

THE FUTURE

UNTIL NOW, IN EVERY ASPECT OF THE OIL AND GAS BUSINESS — from satellite sighting of under-earth resources, to production, to refining, to product formulation — technological progress has transformed the ability of the oil and gas industry to meet the imperatives of both the environment and the marketplace.

- Now the bar is being raised. The new century brings an array of environmental, economic, and political challenges that will inevitably stretch the resources and test the will of the industry. Strategic issues currently facing the industry include remaining successful in an evolving and volatile marketplace; sustaining science and technology



EXPLORATION



DRILLING AND COMPLETION



PRODUCTION



SITE RESTORATION



OPERATIONS IN SENSITIVE ENVIRONMENTS



Photo: The Stock Market

REMAINING SUCCESSFUL IN AN EVOLVING AND VOLATILE MARKETPLACE

As this report goes to press, oil prices at wellhead in the United States have increased approximately 80 percent since December 1998, when prices were at their lowest levels since the Great Depression. Although low prices enabled energy consumers and the United States economy to reap tremendous savings, low prices also threatened the economic viability of the domestic oil and gas industry and our Nation's longer-term oil and gas production capacity and energy security.

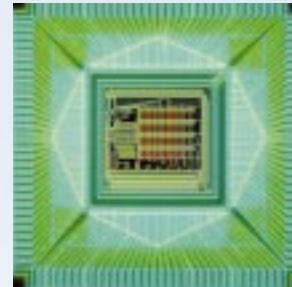


Photo: Corbis Images

SUSTAINING SCIENCE AND TECHNOLOGY PROGRESS

On the domestic E&P front, oil and gas resources will become increasingly difficult to find and produce. Although significant new resources remain to be discovered in previously unreachable areas, low oil prices will constrain E&P investments. If these domestic resources are to be developed, industry will be challenged to develop and apply E&P technologies that are even more productive and innovative than today's best. Ongoing R&D will be vitally important.

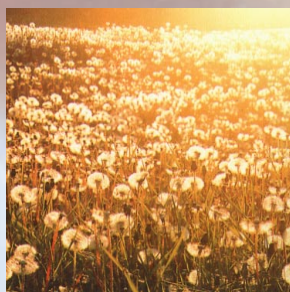
CHALLENGES

progress; minimizing and controlling greenhouse gases; and ensuring responsible development. • In the longer term, worldwide demand for oil and gas is projected to increase significantly, possibly raising competitive tensions, particularly between the developed and developing nations. Increased productivity in E&P will be essential if the industry is to keep pace with demand. • If the past is prologue, further advances in science and technology can enable these challenges to be met. Technology innovations, stimulated by shared societal objectives for a sustainable future and enabled by a flexible, responsive government regulatory and policy framework, can ensure a brighter tomorrow.



MINIMIZING AND CONTROLLING GREENHOUSE GASES

Concerns about global climate change are expected to drive reductions in greenhouse gas emissions associated with the production and use of fossil energy. Scientists cite such phenomena as the melting of the polar ice caps and increases in weather volatility as evidence that climate change is already under way, and consensus is growing among both political and industry leaders that actions must be taken to reduce greenhouse gas emissions to prevent far-reaching consequences. The oil and gas industry will be challenged to minimize and control these emissions on many fronts, including in E&P.



ENSURING RESPONSIBLE DEVELOPMENT

Environmental challenges for the exploration and production of oil and gas will intensify. Industry will face increased concerns and pressures related to land, air, and water quality issues, environmental justice, preservation of indigenous plants, animals, and people throughout the world, and protection of the earth's ozone layer. Continued improvements in efficiency, waste minimization, ecology-sensitive solutions, and societal interactions in E&P will be required.



DAUNTING CHALLENGES DEMAND NEW SOLUTIONS

Remaining Successful in an Evolving and Volatile Marketplace

MOST INDUSTRY EXPERTS PROJECT that worldwide demand for oil and gas will grow considerably over the longer term. As a result, the international petroleum industry will face intensified pressure to provide increased volumes of crude oil and natural gas at reasonable prices. Industry success will depend on continued improvements to productivity and efficiency.

The global oil and gas industry is struggling to survive in the increasingly competitive and volatile marketplace. Mergers and acquisitions, such as the BP-Amoco and Exxon-Mobil mergers, are unprecedented in both scale and pace. Moreover, the industry is going through a fundamental transformation—many countries with traditionally government-operated national petroleum companies are divesting assets and opening their borders to international investment and development.

The petroleum industry has in the past and must continue in the future to be able to withstand change in the marketplace. The industry has a long record of success in assessing and managing risk, and in handling the cyclic oil prices that have been a hallmark of the petroleum business. By most accounts the year 1998 was considered one of the worst the industry has ever experienced. Adjusting for inflation, world oil prices



*Increased productivity
in E&P is vital to meeting
future demand growth.*

reached the lowest level in 25 years. Throughout 1999, however, world oil prices have rebounded considerably, increasing nearly 50 percent in the first six months of the year.

Low oil prices: What's at stake?

While low oil prices, such as those in 1998, enable energy consumers to reap significant savings, they also threaten the viability of the domestic petroleum industry. The number of rigs drilling in the United States in 1998 was 60 percent lower than the year earlier. Upstream employment dropped to levels not seen in decades, to an annual average of almost 326,000, the lowest level in 25 years—nearly 55 percent lower than the record employment levels of the early 1980s. And U.S. imports of crude oil reached an all-time high of 8.6 million barrels per day.

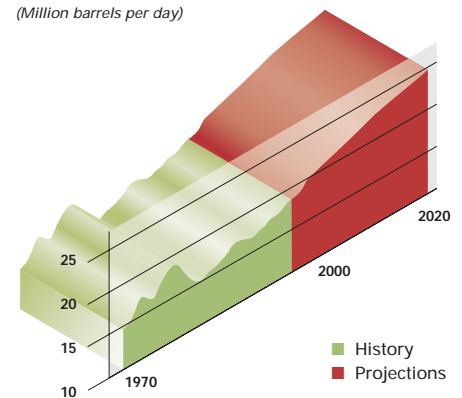
Low prices make marginally producing wells (especially those producing fewer than 10 barrels per day) particularly susceptible to

premature abandonment. In 1997, approximately 436,000 oil wells in the United States produced fewer than 10 barrels per day. With 353 million barrels produced, these wells accounted for almost 15 percent of domestic oil production.

In 1998, company budgets for exploration and development expenditures were dramatically reduced from previous years. Finding capital for new projects and preserving the existing infrastructure—including leases, wells, drilling and service equipment, transmission pipelines, and a skilled workforce—became increasingly difficult. Although industry is breathing easier these days, the pain of low oil prices has not faded. Despite months of recovering prices, rig activity remains near historic lows. Some analysts predict that domestic E&P spending will decrease 20 percent in 1999.

U.S. Consumption of Petroleum Products, 1970–2020

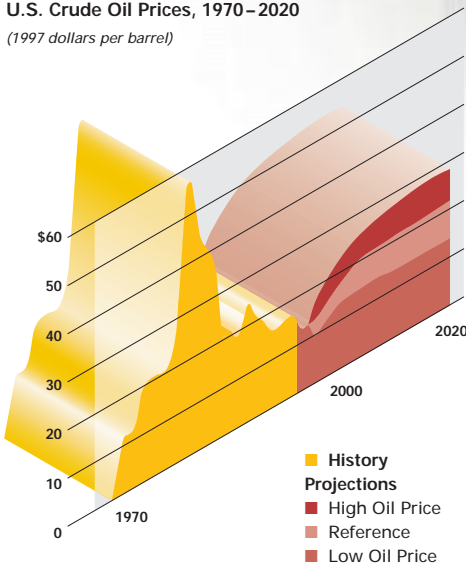
(Million barrels per day)



Source: Energy Information Administration, 1998



U.S. Crude Oil Prices, 1970–2020
(1997 dollars per barrel)



Source: Energy Information Administration, 1998

Low oil prices pose a particular threat to smaller domestic companies, those of insufficient size, diversification, or worldwide presence to weather the storm. In the United States, the vast majority of oil and gas companies are smaller independent firms with fewer than 20 employees. These independents drill 85 percent of all new oil and gas wells in the country and produce 40 percent of the crude oil and 65 percent of the natural gas.

Americans enjoying the low prices at the gasoline pump may ask, So what? The answer: this short-term windfall may well come at the expense of longer-term economic and national security. If American wells are prematurely plugged and abandoned and American producers go out of business, we lose jobs, tax revenues, royalty income to land and mineral owners, access to domestic

United States dependence on imported oil has increased to record levels during the last 25 years. Net imports provide almost 50 percent of U.S. oil consumption. Oil imports could grow to as much as 71 percent in 2020 depending on world oil prices, as the gap between domestic oil production and consumption widens.

resources, in some cases never to return, and increase our dependence on foreign oil and gas. Such changes could also hurt our environment—reducing the capability of industry to meet projected natural gas demand in the United States, increasing tanker traffic and the possibility of spills in the marine environment, and reducing industry’s capacity to develop and deploy new technologies for improving productivity and environmental performance.

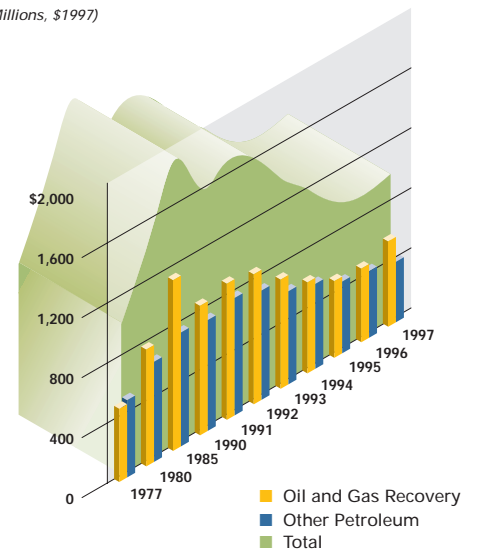
A formidable task for industry and government

At this challenging time in the industry’s history, government and industry must work together to preserve America’s longer-term oil and gas production capacity and energy security. An array of actions by States as well as the Federal government may periodically be necessary to assist the industry, especially small businesses, in surviving low oil prices, and to enable them to provide a foundation for the future. Industry itself plays the greatest role in its future survival. Companies must reassess their corporate strategies and be prepared to articulate to others outside the industry why oil and gas E&P is a prudent longer-term economic and energy investment.

Sustaining Science and Technology Progress

RESEARCH AND DEVELOPMENT (R&D) is America’s investment in its future, providing a science and technology base for international competitiveness and leadership. In the oil and gas industry, however, both public and private investment in R&D have been declining over the past decade. The 24 largest E&P companies report that they spent less than \$500 million in 1995 on research and development, only about 45 percent (in real dollars) of its 1985 peak. A decline in basic research is particularly apparent. Two-thirds or more of the investments made supported field service activities rather than the advance of the basic science that generates dramatic new technology.

Petroleum Industry R&D Expenditures, 1977–1997
(Millions, \$1997)



Source: Energy Information Administration, Form EIA-28 (Financial Reporting System)



Building Awareness of Smarter Technology

Additional causes for concern are trends in corporate downsizing and restructuring, as well as a phase-out of consumer subsidized financing by 2005 at the Gas Research Institute, the Nation's largest natural gas research and technology development organization. Some experts believe these trends foreshadow a shrinking population of scientists and engineers and reduced opportunities for new generations of technologists.

Other factors provide reason for hope. From the vantage point of three decades, both the E&P industry and government have climbed a steep learning curve. Industry and government relationships over the environment have progressed markedly, from confrontation toward dialogue, from conflict to far more collaborative, win-win problem solving. Technology partnerships have become more widespread. To meet cost pressures and leverage resources, companies increasingly are working with each other, with academic groups, and with government in new and creative technology research, development, and deployment efforts. More efforts of this kind will be required in the future, to enable essential technological advances.

Continued need for leadership

Energy experts from industry, academia, and the research community have recommended that the Federal government continue to provide leadership, focus, and substantial financial support for energy research and development. This Federal role can ensure the achievement of national goals of U.S. energy security, economic strength, environmental quality, and leadership in science and technology.

Organizations fostering oil and gas technology transfer range from universities, to States, to professional societies, to advocacy groups. These groups are also instrumental in articulating geoscience principles, and standards for more efficient oil and gas operations, environmental protection, and professional conduct. A representative—but not comprehensive—list of these organizations includes:

American Association of Petroleum Geologists	International Association of Drilling Contractors	Society of Exploration Geophysicists
American Association of Professional Landmen	International Petroleum Institute Environmental Conservation Association	Society of Independent Petroleum Earth Scientists
American Geological Institute	International Marine Contractors Association	Society of Petroleum Engineers
American Institute of Professional Geologists	Interstate Oil and Gas Compact Commission	Society of Petroleum Evaluation Engineers
American Petroleum Institute	National Ocean Industries Association	Society of Professional Well Log Analysts
Association of American State Geologists	National Association for Black Geologists and Geophysicists	State and national environmental professionals associations
Completion Engineering Association	Offshore Operators Committee (Gulf of Mexico)	State and private universities, including Historic Black Colleges and Universities
Drilling Engineering Association	Oil and gas service companies (e.g. drilling and equipment service suppliers)	State and regional industry trade associations
E&P Forum	Petroleum Technology Transfer Council (addressing the needs of independent producers)	State geological surveys and societies
Federal agencies		State regulatory agencies
Gas Research Institute		U.S. Oil and Gas Association
Geological Society of America		
Ground Water Protection Council		
Independent Petroleum Association of America		

To lower carbon dioxide emissions and decrease oil imports, the Department of Energy has been called on to increase collaborative government and industry R&D on natural gas as the transition fuel in the 21st century. For example, investments would be made to conduct R&D in natural gas production and processing technologies, including a science-based program to understand the potential of methane hydrates worldwide. Collaborative investments also would be continued for technology transfer and cost-effective technology demonstrations, to maintain production from mature and marginal domestic oil and gas regions.

"The United States' research and development enterprise is in transition, shaped by the end of the Cold War, increasing competitive pressures in the private sector, realignments at research universities, and shifting priorities in Federal spending. . . . The headlights are being lowered in the private sector, where 'long term' is now only five years—and sometimes three."

Secretary of Energy Advisory Board Task Force on Strategic Energy Research and Development, 1995



Fostering technology transfer

Demonstrations of advanced technology concepts and information exchange are critical to accelerating the deployment of smarter technologies. As new technologies are developed to improve economics or productivity, their introduction into the marketplace can vary significantly due to such factors as cost, performance, applicability, adherence to government regulations or policies, and regional availability. The advanced technologies described in this report range from technologies commonplace today, such as 3-D seismic, to those gaining wider use domestically and internationally, such as horizontal drilling, to very promising technologies yet to be fully demonstrated, such as separating oil and water downhole within the reservoir.

Minimizing and Controlling Greenhouse Gases

THE RISE IN GREENHOUSE GAS emissions from fossil fuel combustion and industrial and agricultural activities has aroused international concern about the impacts of these emissions on climate. Greenhouse gases—mostly carbon dioxide, but also some methane, nitrous oxide, and other trace gases—are emitted to the atmosphere, enhancing an effect in which heat reflected from the earth's surface is kept from escaping into space, as in a greenhouse. Concerned scientists believe that the earth's surface temperature may rise enough to cause global climate change. They cite such phenomena as the melting of the polar ice caps and increases in weather volatility as evidence

"Technological progress plays a critical role in the modern economy."

Presidents Council on Advanced Science and Technology, 1998

that climate change is already under way. And while scientific uncertainty remains on the extent of the potential climate change, nonetheless, consensus is growing among both political and industry leaders that actions must be taken to reduce greenhouse gas emissions to prevent potentially far-reaching consequences.

On a per capita basis, the United States is the world's largest source of greenhouse gas emissions. With 4 percent of the world's population, our Nation emits 23 percent of the world's greenhouse gases.

Approximately 90 percent of United States greenhouse gas emissions from human activities come from energy production and use, most emissions a by-product of the combustion of fossil fuels. Concerns about global climate change are expected to drive reductions in greenhouse gas emissions related to the production and use of fossil energy. The oil and gas industry will be challenged to minimize and control these emissions on many fronts, including in E&P.

The Kyoto Protocol, negotiated by more than 160 nations in December 1997, is intended to reduce net emissions of certain greenhouse gases significantly by the 5-year period between 2008 and 2012. Each participating developed country has established emission reduction or limitation targets under the negotiated treaty. The ground rules for how these reductions can be achieved, reported, and verified continue to be negotiated.

Uncertainties and constraints

Many believe that significant economic burdens could result from implementing the requirements agreed to under the Kyoto protocol. The extent of these burdens is highly uncertain, however, and is the source of significant disagreement. Some factors contributing to this uncertainty include:

- The availability and cost of new and improved technologies, and the pace at which existing capital stock can be replaced.
- Consumer acceptance of more advanced or efficient technologies, as well as the increased use of nuclear and renewable electric generation technologies.
- The identification and implementation of successful, cost-effective fiscal and monetary policies to moderate economic impacts, and a diverse range of cost-effective mechanisms to encourage actions to reduce greenhouse gas emissions.
- The adjustment of the electricity, natural gas, and renewable energy industries to new requirements and the possible changes in industrial and energy sector composition that would likely result.
- The timing and phase-in of the necessary transitions.



The Birth of the Kyoto Protocol

- In 1988, the World Meteorological Organization and the United Nations Environment Programme established the Intergovernmental Panel on Climate Change (IPCC) to assess the available scientific, technical, and socioeconomic information regarding climate change.
- The United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1992, in which Parties agreed in a nonbinding pledge to voluntarily reduce greenhouse gas emissions to 1990 levels by 2000. The United States was one of the first countries to ratify this treaty.
- In 1995 and 1996, the first and second Conference of the Parties agreed to address greenhouse gas emissions for the period beyond 2000, and began negotiating a protocol establishing legally binding emissions limitations and reductions for developed countries.
- At the third Conference of the Parties—held in December 1997 in Kyoto, Japan—the Kyoto Protocol was finalized, committing participating developed nations to specific, binding emissions targets.
- The fourth Conference of the Parties, which was held in Buenos Aires, Argentina, in November 1998, agreed to a 2-year plan for implementing the Kyoto Protocol. The United States signed the Kyoto Protocol on November 12, 1998. Although signing affirms the United States' commitment to work with other nations to meet the treaty's goals, it does not impose an obligation on the United States to implement the Protocol. (The treaty cannot become binding without approval of the United States Senate.)

Most projections envision a dramatic rise in natural gas consumption to meet the needs of a greenhouse gas constrained world, which in turn will require substantial increases in natural gas development and production to meet growing market demands. To minimize potential negative economic impacts of climate change constraints, the domestic industry must be able to continue to hold costs down while delivering increasing volumes of natural gas. To accomplish this, technological advances must continue, and a supportive policy and regulatory environment must encourage increased natural gas development and production.

The response: policy and technology dimensions

To meet the challenges posed by climate change, industry and government must work collaboratively. Government must provide a policy and regulatory environment for the industry that encourages action, without posing unnecessary economic burdens or penalizing in the future those that act today. Governments must identify and evaluate the full range of options available to encourage greenhouse gas emission reductions, allowing the maximum amount of flexibility possible to capture the innovation and entrepreneurial creativity that has always characterized the petroleum industry. All possible policy instruments—including, but not limited to, economic incentives, emissions trading, technology controls, energy efficiency initiatives, and product changes—should be debated, evaluated, and, where appropriate, implemented.

"For the oil and gas industry the dominant issue of public policy is climate change. . . . Our goal [at BP Amoco] is to reduce our emissions of greenhouse gases by 10 percent from a 1990 baseline over the period to 2010. . . . That target will now sit alongside our financial targets. . . . [It] has been developed. . . in close cooperation with the Environmental Defense Fund, whose help and support has been tremendously valuable. I want to pay a tribute to them."

SIR JOHN BROWNE, GROUP CHIEF
Executive, BP Amoco p.l.c., 1998

The opportunity: the critical role of natural gas

Because of the higher relative carbon content of coal and petroleum products, any strategy to reduce greenhouse gas emissions would encourage the decreased use of these fuels and the increased use of lower-carbon fuels. This implies more reliance on renewable energy, perhaps on nuclear energy, and, especially in the nearer term, on natural gas.



Industry must be proactive in addressing demands upon it to reduce greenhouse gas emissions. It must participate in multi-stakeholder forums to constructively develop effective mechanisms to address climate change issues and ensure that industry's concerns and recommendations are represented. Industry must carefully examine its own operations, policies, and procedures, and identify all possible options for cost-effectively and voluntarily reducing emissions of greenhouse gases and improving efficiency of operations. In many instances, considerable cost reductions and economic advantages can be achieved in conjunction with emissions reductions. And responding to concerns about climate change can provide marketplace opportunities for those in industry willing to act decisively.

The oil and gas industry currently possesses many of the tools and basic understandings needed to mitigate carbon emissions. Technologies now available, and under development, may be used to separate and capture carbon dioxide emissions from fossil-fueled power plants, oil and natural gas processing facilities, and other industrial processes for injection into geologic formations. Three principal formations—inactive and uneconomical gas reservoirs, aqueous formations, and deep and unmineable coal reservoirs—are widespread and have the potential for sequestering large amounts of carbon dioxide. In the case of carbon dioxide injection for enhanced oil recovery or enhanced coalbed methane recovery, the benefits of oil and gas extraction may partially or totally offset the cost of carbon dioxide separation and capture.

“Natural gas has the potential to make a significantly larger contribution to both this Nation’s energy supply and its environmental goals. Achieving that potential will take a commitment of innovation, leadership, and resources by the industry to overcome challenges that arise.”

National Petroleum Council, The Potential for Natural Gas, 1992

For the industry and the Nation to address climate change, continued improvements in technology are critical. Technology opportunities in the 21st century to reduce United States greenhouse gas emissions are possible only with sustained government and industry R&D efforts. Future technologies for deployment in the oil and gas industry to reduce greenhouse gas emissions may include:

- Increasing energy efficiency in crude oil refining.
- Converting natural gas to liquid fuels.
- Increasing natural gas production to help fuel industry and generation of electric power.
- Pumping carbon dioxide captured from industrial and electric power generation into oil reservoirs to enhance oil recovery, into coal seams to recover methane efficiently, and into natural gas storage fields to maintain subsurface pressures necessary for gas deliverability (carbon sequestration).
- Minimizing fugitive gas emissions from pipelines and other oil and gas equipment.

While holding significant promise, the development and deployment of such technologies is not certain, given the decline in R&D investment.

Ensuring Responsible Development

ENVIRONMENTAL QUALITY WILL BE a continuing issue for the oil and gas industry. America's oil and gas industry must find the means, including new technology, to meet its future challenges, both in lowering costs to maintain competitiveness and in protecting the environment. A rational regulatory framework, reasonable access to resources in the United States and abroad, and communication are also critical to meeting these objectives.

Reinventing government

A more flexible and responsive policy and regulatory framework is critical to the U.S. oil and gas industry's ability to provide reliable and affordable energy supplies in a manner reflecting shared societal concerns for environment, health, and safety. Government must continue to improve its approach to regulation—emphasizing sound science and cost-benefit and goal-oriented mechanisms—and to improve coordination of policies affecting the industry. States and Federal agencies, including the United States Environmental Protection Agency, the Department of the Interior, and the Department of Transportation, have increasingly come to understand effective roles of government in enabling industry to improve its environmental performance. These roles include providing educational assistance and fostering, not stifling, technology innovation and voluntary efforts to protect the environment.



A Vision for the Future

Moving beyond conflict to consensus

Access to oil and gas resources domestically and abroad will increasingly depend on industry's ability to demonstrate its commitment to responsible development. Industry has a responsibility to improve its credibility and an opportunity to lead in the resolution of contentious issues. Oil companies, in particular, have been viewed by many as lacking a concern for the environment and the commitment to protecting it. For this perspective to change, industry must improve and expand communication with stakeholders outside the industry. Such communication will be crucial for resolving the economic and environmental issues the oil and gas industry will face. Enhanced communication must be championed by industry leaders to show the commitment to real change in relationships with stakeholders. Effective dialogue can enable consideration of the positions of all stakeholders, resulting in a more realistic basis of action. Great strides have been made, but more opportunities remain.

"A better dialogue between the oil industry and the environmental movement is imperative. There is a lot of misunderstanding, and an opportunity for constructive action exists."

Participant in the National Petroleum Council's 1995 Report on Future Issues: A View of U.S. Oil and Natural Gas in 2020

Innovation in E&P technology continues well into the 21st century, providing further environmental benefits. Successive generations of technology pioneers ensure that E&P trends are progressively smarter, more protective of the environment.

In the fields of the future:

- **Advanced earth imaging pinpoints the location of valuable oil and gas resources.**
- **Downhole sensors ensure peak drilling efficiency.**
- **Multiple completion wells and reduced surface footprints are the norm.**
- **Improved reservoir management and recovery processes ensure maximum oil and gas recovery.**
- **Subsurface waters remain in situ or are separated downhole, and produced waters are minimized.**
- **Air emissions approach zero as particulates are effectively captured, gases are reinjected, and leak detection and control strategies become more effective.**
- **Production wastes are minimized and/or recycled.**
- **Impacts of drilling and resource recovery on sensitive environments, including wildlife habitat, are minimal.**
- **Exploration and production sites are restored to original conditions or beneficially improved.**

In the Nation:

- **Maximum recovery of the Nation's valuable domestic oil and gas resources is achieved, respecting the environmental and other societal objectives.**
- **Natural gas serves as a transition fuel to lower carbon-based greenhouse gas emissions and to decrease oil imports.**
- **Affordable and abundant supplies of energy enhance our national security.**
- **The United States sustains its E&P technology leadership worldwide.**
- **International cooperation expands to address global economic, security, and environmental concerns.**



Better communication between industry and the public will improve public understanding of the industry and its value to the country. Education in the principles of science and economics is key to comprehending energy and environmental issues facing the industry. Though industry has a strong history of supporting educational programs, it must focus its efforts to better understand public and customer concerns, and to encourage science, economic, and energy education.

Stewardship of public lands

In the United States, vast quantities of oil and gas resources underlie Federal lands, including forests, deserts, rangelands, wetlands and marine environments, to be managed for public benefit. Today, onshore Federal lands annually yield approximately 5 percent of our Nation's crude oil production and nearly 10 percent of its natural gas. Offshore, Federal lands account for approximately 19 percent of annual crude production and 25 percent of annual natural gas production. About 50 percent of the remaining untapped technically and economically recoverable crude oil and gas reserves are on Federal lands, excluding wilderness areas. More than 80 percent of these properties are offshore. Public opinion on access to Federal lands for resource exploration and production remains divided. Advanced oil and gas technology will play a critical role in the continued debate regarding access to Federal lands, both onshore and in the Outer Continental Shelf. Public dialogue on the need for energy and the need for protection of the environment, particularly our most fragile ecosystems, will contribute to improved resolution of the issues.

ENABLING NEW GENERATIONS OF TECHNOLOGY PIONEERS

"Folks were impressed with the pluck and enterprise of the two guys and decided to give them a hand. . . . The story of Wilcox Oil Company [the dream of two young geologists fresh out of college] is one of generosity, mentoring, giving the lessons of a lifetime, and furthering the best of human character."

RICHARD S. BISHOP
President
American Association of Petroleum Geologists, 1998

Looking to the Future

AS WE APPROACH THE 21ST CENTURY, oil and gas scientists and engineers, through professional organizations such as the American Association of Petroleum Geologists, the American Geologic Institute, and the Society of Petroleum Engineers, are looking to the future. Key organizations have strengthened their commitment to fostering ethical behavior and professional conduct, to applying scientific principles and data for addressing basic environmental issues, and to working actively to encourage responsible exploration and production of the world's oil and gas resources.

These organizations have long stimulated professional development in the oil and gas industry, as the hub of information exchange on geologic, engineering, and biological sciences, and as the source of career and corporate mentoring. Increasingly, these organizations are also looking outward. They are stepping up outreach efforts to communicate the technology and practices used today to minimize environmental

impact. They are partnering across scientific disciplines. They are partnering with land management agencies to understand the impact of oil and gas operations on sensitive ecosystems, and to develop industry guidelines and policy for future operations in these areas. And they are encouraging members to become more involved in public policy and promoting a scientific approach in solving environmental problems.

The development of new oil and gas technologies—and the environmental benefits that come from them—will be constrained only by the limits of our Nation's drive and imagination. With sustained vision, leadership, and the commitment of both the public and private sectors, new technologies will be developed, American oil and gas resources can be utilized, and the environment will be served.