive Rate Design
4.8 Encourage the Elimination of Regulations that Inhibit the Use of Natural Gas in Vehicles
4.9 Encourage the Use of Natural Gas for Electric Power Generation

Why Natural Gas?

Natural gas is an abundant domestic resource and has the potential to make a significant contribution to energy security of the Nation. Natural gas can be produced and delivered at prices that allow both expansion of the market and continued development of the resource. Natural gas is a clean-burning fuel and can be used in a variety of applications to satisfy environmental requirements. Being the lightest hydrocarbon fuel, it burns easily with little or no smoke (soot or particulate) and it produces the least amount of combustion CO_2 relative to other fossil fuels. Natural gas provides lower combustion emissions in large stationary applications, i.e., virtually no sulfur emissions, no NO_x emissions from fuel-based nitrogen, extremely low particulate emissions, no non-methane volatile hydrocarbon emissions, and CO_2 emissions 25 percent lower than oil and 49 percent lower than coal.

Accomplishments to Date

4.1 Ensure Robust Secondary Markets for Pipeline Capacity: Under this action, DOE is examining alternative ways to structure the secondary market for interstate natural gas pipeline capacity to allow capacity to be traded as efficiently as possible. In February 1994, the 3rd Annual DOE/National Association of Regulatory Utility Commissioners (NARUC) conference on state issues affecting natural gas use initiated the discussion of the problems faced by buyers/sellers of released capacity and possible solutions to these problems. Currently, DOE is gathering input from various stakeholder groups to better understand this evolving market. FERC currently is undertaking a formal review of its regulations governing the release of pipeline capacity.

Future Actions

- During calendar year 1995, conduct an analysis of the secondary market for pipeline capacity. This analysis will form the basis for DOE's comments and recommendations to FERC in its review of FERC regulations.
- Discuss the state of the secondary market at the 4th Annual DOE/NARUC Natural Gas Conference in Orlando, Florida, in February 1995.
- Participate in FERC's review of its capacity release regulations.
- Identify and participate in state proceedings addressing secondary market issues.

4.2 Encourage Open Access to the Electric Transmission Grid: Under this action, DOE will advocate federal regulations and other policies governing access to the wholesale electric transmission grid that will enable natural gas-fired electric generation to compete freely with other generating sources. DOE gave over 30 presentations to stakeholders in FY 1994, and has been filing comments in FERC electric transmission proceedings as notices are issued.

Future Actions

- Conduct an analysis of electric transmission access and pricing rules that best enable natural gas-fired generation to compete with other generation fuels.

- Address issue of barriers to natural gas use in electric generation at the 4th Annual DOE/NARUC Natural Gas Conference in Orlando, Florida, in February 1995.
- Identify and participate in FERC and state proceedings that affect the ability of natural gas-fired generation to compete with other generating fuels.

4.3 Expedite Construction of New Natural Gas Facilities: Under this action, DOE will advocate ways in which the certification and construction of natural gas transportation and storage facilities might be expedited without relaxing safety and environmental precautions. As an initial step, FERC has implemented a program that will allow applicants seeking certification to construct new natural gas pipelines using third-party contractors to perform initial environmental analyses of their projects. This voluntary third-party contracting program will enable FERC to expedite the processing of certificate applications without compromising the environmental review requirements of the National Environmental Policy Act of 1969.

Future Actions

- Seek input from stakeholders on impediments to construction of natural gas facilities.
- Examine federal and state statutes and regulatory and environmental policies affecting certification and construction of natural gas facilities.
- Discuss construction issues at the 4th Annual DOE/NARUC Natural Gas Conference in Orlando, Florida, in February 1995.
- Identify and participate in generic federal and state proceedings involving construction of natural gas facilities.

4.4 Encourage Open Access for Natural Gas Transporters Through Distributors, to Resolve the "Contract Portfolio" Issue: Under this action, DOE will work in cooperation with the National Association of Regulatory Utility Commissioners and individual state regulatory commissions to consider programs which would make available to natural gas customers nondiscriminatory access to the distribution system through third-party merchants to increase competition and improve service in natural gas markets. In FY 1994, DOE initiated a collaborative study with the Maryland Public Service Commission (MPSC) on the issue of local distribution company (LDC) access and supply purchasing. The collaborative has resulted in formal recommendations by MPSC staff for "A Framework for Future Regulation of General Services in Maryland." DOE filed comments with MPSC on the staff's recommendations. It is expected that these recommendations will lead to a set of rules promulgated by the MPSC under which the three largest LDCs in Maryland will begin to implement third-party access to distribution facilities.

In October 1994, DOE and NARUC cosponsored a two-day workshop on competition behind the citygate. At this meeting, producers, marketers, local distribution companies, end-users, and regulators discussed the potential for new customers to be allowed access to third-party merchants.

Future Actions

- Publish analysis of local distribution company access issues during the second quarter of 1995.
- Publish proceedings of the October 1994 workshop on competition behind the citygate during the second quarter of 1995.
- Publish case study of DOE-Maryland Collaborative by December 1995.
- Continue discussion of issues at the 4th Annual DOE/NARUC Natural Gas Conference in Orlando, Florida, in February 1995.
- Identify and participate in state commission proceedings involving open access to local distribution service.

4.5 Promote the Use of Efficient Natural Gas and Electricity Pricing: This action will be carried out by working with regulators who are interested in exploring alternatives to cost-of-service pricing for natural gas and electric services. Electric and natural gas utilities will be encouraged to consider time-of-use and seasonal pricing for industrial, commercial, and residential customers.

During 1994, DOE conducted an initial analysis of pricing issues. This analysis will form the basis for DOE's participation in federal and state proceedings concerning pricing of utility services.

Future Actions

- Publish analysis of natural gas and electric pricing issues during the second quarter of 1995.
- Discuss natural gas and electric pricing issues at the 4th Annual DOE/NARUC Natural Gas Conference in Orlando, Florida, in February 1995.
- Identify and participate in generic federal and state proceedings concerning pricing of utility services.

EIA Projects Increased Natural Gas Use

The Energy Information Administration (EIA) projects that total gas consumption in the industrial, electric generator, and vehicle market sectors will increase by more than 4 Tcf by 2010. The market expansion will be primarily driven by the demand for electricity (including industrial cogeneration) and the requirements for alternative fuel vehicles.

4.6 Encourage the End of Fuel-Specific Subsidies: Under this action, DOE will assist states in their evaluations of integrated resource planning programs, and determining the most efficient way to meet the needs of customers.

During 1994, DOE conducted an initial analysis of fuel-specific subsidies. This analysis will form the basis for DOE's participation in federal and state proceedings concerning fuel-specific subsidies.

Future Actions

- Publish analysis of fuel-specific subsidies during the second quarter of 1995.
- Initiate collaborative with Illinois Commerce Commission on investigation of fuel-specific subsidies.
- Discuss fuel subsidy issues at the 4th

Annual DOE/NARUC Natural Gas Conference in Orlando, Florida, in February 1995.
- Identify and participate in federal and state proceedings concerning fuel-specific subsidies.

4.7 Foster the Use of Incentive Rate Design: In this effort, DOE will work with state regulators to establish rates that separate the local distribution company's rates from their costs, thereby offering the local distribution company the opportunity to increase profits by cutting costs. Efforts are underway to analyze such mechanisms as price caps and indexing to determine their applicability. During 1994, DOE conducted an initial analysis of performance-based regulation. This analysis will form the basis for DOE's participation in federal and state proceedings involving incentive rate design.

Future Actions

- Publish analysis of performance-based regulation issues during the second quarter of 1995.
- Discuss issues at the 4th Annual DOE/NARUC Natural Gas Conference in Orlando, Florida, in February 1995.
- Identify and participate in federal and state proceedings concerning incentive rate design.

4.8 Encourage the Elimination of Regulations that Inhibit the Use of Natural Gas in Vehicles: Under this action, DOE will work with regulators to identify those regulations that may create barriers to achieving the Nation's environmental and energy security goals through increased use of natural gas as a transportation fuel. During 1994, DOE conducted an initial analysis of barriers to increased use of natural gas vehicles. This analysis will form the basis for DOE's participation in federal and state proceedings.

Future Actions

- Publish analysis of barriers to the use of natural gas vehicles during the second quarter of 1995.
- Identify and participate in proceedings addressing the use of natural gas as a transportation fuel.
- Address the issue at the 4th Annual DOE/NARUC Natural Gas Conference in Orlando, Florida, in February 1995.

4.9 Encourage the Use of Natural Gas for Electric Power Generation: Through this action, DOE will work cooperatively with federal and state regulators to identify those regulations that constitute barriers to increased use of natural gas to generate electricity. During 1994, DOE conducted an initial analysis of the use of natural gas for electric power generation. This analysis will form the basis for DOE's participation in generic federal and state proceedings involving the use of natural gas to generate electricity.

Future Actions

- Publish analysis of natural gas use in electric generation during the second quarter of 1995.
- Discuss issues at the 4th Annual DOE/NARUC Natural Gas Conference in Orlando, Florida, in February 1995.
- During calendar year 1995, convene

discussions with stakeholders of regulatory, policy, and technological impediments to increased use of natural gas for electric generation.

ACTION 5.0
Provide Information Services

This action is designed to improve DOE's ability to develop, collect, and disseminate information on natural gas deliverability and storage. This will be accomplished primarily by enhancing the capabilities of the Energy Information Administration, and by developing an Energy and Resources Mapping and Information System.

Actions

5.1 Develop an Energy and Resources Mapping and Information System
5.2 Enhance the Energy Information Administration's Natural Gas Storage Data Collection
5.3 Develop a "One-Stop-Shopping" Contact List Readily Accessible to a Clearinghouse for the Natural Gas and Oil Industry

Accomplishments to Date

5.1 Develop an Energy and Resources Mapping and Information System: This action will enable DOE to analyze the geographic and demographic implication of energy-related policies at the county, state, or regional levels. This program combines and enhances existing geographic information systems and databases to provide consistent, coherent, and timely data and information to policy formulators, analysts, and decisionmakers. The system will allow quick and thorough understanding and communication of potential impacts of pending legislation, regulations, or policy decisions promulgated by Congress, other government agencies, or the private sector.

Future Actions

- Install the master database and support software on a stand-alone basis on individual personal computers (PCs) in EIA and other interested DOE offices.
- Form a user group at DOE headquarters to foster communications among the EIA and DOE users of the system in a format expandable at a later time to include additional user communities.
- After sufficient in-house testing, make the system widely available on the EIA and DOE local area networks, and to agencies on a stand-alone basis.
- Pursue avenues to make the system available to the states and to private users.

5.2 Enhance the Energy Information Administration's Natural Gas Storage Data Collection: Under this action, EIA has been working with industry to expedite the collection and publication of natural gas storage data from a monthly to a weekly publication cycle. The American Gas Association (AGA) has instituted a weekly sample survey of underground storage operators. A number of AGA members voluntarily provide their weekly storage information to AGA. These data are used to estimate the weekly working gas underground storage levels for the country. EIA is closely monitoring these data each week and comparing AGA data to EIA data

from the Form EIA-191, "Monthly Underground Natural Gas Storage Report." These data will provide users with more timely information that they have been requesting without additional costs to the federal government. Accelerated publication of natural gas storage data will enhance the efficiency of natural gas markets and will improve the likelihood of market stability and growth. The weekly underground storage data will soon appear in the EIA Winter Fuels Report, a weekly publication during the heating season. AGA also faxes the data to a number of users on a weekly basis. The data are also available on the AGA Bulletin Board.

Future Actions

- Continue monitoring the weekly data for an indefinite period of time. EIA will continue to compare this data to its monthly data and work with AGA when discrepancies may occur.

5.3 Develop a "One-Stop-Shopping" Contact List Readily Accessible to a Clearinghouse for the Natural Gas and Oil Industry: Under this action, the Energy Information Administration initiated efforts to develop a federal program clearinghouse for natural gas and oil producers to reduce the costs of information search and to improve government effectiveness. The clearinghouse will provide up-to-date contact lists for federal assistance and regulatory activities in all agencies. The clearinghouse personnel will be trained to act as facilitators for natural gas and oil producers, particularly for firms that lack specialized government affairs and regulatory compliance specialists. EIA worked with other federal agencies and energy concerns to develop the contact list (e.g., Departments of Commerce, State, Defense, Interior, Transportation, and Agriculture; the U.S. Environmental Protection Agency; Office of Management and Budget; Canadian National Energy Board; Interstate Oil and Gas Compact Commission; and the National Association of State Energy Officials). The contact list, sorted by subject matter, currently resides on Internet. It can be accessed through *Mosaic* on the World Wide Web server, Sun workstation, DOE Home Page, EIA Home Page, and the Domestic Natural Gas and Oil Initiative Information and Contact List. The Internet address is: http://apollo.gov/devel/eia/dom--gas.html. In October 1994, EIA contacted other agencies for additions and comments to the latest version of the contact list.

Future Actions

- Perform additions/updates to the contact list as needed.
- Promote availability of the contact list through Public Affairs, DOE's Office of Scientific and Technical Information, EIA's marketing programs, and marketing programs of other participating agencies.
- Pursue allocation of staff or resources to establish the clearinghouse and a toll free "800 number." Such a clearinghouse could be established in the outyear upon availability of resources.

STRATEGIC ACTIVITY III

IMPROVE GOVERNMENT COMMUNICATION AND DECISIONMAKING

This strategic activity is composed of actions to ensure cost-effective environmental protection by streamlining and improving government communication, decisionmaking, and regulation, and by eliminating excessive regulation through greater coordination and flexibility. Specific actions are grouped under four areas: Action 6 - Simplify Regulations without Compromising Environmental Protection; Action 7 - Evaluate Production from Federal Lands; Action 8 - Work with States and Native American Tribes; and Action 9 - Address West Coast Production Constraints.

POTENTIAL BENEFITS OF STRATEGIC ACTIVITY III ACTIONS

Industrial Competitiveness: Strategic Activity Area III actions reflect the Administration's commitment to increasing the productivity and competitiveness of the domestic natural gas and oil industry without compromising the goal of environmental protection. The activities under Action 6 will eliminate "regulatory overkill" and achieve optimal levels of environmental protection at the lowest possible cost through streamlining of state and federal regulations, improved coordination among regulatory agencies and avoiding duplication in state and federal regulatory compliance programs, and removal of constraints to resource access and recovery. Actions 6.3 and 6.5 will benefit the refining industry and enhance its competitiveness through development of alternative, innovative, and cost-effective environmental compliance strategies (i.e., multi-media pollution control rather than single-media control). The study developed under Action 9.2 could lead to lifting of the ban on Alaskan North Slope oil export, which would help the producers in California and improve their profitability, and also create new job opportunities for industry.

Energy Resources: Natural gas and oil producers have become subject to many overlapping state and federal environmental rules which led to increased cost and reduced exploration and production activity. Strategic Activity III actions are designed to ease the regulatory burden on industry and governments through streamlining and simplifying environmental compliance requirements, enhancing opportunities for access to natural gas and oil resources, and increasing productivity. The activities will also encourage exploration and production in federal and tribal lands. For example, the options defined under Action 7.2 could result in development of natural gas and oil resources in the Naval Oil Shale Reserves. The incentives developed under Actions 7.3 and 7.4 could substantially increase natural gas and oil production on the Outer Continental Shelf and in the Gulf of Mexico. In addition, Action 8.1 will assist Native American Tribes in gaining access to energy and environmental technology which could lead to increased natural gas and oil production on tribal lands.

Science and Technology: The actions of Strategic Activity III will allow federal government, states, industry, and industry organizations, e.g., the Interstate Oil and Gas

Compact Commission (IOGCC), to form partnerships, forge links, and enhance technology development and deployment activities for innovative and risk and science-based environmental regulation, more efficient pollution control, and improved energy security and industrial competitiveness. Action 6.2 will lead to development of cost-effective and more efficient pollution prevention and control techniques for the refining industry. The Refinery of the Future Initiative will collaboratively develop and deploy technologies to increase energy efficiency, fuel flexibility and economics through process modifications and/or unit changes in the refineries. Environmental technologies also will be developed and demonstrated to provide superior and cost-effective environmental compliance. Action 8.2 will lead to technology transfer to Native American Tribes in advanced natural gas and oil production and environmental management and control technologies.

Environmental Quality: Action 6 activities of Strategic Activity III are designed to reduce environmental uncertainties, prioritize risks, and eliminate barriers to exploration and production operations through greater cooperation between federal and state regulatory bodies and industry, and streamlining of environmental regulations. For example, Action 6.1 will enhance efficiency and effectiveness of state and federal regulatory programs and will reduce undue burdens on the industry and governments. Action 6.2 will increase the availability of sound technical information on the environmental risks associated with natural gas and oil operations for assessing impacts and risk-based regulatory decisionmaking. Action 6.3 will demonstrate the feasibility of alternative approaches to conventional command-and-control environmental regulation that more accurately balance costs and benefits, promote technological innovation, allow for compliance flexibility, and achieve the same or greater levels of environmental benefits at less cost. Action 6.4 will promote and establish partnerships with industry, states, and the public, and enhance dialogue and cooperation. Action 6.5 will help in creating a more viable domestic oil refining industry while maintaining or enhancing current levels of environmental protection.

National Security: Strategic Activity III actions contribute to strengthening of the domestic natural gas and oil industry, removing barriers to domestic production, and enhancing the Nation's energy independence. Action 6 activities will lead to a healthier industry through elimination of unnecessary regulatory burdens and reduced environmental compliance expenditures. Activities under Actions 7 and 8 will allow access to natural gas and oil resources in federal and tribal lands and result in increased production. Lifting the ban on export of Alaskan North Slope oil (Action 9.2) will improve the prices on the West Coast and ease the financial pressures on the producers.

ACTION 6.0
Simplify Regulations Without Compromising Environmental Protection

Under this action, federal and state regulatory agencies and departments are

Is DOE a Regulator?

DOE is not a regulatory agency. DOE provides assessment and analysis support to federal and state regulatory agencies to facilitate risk-based regulatory decisionmaking based on technical and scientific data. DOE has a unique role in reconciling economic, energy, and environmental goals by helping industry develop environmentally conscious processes, technologies, and materials. DOE looks to the private sector to assist in the accomplishment of its mission and program objectives.

DOE can help to remove unnecessary regulations and prevent regulatory duplication and overkill. DOE has been working with federal regulatory agencies, industry, energy producing states, and others to develop and collect sound technical and economic data that can help regulators develop balanced environmental requirements for the petroleum industry.

working together to streamline and simplify multi-jurisdictional, multi-layer, and overly complex processes that increase compliance costs for industry, with no compromise in protection of the environment and the public interest. Market-based and multi-media pollution control solutions (rather than single-media, command-and-control type pollution control) are under development and, in some cases, are already a matter of law. Federal and state agencies are increasingly using regulatory negotiations and formal collaborative processes, and agencies such as FERC are searching for self-enforcing, market-based processes that eliminate or reduce the need for formal hearings.

Actions

6.1 Streamline State and Federal Regulation
6.2 Enhance State and Federal Regulatory Decisionmaking Capability
6.3 Progress Beyond Command-and-Control Regulation
6.4 Enhance Dialogue through Industry/Government/Public Partnerships
6.5 Review the Findings and Recommendations of the National Petroleum Council's Report on U.S. Oil Refining
6.6 Enhance the Scope of the National Petroleum Council

Accomplishments to Date

6.1 Streamline State and Federal Regulation: DOE has been working with states and other federal agencies to encourage and assist them in streamlining state and federal regulatory programs affecting gas and oil supply. The end result will be more efficient and effective regulatory programs and fewer unnecessary burdens or restraints on industry and governments. DOE has actively participated in the process initiated by the Department of the Interior's (DOI) Bureau of Land Management (BLM) in early 1994 to review and restructure the onshore gas and oil leasing program. Consistent with the National Performance Review, key objectives of the BLM Performance Review include simplifying regulations, eliminating superfluous requirements (e.g., reduce the volume of existing regulations and paperwork by 50 percent), and improving customer service.

The National Environmental Policy Act (NEPA) of 1969

NEPA, as implemented by Executive Orders 11514 and 11991, establishes national policies and goals for the protection of the environment. Among the purposes of NEPA are to encourage harmony between people and the environment, to promote efforts to prevent or eliminate damage to the environment and the biosphere, and to enrich the understanding of ecological systems and natural resources important to the Nation.

NEPA requirements direct all federal agencies to give appropriate consideration to the environmental effects of their decisionmaking and to prepare detailed environmental statements on recommendations or reports on proposals for legislation and other major federal actions significantly affecting the quality of the environment.

The BLM Performance Review has entailed extensive outreach to industry, the environmental community, states and other interested parties. Five interagency teams are focusing on regulatory reform, bonding and unfunded liability, outreach and interagency coordination, National Environmental Policy Act and resource management planning, and gas and oil incentives.

Pursuant to the BLM Performance Review, DOE has been assisting BLM with assessing the costs and benefits of economic incentives, such as royalty reduction, and other potential regulatory and policy changes. For example, DOE provided analytical modeling support to BLM to assess a proposal to reduce royalty rates for marginal gas and oil wells on federal and Native American lands. This work resulted in a change in regulations, allowing lower royalty rates for those wells (e.g., sliding scale royalty rates as production declines -- from 12.5 percent at 15 barrels/day to 0.5 percent at zero production). Discussions are also being held on the feasibility of establishing a long-term relationship between DOE and BLM, including a Memorandum of Understanding, to ensure that national energy strategies are appropriately considered in leasing decisions related to federal lands.

In November 1994, DOE initiated several regulatory streamlining projects with IOGCC, an organization of the Governors of 29 gas and oil producing states. For example, a project involving DOE, DOI, the U.S. Forest Service, the U.S. Environmental Protection Agency (EPA), industry, and the environmental community will investigate streamlining of regulations for gas and oil exploration and production on federal lands in California, Colorado, New Mexico, and Wyoming (Phase I). Additional states will be incorporated if the first phase is successful (Phase II).

Separately, DOE has been working with the State of Kentucky to streamline and clarify regulations for gas and oil exploration and production in part by assisting the state to issue a user-friendly guidance document outlining requirements for industry compliance. DOE is participating in a government/industry task force led by the California Environmental Protection Agency (Cal/EPA) to identify opportunities for regulatory reform related to gas and oil exploration and production. Cal/EPA is

charged with -- under the Permit Reform Project -- examining and working with major industry sectors to identify opportunities for improvements in the cost-effectiveness of regulations. Areas of investigation include opportunities to simplify duplicative and overlapping regulations, and substantiate issues and propose solutions to environmental statutory and regulatory issues. These issues of concern are those which are contrary to California's regulatory streamlining efforts and are disruptive to industry's ability to operate competitively in California. The task force will issue a report by the end of February 1995. It will contain immediate "quick-fix" items and identify possible next steps.

Future Actions

- Continue participation in the BLM Performance Review in support of better government at less cost and ensuring the appropriate consideration of national energy strategies in leasing and operating decisions related to federal lands. BLM teams are developing recommendations for regulatory and operational changes in environmental planning, leasing, bonding and unfunded liability, exploration and production incentives, compliance, and outreach and technology transfer. Cooperative efforts with states are contemplated to reduce overlap and share information and resources.
- Support projects in individual states, directly or through organizations such as IOGCC, to streamline regulations affecting gas and oil supply. An upcoming IOGCC project will involve public participation in streamlining of regulations in the State of Indiana. Another IOGCC project will involve rewriting and simplifying the Rules of Procedure in the States of Texas, Oklahoma, and Louisiana.

The Interstate Oil and Gas Compact Commission (IOGCC)

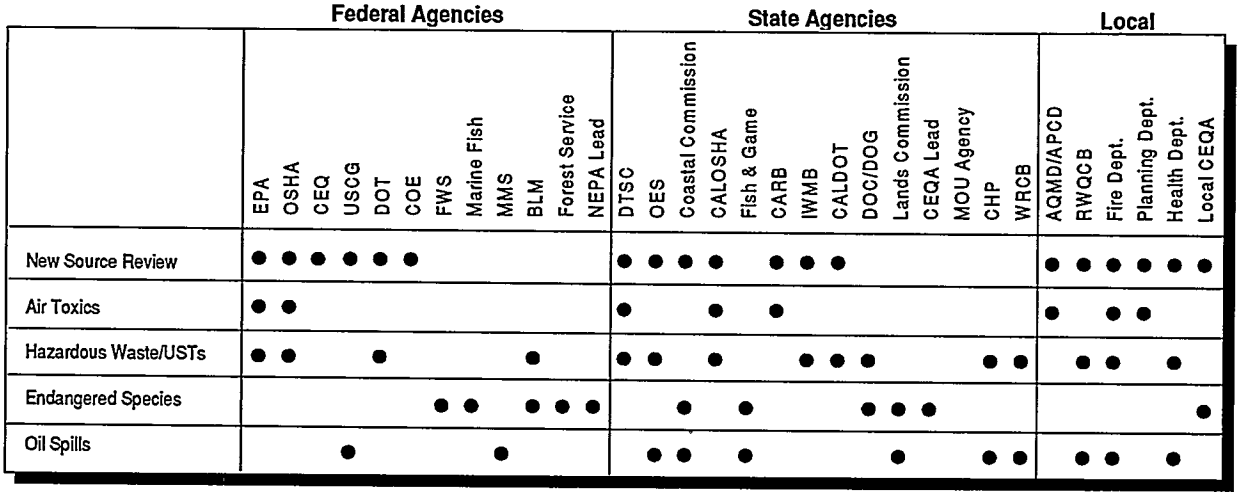
With the discovery of the East Texas oilfield in 1930, domestic oil production rose dramatically. In a matter of months, there was more oil than the Nation could use, export, or store. It became obvious to consumers, producers, and the states responsible that regulation was needed to deal with overproduction and the resulting waste of oil. In 1935, six states joined together to ratify the Interstate Compact to Conserve Oil and Gas. This agreement resulted in the creation of the Interstate Oil Compact Commission.

In 1990, the name of the organization was changed to the Interstate Oil and Gas Compact Commission to reflect the Nation's energy future. Today, IOGCC consists of 29 oil and gas-producing states and six associate-member states. IOGCC is responsible for ensuring that the Nation's supplies of oil and gas are produced with minimum waste. As stated in its charter, IOGCC is charged with encouraging conservation of these vital, domestic energy sources.

6.2 Enhance State and Federal Regulatory Decisionmaking Capability: This action entails enhancing the capability of state and federal agencies to make better, more cost-effective regulatory decisions affecting the natural gas and oil industry. Through existing research and analysis activities, DOE has supported efforts to increase the availability of sound technical

ENVIRONMENTAL COMPLIANCE IN CALIFORNIA

There is a growing concern about whether the extent and level of overlapping regulations required at the local, state, and federal level are necessary or appropriate. For example, this diagram below shows that operators in California are subject to potential regulatory overlap and duplication. In fact, operators in the state are subject to environmental requirements under the authority of nearly 40 local, state, and federal bodies, and over 150 statutes and regulations.



APCD	Air Pollution Control District
AQMD	Air Quality Management District
BLM	Bureau of Land Management
CAL	California
DOT	Department of Transportation
OSHA	Occupational Safety and Health Admin.
CARB	California Air Resources Board
CEQA	California Environmental Quality Act
CEQ	Council on Environmental Quality
CHP	California Highway Patrol
COE	Army Corps of Engineers
DOC/DOG	Department of Conservation/ Division of Oil and Gas
DTSC	Department of Toxic Substances Control
FWS	Fish and Wildlife Service
IWMB	Integrated Waste Management Board
MMS	Minerals Management Service
MOU	Memoranda of Understanding
NEPA	National Environmental Policy Act
OES	Office of Emergency Services
USCG	U.S. Coast Guard
UST	Underground Storage Tank
RWQCB	Regional Water Quality Control Board
WRCB	Water Resources Control Board

information on the environmental risks associated with natural gas and oil operations, as well as the costs and benefits of alternative regulatory approaches. Key efforts in this area have included an ongoing economic and environmental assessment of discharges from gas and oil operations in the Gulf of Mexico region, and assistance to state and local government agencies in California to assess the integrity of crude oil pipelines. DOE has also assisted states with research, analysis, and improved data management to support risk-based regulatory decisions affecting the natural gas and oil industry. For example, in 1993 and 1994, DOE assisted four states (Alaska, Mississippi, Montana, and North Dakota) through the Ground Water Protection Council, and the Underground Injection Practices Research Foundation to adopt improved data management techniques necessary for making risk-based regulatory decisions for gas and oil injection wells. Consistent with the recommendations of a federal advisory committee chartered by EPA to review state and federal regulations for gas and oil injection wells, DOE initiated a program that will enable states and EPA regions to establish variances to certain regulatory requirements when there is limited potential for contamination of underground sources of drinking water. These variances could result in substantial cost savings for both industry and government, e.g., $340 million, based on 70 percent of 95,000 pre-1982 wells qualifying for variance at a savings of $5,000 per well. Texas, Kansas, Oklahoma, and California are the first states to receive assistance from DOE. This effort builds on prior technical studies conducted for the American Petroleum Institute (API), DOE, various states, and EPA.

Future Actions

- Continue research and analysis activities that support improved regulatory decisionmaking.
- Continue efforts to improve DOE models used to assess the impact of regulations, technology availability, and other factors on the potential for gas and oil resource recovery.
- Expand assistance to 29 oil and gas producing states with research, analysis, and improved data management to support risk-based regulatory decisions affecting the natural gas and oil industry.

6.3 Progress Beyond Command-and-Control Regulation: Under this action, DOE investigated alternative approaches to environmental regulation that balance the costs of regulation against realistic health and environmental risks; establish priorities among the various environmental protection programs in achieving goals; and promote innovative methods of achieving environmental objectives.

The Amoco Yorktown Refinery project was reviewed and participants were interviewed. This project showed that, unlike most traditional "command-and-control" approaches, pollution control strategies should consider risk reduction, address multi-media approaches (rather than single-media, "end-of-pipe" pollution control), maximize environmental benefits, encourage efficient use of resources, and promote facility-specific implementation choices. A plan of approach was developed for new studies.

Single-Media vs. Multi-Media Pollution Control

The traditional media-specific organization of EPA and most state regulatory agencies has been a barrier to moving toward lower cost pollution prevention approaches. The single-media focus emphasizes end-of-pipe pollution control systems that treat wastes before they are released to various media. Existing end-of-pipe control, in some cases, inhibits industries from embarking on pollution prevention strategies that would provide a greater net benefit to the environment. This may be due to the fact that the plant has to make a choice between using limited investment capital for either the mandatory end-of-pipe controls or the alternative pollution prevention initiatives.

The multi-media approach, which is currently studied by EPA, emphasizes pollution prevention and also looks at the entire facility when assessing pollution and choosing control options. At the very least, it can help identify the most cost-effective mix of controls if pollution cannot be avoided. Pollution prevention and the multi-media approach are often the most cost-effective options because they may reduce raw material losses and the reliance on expensive end-of-pipe control and waste treatment technologies. Furthermore, they conserve energy, water, chemical, and other inputs and, thereby, reduce costs.

In addition, the Deputy Secretary was instrumental in including the refining industry in EPA's Common Sense Initiative (CSI) to review environmental regulations. CSI is focusing on addressing the environmental regulatory structure relative to six important domestic industries. All interested parties (e.g., industry, government, environmental groups) are included in this effort to achieve at least as much protection of the environment as presently exists, but in a more cost-effective manner. DOE is participating in this initiative and will work with EPA, industry, states, and public interest groups to develop innovative, alternative compliance strategies for the refining industry. DOE also initiated development of a Refinery of the Future Initiative with industry to facilitate dialogue, identify potential R&D and regulatory barriers and solutions, and develop cost-shared partnerships to implement a coordinated R&D program that is responsive to industry's needs.

Future Actions

- Continue assessment of independent refinery needs through interaction with the National Petroleum Refiners Association (NPRA), API, and independent refining organizations.
- Continue to work with EPA on the petroleum refining sector effort of the Common Sense Initiative.
- Conduct Amoco Yorktown type efforts to assist EPA in identifying opportunities to implement the Common Sense Initiative.
- Continue to work with the Department of the Interior to implement demonstration projects on improved safety and environmental management for exploration and production facilities, both onshore and offshore.
- Continue to conduct research (e.g., biotechnological removal of sulfur and heavy metals from heavy crude oil) that focuses on innovative pollution

prevention techniques rather than more conventional end-of-pipe pollution management techniques.

6.4 Enhance Dialogue through Industry/Government/Public Partnerships: Through a variety of activities, DOE has been promoting dialogue and partnerships among industry, state and federal agencies, the public, and other interested parties. The primary purposes of these activities have been to address regional environmental issues constraining U.S. natural gas and oil resource recovery; avoid unnecessary delays in the regulatory permitting process; resolve outstanding disputes concerning natural gas and oil development; and balance national objectives for environmental protection, energy needs, and economic growth. In April and May 1994, DOE participated in the meetings of the California Oil Survival Team (COST), a group of state, federal, and scientific community representatives who address issues affecting the ability of the California petroleum industry to remain a vital part of the state's economy and an important contributor to U.S. gas and oil production. DOE participated in IOGCC projects funded by EPA to review and improve state gas and oil regulatory programs. These include meetings that bring state officials together to discuss gas and oil-related issues of regional or national importance. Examples of meetings are biannual meetings of gas and oil regulatory officials from nine states comprising the Appalachian and Illinois Basins, and meetings of a newly formed committee of state officials to discuss gas and oil data management and production reporting. An interagency network, including representatives from DOE, EPA, DOI,

The Amoco Yorktown Refinery Project

In 1989, Amoco Corporation and EPA initiated a voluntary, joint project to study pollution prevention opportunities at an Amoco refinery in Yorktown, Virginia. A central goal of this project was to identify criteria and develop a ranking system for prioritizing environmental management opportunities that recognized a variety of factors including release reduction, technical feasibility, cost, environmental impact, human health risk, and risk reduction potential. The study concluded that: (1) a facility-wide, multi-media assessment is a necessary first step to developing a strategy to reduce emissions and exploring implementation strategies; (2) the refinery can meet a release reduction goal more cost-effectively than the cost of achieving reductions prescribed by current regulatory or legislative requirements; (3) emissions inventory could be improved by measuring actual releases and developing new emission factors; and (4) research is needed to better characterize the health and ecological effects of multi-media industrial facility releases to be used in conducting risk assessment.

At the Amoco Yorktown Refinery, compliance with current and anticipated regulations requires controls for eight sources, resulting in release reductions of 7,300 tons/year at an average cost of $2,400/ton. A conclusion of the project was that if the refinery were allowed to meet this same tonnage reduction target using its choices of sources and control techniques, it could do so by controlling five sources at an average cost of $330/ton -- less than 15 percent of the costs to meet regulatory requirements. Total cost of this project was approximately $2.3 million. Amoco provided 70 percent of the funding and EPA the remainder.

Department of Transportation, and the Occupational Health and Safety Administration, was established to promote information exchange on safety and environmental management issues related to gas and oil exploration and production. DOE initiated dialogue among industry, EPA, and DOI representatives to address regulatory barriers to the use of potentially more cost-effective and environmentally protective synthetic drilling fluids. Plans to eliminate unnecessary regulatory barriers are discussed in a January 1995 EPA notice of proposed rulemaking. Assistance was provided to the Oklahoma Energy Resources Board to further collaborate state and industry efforts on public education and site remediation related to gas and oil production. DOE worked with industry and the Louisiana Department of Environmental Quality to resolve concerns about regulation for gas and oil discharges in open bay areas. DOE has enhanced its participation in the EPA Gulf of Mexico Program and the Minerals Management Service Advisory Boards.

Future Actions

- Continue support for dialogue and partnership activities on key regional and national issues affecting gas and oil supply.
- Foster opportunities for long-term, self-sustaining collaboration among diverse stakeholders and voluntary action.
- Identify and contact key industry sources, and design target or audience-specific outreach programs.
- Focus on current opportunities for industry-driven outreach activities on key issues, regions, or sectors.

Does DOE Work With Other Federal Agencies?

DOE works with other federal agencies and state governments through working groups, task forces, and interagency agreements to remove regulatory and market barriers to efficient and economic functioning of the energy industries and the economy. DOE also co-funds research and development projects with federal and state agencies, and provides research data, analyses, and modeling support to assess the impact of proposed administrative, regulatory, and legislative actions. DOE also provides the framework for a comprehensive and balanced national energy policy through the coordination and administration of the energy functions of the federal government.

6.5 Review the Findings and Recommendations of the National Petroleum Council's Report on U.S. Oil Refining: Under this action, DOE established a working group and reviewed the findings and recommendations of a two-and-one-half year comprehensive National Petroleum Council (NPC) study on the future of U.S. oil refining. NPC requested that DOE take the lead in organizing a constructive process that includes U.S. refineries, government, and other interested stakeholders to plan strategies and develop cost-effective solutions to societal concerns related to the industry. Recognizing that the U.S. refining industry is competing in a global market, and if the U.S. refining costs are significantly higher than that of the competition, more finished products will be imported, leading to decreased U.S. refining capacity. DOE's fiscal year (FY) 1995 budget

for this activity is $6.9 million, increased from $4.3 million in FY 1994. The FY 1996 budget request is $10 million.

Research is being expanded on new process and retrofit design to enhance the efficiency and environmental performance of upgrading and refining operations. Cooperative industry research will be conducted on novel and advanced concepts for heavy oil and residuum upgrading, including cost-shared industry initiatives to test and refine advanced upgrading of low value West Coast crudes. Research efforts have been initiated to address the ability of the distribution system to accommodate proposed EPA regulations requiring batch separation of new reformulated fuel products. The current system operates effectively and efficiently because product compatibility allows fuel batches of the same grade to be mixed throughout. If regulated product specification and enforcement procedures, including testing tolerances, preclude product compatibility, batch isolation would require segregation that would result in increased manufacturing and distribution costs, sporadic runouts, and potential complete failure of some systems. This research includes engine testing of point-of-sale fuels for engine compatibility and emissions performance.

Other research includes development of refinery processes that minimize emissions and wastestream generation as an alternative to "end-of-pipe" point control of individual pollutants (e.g., biotechnological removal of sulfur from crude oil before it is refined or combusted in a powerplant).

The Common Sense Initiative

EPA's Common Sense Initiative, announced in July 1994, is designed to achieve greater environmental protection at less cost by creating pollution control and prevention strategies on an industry-by-industry basis rather than by the current pollutant-by-pollutant approach. Through this initiative, EPA will bring together federal, state, and local government representatives, environmental leaders, and industry executives to examine the full range of environmental requirements impacting the following six pilot industries: petroleum refining, automobile assembly, computers and electronics, iron and steel, metal plating and finishing, and printing. These industries form a sizeable piece of the American economy, comprising over 11 percent of the U.S. Gross Domestic Product and employing nearly four million people. They also account for 12.4 percent of the toxic releases reported by all American industry in 1992.

The six Common Sense Initiative teams will work to find ways that tougher goals and greater flexibility can result in cleaner, cheaper, smarter performance in the areas of regulation, pollution prevention, reporting, compliance, permitting, and environmental technology. They will look for opportunities to change complicated and inconsistent environmental regulations into comprehensive strategies for environmental protection.

Future Actions

- Incorporate the recommendations cited above into the Refinery of the Future Initiative Program.

- Conduct monthly meetings with EPA on the NPC study recommendations.
- Integrate the results of EPA's Refinery Common Sense Initiative effort into the Refinery of the Future Initiative effort.

6.6 Enhance the Scope of the National Petroleum Council: Under this action, DOE enhanced diversity of NPC by adding 55 new members in order to broaden the participation of the stakeholders. Established in 1946, NPC is a federal advisory committee to the Secretary of Energy. Its purpose is to advise, inform, and make recommendations to the Secretary on matters pertaining to the natural gas and oil industry. In the past, the membership consisted almost exclusively of individuals from the production side of the industry. The Secretary has sought to change this in order to help the council have a greater impact. New representatives will lend important perspectives from regulators, academia, the environmental community, and end-use groups (such as manufactures). New members will also gain insight into industry's concerns and R&D needs.

Future Actions

- This action was completed in July 1994.

ACTION 7.0
Evaluate Production From Federal Lands

This action is aimed at continued collaboration of federal land management agencies with state and local stakeholders on the many technical, economic, and environmental challenges they face in developing policies for producing natural gas and oil from federal lands. Various agencies and departments are coordinating to ensure that national energy strategies are appropriately considered in leasing decisions related to federal lands, and alternative policies to generate greater leasing interest in mature and deepwater areas of the western and central Gulf of Mexico. In addition, DOE is working with Congress and other key agencies to prepare and implement a plan for production for the Naval Oil Shale Reserves.

Actions

7.1 Continue the Interagency Energy Coordinating Group
7.2 Develop the Natural Gas and Oil Resources of the Naval Oil Shale Reserves
7.3 Increase Production on the Deepwater Outer Continental Shelf
7.4 Assess Options for Developing Marginal Prospects on the Gulf of Mexico Outer Continental Shelf
7.5 Enhance the Ability of Smaller Operators to Meet Outer Continental Shelf Financial Requirements

Accomplishments to Date

7.1 Continue the Interagency Energy Coordinating Group: This action is designed to ensure that national energy strategies are appropriately considered in leasing decisions related to federal lands. DOE is working with the Bureau of Land Management in its National Oil and Gas Performance Review to review all aspects of the federal onshore lands leasing program for oil and gas. This review, which is expected to complete its first round of work by Spring

1995, addresses: regulatory streamlining and clarification, environmental issues, and royalty rates and incentives. DOE is involved in all major aspects of this work and is also providing quantitative and modeling support to measure the effects of options under consideration. For example, DOE is supporting BLM in its proposal to reduce royalty rates for heavy oil production from federal and Native American lands onshore properties (heavy oil is defined as oil with an API specific gravity of 20 degrees or less). DOE is providing modeling and analytical support to weigh the costs and benefits of an alternative royalty relief proposal. This proposal is currently reviewed by the Office of Management and Budget. DOE has also begun to work with the Minerals Management Service (MMS) in an internal review of leasing policies for federal lands on the Outer Continental Shelf. This review will focus on current leasing practices and possible alternative leasing policies.

In January 1995, DOE took part in BLM's annual Fluid Minerals Conference. This included a presentation to the Conference on DOE's modeling capabilities, and the results of the analysis of the costs and benefits of royalty relief for heavy oil wells.

Future Actions

- Present the results of DOE's assessments of a series of royalty relief options to BLM for its consideration (Winter 1995).
- BLM will issue its report on the first round of the National Performance Review (Spring 1995).
- BLM will complete analyses and investigations from the first round of the National Performance Review that were not completed as of the Spring 1995 report (during 1995).
- BLM and DOE will conduct a two-year assessment of the impacts of the existing royalty relief provisions for marginal oil wells passed in 1993 (Summer 1995).
- MMS will present alternative leasing options to its management for its consideration (Summer 1995).

7.2 Develop the Natural Gas and Oil Resources of the Naval Oil Shale Reserves: Under this action, DOE analyzed alternative options to develop the natural gas and oil resources at the Naval Oil Shale Reserves Nos. 1, 2, and 3 (NOSRs). The purpose of this analysis was to present an assessment of development options in terms of their potential for providing economic benefit to the federal government. For the purposes of the assessment, the value of the NOSRs to the federal government was assumed to lie in the potential gas and oil resources that they contain. The NOSRs are currently administered by DOE with the intent of being maintained as a future source of hydrocarbons from oil shale. However, the NOSRs are also thought to have potential for the recovery of conventional gas and oil resources. NOSR-3 is situated within the development area of three large natural gas producing fields (Parachute, Rulison, and Grand Valley fields) in Garfield County, Colorado. NOSR-1 is situated directly north of NOSR-3 and the aforementioned gas and oil fields. NOSR-2, located in Uintah and Carbon Counties, Utah, is situated in an area where seismic surveys performed to date exhibit geological potential for oil and natural gas accumulations.

Despite the potential for conventional oil and/or natural gas recovery from both NOSR-1 and NOSR-2, current legislative restraints have prevented any commercial gas or oil development from taking place. The only statutory authority the government presently has for extracting gas and oil resources from the NOSRs, except for national defense purposes, is in cases where production from adjacent leases causes drainage and migration of resources from the NOSRs. To date, protective drilling has only occurred at NOSR-3 to prevent drainage. No protective drilling has occurred on NOSR-1 or NOSR-2 as a result of production on adjacent leases. If full development of the NOSRs is desired, legislative directives allowing such activities would be required.

On October 14, 1993, Deputy Secretary William White of DOE testified before the Senate Energy and Natural Resources Committee on a proposed bill (S. 1170) to lease NOSRs Nos. 1 and 3 in Colorado to private industry and to allow full development of the natural gas reserves that they contain. At that hearing, Deputy Secretary White advised the Committee that DOE supports broader development legislation and would complete a study that identified and evaluated various development alternatives, including lease, sale, farmout, and direct federal government development options. Furthermore, it was determined that the study would assess not only NOSR-1 and NOSR-3 in Colorado, but also NOSR-2 in Utah.

Two separate analyses have been prepared. Because NOSR-3 contains existing producing wells, it was analyzed independently of NOSR-1 and NOSR-2. The study of development options for NOSR-3 was completed and submitted to Deputy Secretary White in January 1994. An addendum to this study was completed in January 1995. The corresponding report assessing the NOSR-1 and NOSR-2 development options was finalized and submitted to the Deputy Secretary in June 1994.

Future Actions

- Pursue decision on development options.
- Assist in enactment of legislation to allow for development.
- Initiate implementation of the Development Option Plan.

7.3 Increase Production on the Deepwater Outer Continental Shelf:
DOE is working with the National Economic Council and the Minerals Management Service to review incentives for the development of new deepwater areas in the Federal Outer Continental Shelf. These incentives will support the development of new gas-prone resources in deep waters, and will also promote the development of new technologies needed to develop these areas.

Senator Johnston (D. - La.) proposed royalty relief for new deepwater projects in the last Congress which, while passed by the Senate Energy Committee, was not passed by the full Senate. Senator Johnston has proposed a new version of his deepwater royalty relief package (S. 158) in the 104th Congress. This proposal reflects the compromises made in the last session of Congress, and appears to be acceptable to the Minerals Management Service.

DOE is also working with the National Economic Council to include deepwater royalty relief as part of a package of proposals that the Administration will make in response to the Department of Commerce's recent finding that the level of oil imports threatens to impair national security.

Future Actions

- Work with the National Economic Council, Minerals Management Service, and the 104th Congress to advocate deepwater royalty relief proposals for incentives, and support passage of legislation to enact incentives.

7.4 Assess Options for Developing Marginal Prospects on the Gulf of Mexico Outer Continental Shelf: Goal of this action is to assess options for spurring development of marginal prospects to determine the value of encouraging leasing, exploration, and production of gas and oil in shallow waters. DOE is working with the Minerals Management Service to review current leasing policies, with the goal of finding alternative policies and practices that could promote more active development of the large number of undeveloped leases in shallow and deeper waters. Options to promote the development of marginal prospects in shallow waters are being considered in this process.

Future Actions

- MMS will present alternative leasing options, including its proposal for marginal prospects in shallow waters, to its management for consideration (Summer 1995).
- Continue assisting MMS in the review of alternative leasing policies.

7.5 Enhance the Ability of Smaller Operators to Meet Outer Continental Shelf Financial Requirements: This action is designed to assess the effects of increased financial responsibility requirements of the Oil Pollution Act of 1990 (OPA) on small companies who will have difficulty meeting them. Pursuant to implementation of the Act, MMS published an Advance Notice of Proposed Rulemaking on the financial responsibility provisions. At the request of the Secretary, NPC was commissioned to analyze the criteria published in the notice, as well as recommend alternative approaches to fulfill the intent of the legislation, while allowing small operators to participate. The NPC study was completed and subsequently released in July 1994.

The report concluded that the new financial responsibility requirements, as contained in the MMS' preliminary broad interpretation, could have serious and substantial impacts on all segments of the gas and oil industry and disrupt commerce in many other areas without benefiting the environment. Even under a narrower interpretation of OPA's requirement, offshore operators would face significant new cost burdens. The report recommended that the Secretary of Energy become actively involved in the ongoing rulemakings by:

- Working with MMS to promulgate a regulation that meets OPA and energy policy goals, consistent with Executive Order 12866;

- Working with the President and the National Economic Council to bring about a risk-based approach to this financial responsibility, which recognizes the excellent environmental record of the offshore gas and oil industry; and
- Continuing to participate in the natural resource damage assessment rulemakings and ensuring high-level Administration review of such assessment issues to avoid unpredictable and potentially bankrupting liabilities on gas and oil operators.

Future Actions

- Assist in development of the final rulemaking by MMS (a draft rulemaking is expected by late 1995).

ACTION 8.0
Work With States and Native American Tribes

This action is designed to promote closer cooperation and partnerships among state and federal land management agencies and Native American Tribes to increase domestic natural gas and oil production on tribal lands. These partnerships will strive to recognize the importance of economic development, environmental preservation, and cultural sensitivity to tribal affairs. This requires cooperative efforts among DOE, various Interior Department agencies, the Administration for Native Americans, the Council of Energy Resource Tribes, and other Native American organizations and individual Native American Tribes.

Actions

8.1 Work With States on the Domestic Natural Gas and Oil Initiative

8.2 Increase Natural Gas and Oil Production and Environmental Protection on Native American Tribal Lands

Accomplishments to Date

8.1 Work With States on the Domestic Natural Gas and Oil Initiative: This action is designed to strengthen communications with state organizations and with individual states to identify and resolve key issues constraining natural gas and oil production. DOE has increased its interaction with states and has been working closely with them to identify and resolve key issues constraining natural gas and oil supply at the state and regional levels.

In August 1994, DOE awarded a grant to IOGCC to conduct environmental workshops on such topics as naturally occurring radioactive materials (NORM) and H_2S safety, and for streamlining federal and state regulation of gas and oil operations on public lands. Also, in August, DOE attended the mid-year meeting of the Ground Water Protection Council, an organization of state and industry representatives, and discussed cooperative efforts in research related to underground injection control for gas and oil operations. In September 1994, DOE participated in meetings of the California Oil Survival Team, a partnership of state, federal, and industry representatives aimed at maintaining a viable oil industry in California. DOE also participated in EPA-funded reviews of the gas and oil environmental management programs in the

States of New York, Louisiana, Kentucky, and Ohio. During the reviews, results of ongoing DOE environmental R&D were incorporated into the programs. DOE helped develop guidelines for these programs. DOE's participation in state reviews encourages the continuing improvement of state regulation of gas and oil programs and enforces the notion that states, and not the federal government, should continue to be primarily responsible for that regulation because of the variation of conditions across the country (e.g., geologic, hydrologic, climatic, economic, and institutional). It also demonstrates DOE's outreach to states and industry and keeps DOE informed of the latest developments in state programs.

Future Actions

- Establish opportunities with states for target-specific outreach activities on key issues, regions, or sectors.
- Conduct a "Public Lands Project" to streamline the regulation of gas and oil operations on federal lands in four western states (California, New Mexico, Colorado, Wyoming). This three-year project is aimed at eliminating state/federal duplication and increasing cost-effectiveness in the regulation of these operations.
- Conduct regulatory streamlining in three volunteer states (to be determined) in order to eliminate unnecessary requirements and make regulatory operations more efficient, resulting in savings to both industry and states.
- Continue to assist up to 24 states (FY 1995-1998) obtaining variances from EPA under the new Underground Injection Control Program Regulations.

8.2 Increase Natural Gas and Oil Production and Environmental Protection on Native American Tribal Lands: Under this action, DOE has been helping Native American Tribes become self-sufficient in developing and producing their natural gas and oil resources by providing access to energy technology and environmental management assistance. DOE signed a Memorandum of Understanding with the Osage Tribe in December 1994 to outline the framework for future cooperative projects between the Department and the Tribe on tribal land. One such project, a shallow 3-D seismic technology research project, has been initiated on the tribal land with assistance from the Tribe. Successful transfer of research results could spur exploration activity on the tribal land.

Under the Energy Policy Act of 1992 (EPACT), DOE is encouraged to assist tribes in their efforts to become vertically integrated in the management of their mineral and energy resources. DOE has funded a project to develop a model suitable for a tribe to make the transition from simple royalty owner to controlling the exploration, production, refining, and marketing of its oil, gas, and coal resources. The model can be used by several tribes.

The Basin Analysis Project in Fossil Energy's Exploration Program has focused much of the effort in the Black Mesa Basin in Northeast Arizona on Hopi and Navajo Tribal Lands. Much of this land has been under an exploration and development moratorium for 30 years. New energy policies being developed by the Hopi Tribe and the recent development of the Navajo Energy Company will make much of this area available for

exploration. The results of the DOE Exploration Program will be made available to the public and it is hoped to encourage drilling activity on the tribal land, thereby increasing tribal gas and oil resources.

Significant progress has been made both in outlining an overall program, and in initiating an environmental management training program. Two pilot classes were held for the Osage Tribal Council and representatives of the Arapahoe and the Jicarilla Apache Tribes. The classes (Basic Oilfield Technology, held at the Rocky Mountain Oilfield Testing Center (RMOTC) in Casper, WY, and Environmental Compliance, held at the National Institute for Petroleum and Energy Research (NIPER) in Bartlesville, OK) were both developed and taught by contractors from NPR-3. Twenty-six tribes expressed interest in this training. Training schedules are currently under development for 1995 and the future, depending on funding. Some of the most interested tribes are the Creek, Tonkawa, Mohawk, Southern Ute, All Indian Pueblo Council, Cherokee, and Ute Mountain Ute.

Two summer internships were offered to Native American college students at the NIPER facility in 1994 and an expanded program is anticipated for 1995. DOE is investigating opportunities for internship programs at RMOTC.

Development of an implementation plan and conduct of stakeholder meetings is planned for 1995. Several projects and commitments can be initiated when funding is available in FY 1995.

Future Actions

- Release the schedule for environmental management training (April 1995).
- Release the schedule for basic oilfield technology training (April 1995).
- Release the assessment report and recommendations for internship programs (May 1995).
- Release the model for vertical integration of tribes (May 1995).
- Establish a grant program to assist Native American Tribes with natural gas and oil development.
- Publish the results of the Shallow 3-D Seismic Exploration project (1996).
- Begin information dissemination on the basin analysis of the Black Mesa Basin (1995/1996).

ACTION 9.0
Address West Coast Production Constraints

Crude oil production from the Alaskan North Slope is likely to decline, leaving the West Coast once again a significant importer before the year 2000. DOE has been working with the Departments of Justice, Commerce, and Interior, and the California Public Utilities Commission to ensure access to central California oil pipelines. The economic, social, and environmental benefits and costs of exporting Alaskan North Slope crude oil also was examined.

The objective of this action is to stimulate California and Alaska oil production by creating a more positive business environment. One initiative seeks to make the oil market more competitive in California

by opening access to currently proprietary crude oil pipelines in the state. This would allow producers to ship crude oil to market and receive its fair market value, as opposed to the artificially low prices offered by refiner/pipeline owners. The other initiative involved evaluating the effects of removing barriers to exporting Alaskan crude oil. A study of this issue, completed by DOE in June 1994, showed that there are considerable benefits and few costs to allowing exports.

Actions

9.1 Open Access to Crude Oil Pipelines in California
9.2 Study Barriers to Export of Alaskan North Slope Crude Oil

Accomplishments to Date

9.1 Open Access to Crude Oil Pipelines in California: Under this action, DOE, together with the Departments of Commerce and Interior, have been exploring strategies to secure open access to California crude oil pipelines. Unfortunately, key court rulings directing open access for the important heated heavy oil pipelines in the state were reversed on appeal. The State of California, which brought the original suits that resulted in the open access decisions, probably will not appeal this unfavorable development. The Department of Interior, responding partly to suggestions by DOE, had filed an amicus brief on behalf the state, but this was ignored by the court in its final decision.

Currently, the pipeline issue is being addressed in an interagency working group comprising the Departments of Energy, Interior, Commerce, and Justice. While the focus of this group is on underpayment of federal royalties in California, a considerable body of data has been obtained from the state court case that demonstrate how the market is constrained by the pipeline owners. This evidence has generated an examination by the DOI of the possibility of using certain federal statutes of the open access to the three major state heated heavy oil pipelines. This strategy will be pursued in the coming year.

Future Actions

- Complete interagency review of royalty underpayment, including DOE participation in company audits (September 1995).
- Explore justification for anti-trust suit by the Justice Department (June 1995).
- Obtain legal opinions of applicability of the mineral leasing list to California pipelines for the Department of the Interior (March 1995).

9.2 Study Barriers to Export of Alaskan North Slope Crude Oil: Under this action, DOE examined the economic and environmental benefits and costs of lifting the current prohibitions against the export of Alaskan North Slope (ANS) crude oil. A comprehensive report was completed, reviewed throughout the Executive Branch, and released in June 1994. The study concludes that there will be significant benefits to the Nation if the U.S. lifts the ban on exports of ANS crude oil. For example, exporting ANS crude will partially relieve the downward pressure on West Coast prices of both Alaska and California crude oils. Accordingly, higher crude oil prices will lead

to better oil producer profitability, which in turn, will raise investment in domestic oil production. Improving conditions for West Coast oil producers will raise royalty revenues for the federal government, and tax and royalty revenues for the States of Alaska and California. It is estimated that exporting ANS crude oil will increase production in Alaska and California by up to 110,000 barrels per day, and also generate up to 25,000 new domestic jobs by the year 2000. The Departments of Transportation, Interior, Commerce, and Defense also contributed to the DOE study.

Future Actions

- Administration supports lifting the ban and is developing legislative language that will be forwarded to the 104th Congress.

THE QUESTION OF OIL IMPORTS

Oil imports are critical to the U.S. economy, and the possible disruption of oil imports would have serious repercussions for the transportation, industrial, commercial, and residential sectors. The last action of the Initiative addresses these concerns. The relatively low world oil prices have spurred U.S. oil demand, while forcing the U.S. oil industry to retrench and consolidate, allowing U.S. oil imports to rise. The 1995 Annual Energy Outlook, published by the Energy Information Administration (EIA) projects U.S. oil imports to cover 59 percent of our oil consumption by 2010 (in terms of barrels per day), up from 44 percent in 1993.

10.1 Study the Costs and Benefits of Oil Imports: DOE, under the general guidance of the National Economic Council and with input from other agencies, has focused efforts on describing and quantitatively estimating the economic, environmental, and energy security costs of oil imports that are not in the price of oil.

Other DOE study efforts include modeling the consequences for energy markets, oil supply disruption scenarios, and the U.S. economy for seven different options to reduce U.S. oil imports by 1 million barrels per day by 2010. EIA's National Energy Modeling System has been used to estimate the quantitative effects, while the intelligence community has produced estimates of the probabilities, magnitudes, and durations of oil supply disruptions during the period 1996-2010.

DOE is currently working with the interagency advisory group to come to a consensus on the costs not in the price of imported oil.

Under another but related activity, the national security implications of imported oil have been examined by DOE and an interagency working group under Section 232 of the Trade Expansion Act. In a study released in February 1995, the group concluded that oil imports are hurting our national security and advocated continuation of Administration policies aimed at improving U.S. energy security through a series of energy supply enhancement, conservation, and efficiency measures designed to reduce the Nation's dependence on oil imports. They include:

- Increased government regulatory efficiency to make domestic oil and gas industries more competitive by lowering costs.
- Increased government investment in technology to lower costs and increase production of natural gas and oil.
- Expanded utilization of natural gas to increase our reliance on this clean, abundant, domestic fuel.

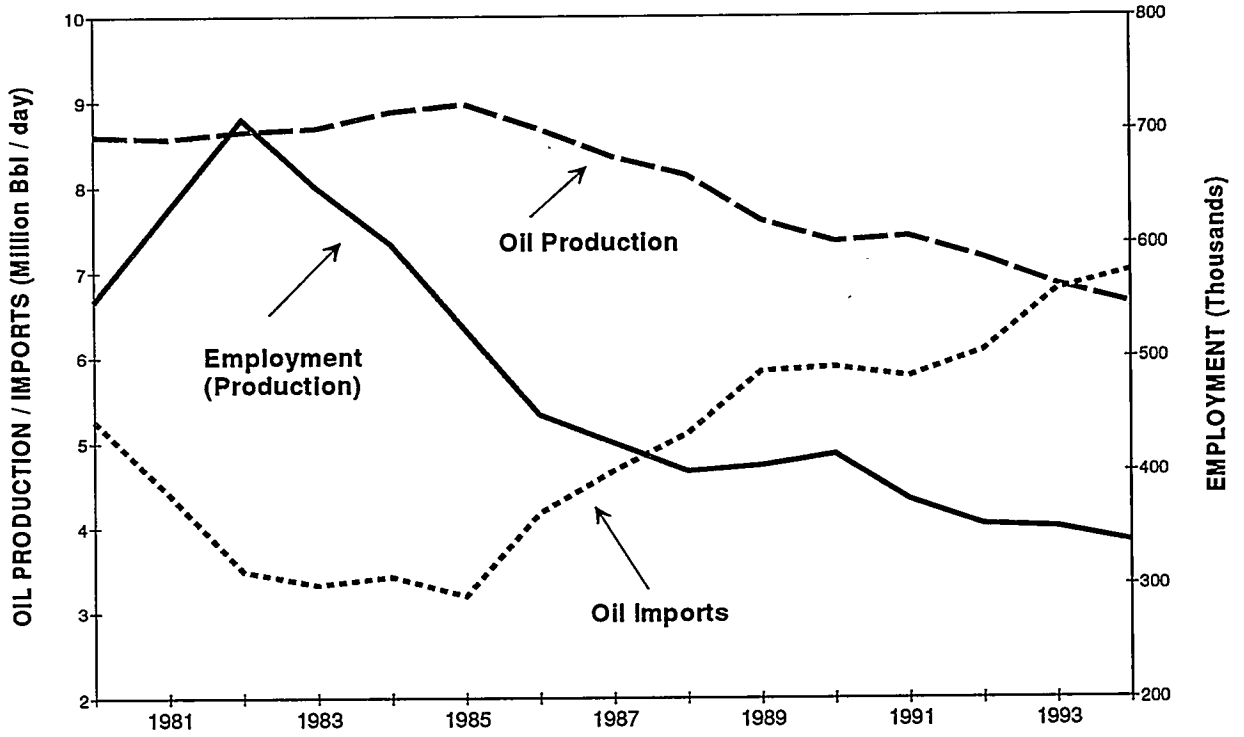
Future Actions

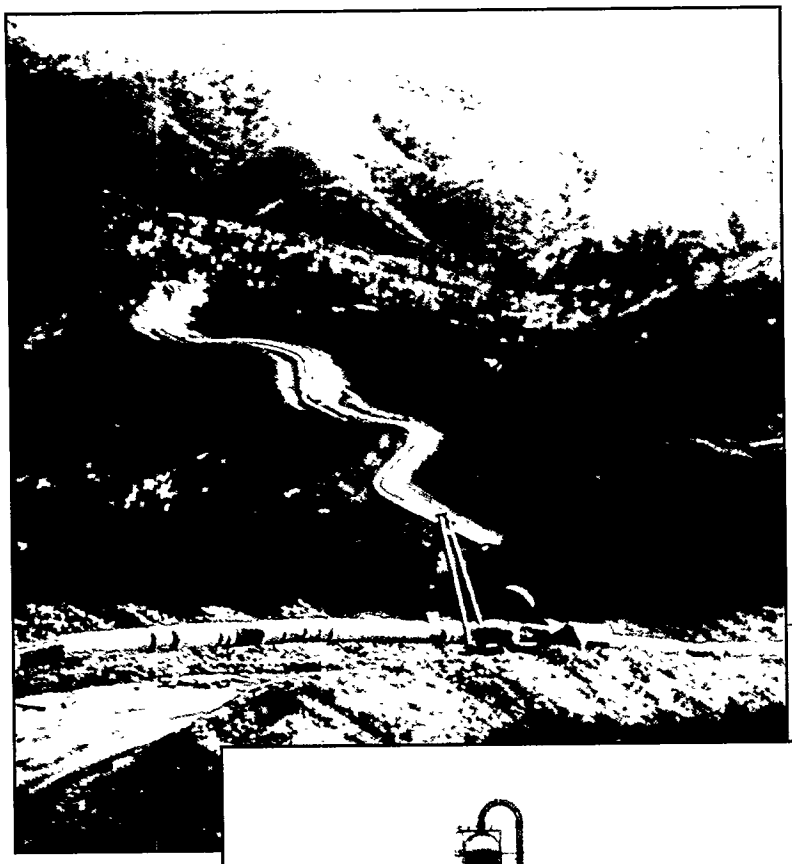
- Public dissemination of the study on cost and benefits of oil imports by the end of March 1995.

COST OF OIL IMPORTS

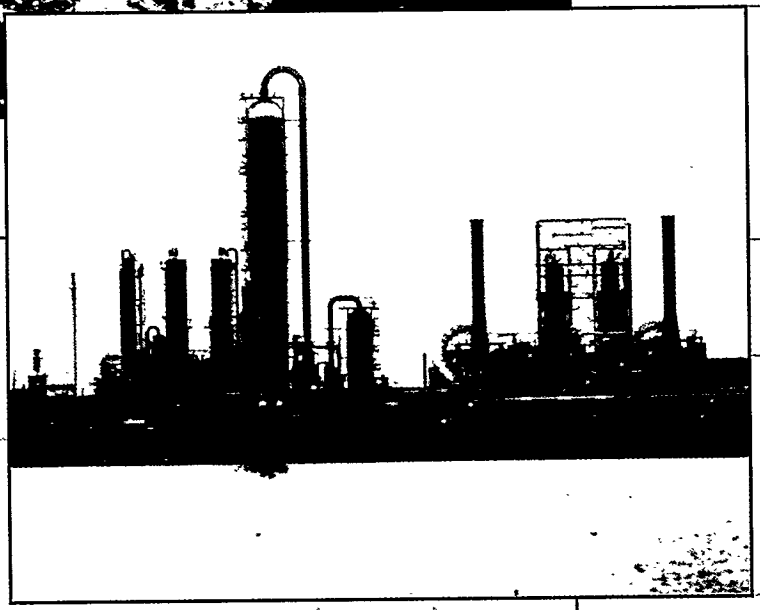
The economic well-being of the American people depends heavily on the continuing availability of low-cost oil products. Direct jobs within the oil industry are high technology, investment-driven, high-wage jobs. In 1992, the average wage for an oil production worker was 22 percent above the average manufacturing worker, and the average refinery worker's wage was 71 percent above the manufacturing equivalent. Unfortunately, as shown in the exhibit below, the trends in employment as well as other measures have been negative for this important domestic industry during the last decade. Both employment and crude oil production have been falling, and the oil imports have been rising. The forecasts for the future are for more of the same, and the only variable is the rate of decline.

The domestic supply has not kept up with demand. In fact, it has dropped 23 percent while the product demand increased 7 percent since 1980. An increasing portion of crude oil supply is imported, increasing from 35 percent in 1980 to 50 percent in 1994. The increasing dependence on imported oil has negative impacts on the Nation's security and the strength of the U.S. economy. In 1986, the cost of oil imports was approximately $35 billion. It increased to $51 billion in 1993; approximately $1 billion/week. Oil imports averaged 7.8 million barrels/day and 1.6 million barrels/day equivalents of petroleum products during the mid-1994. At current prices, this contributes roughly $60 billion/year to the trade deficit and a corresponding drain on the economy. There are also hidden costs for the military defense expenses related to maintaining secure foreign sources and supply routes.

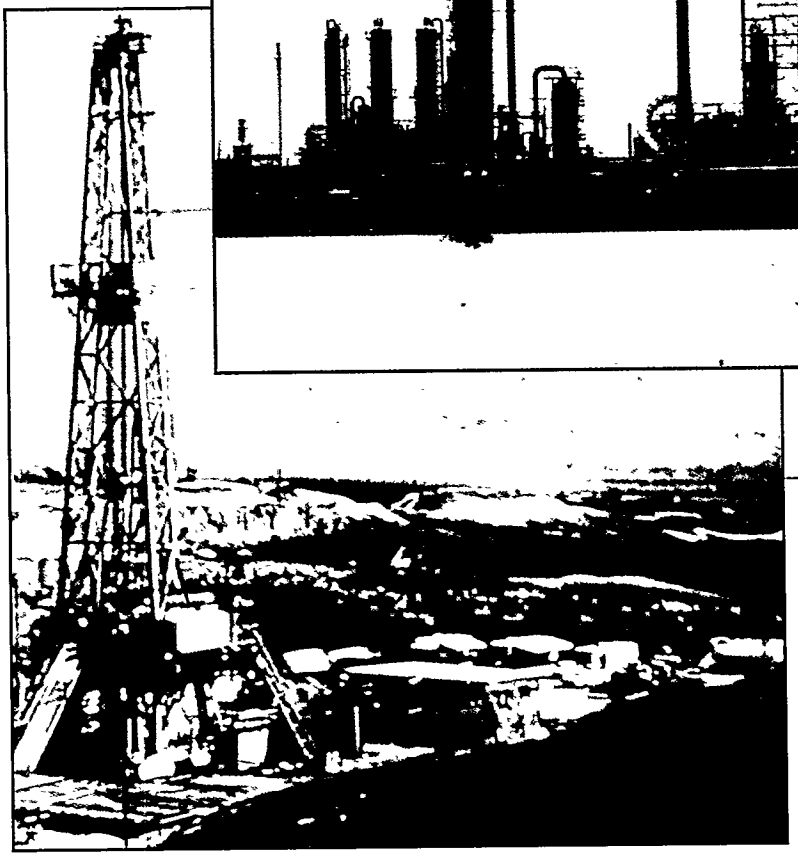




Advance and Disseminate Natural Gas and Oil Technologies



Stimulate Markets for Natural Gas



Improve Government Communication and Decisionmaking