cant damage to the U.S. economy. Terrorism, regional conflicts in energy exporting countries, industrial accidents and even acts of God require contingency plans and policies. A growing dependence on imported energy need not mean increased vulnerability to supply disruptions, provided effective emergency preparedness programs and policies are in place. Given the global nature of energy markets and the fact that the U.S. economy cannot be isolated from the risks of energy supply disruptions, contingency plans should include international cooperation as a key component.

Energy Efficiency

Investments in energy efficiency can reduce energy use and operating costs. The use of less energy can help protect the environment. When energy efficiency opportunities are identified, firms and individuals should take advantage of these opportunities. However, decisions that involve a trade-off between energy efficiency and energy production should be transparent. Such decisions also should not favor one option over the other, for the choice really involves a complementary relationship.

Indeed, when given appropriate competitive market signals, improved efficiency in energy production is as significant a priority as improved energy-efficiency among end users. In recent decades, improvements in technology and productivity have increased the efficiency of energy suppliers in all sectors. Policymakers should therefore allocate R&D energy efficiency funding on the basis of potential gain, regardless of whether that efficiency gain occurs during energy production or energy consumption.

Capital Investments

Enormous capital investments in all forms of energy—fossil fuels, nuclear energy and renewable energy—will be required to fuel the U.S. economy during the early decades of the 21st century. These investments will be needed in all phases of the energy sector, from production to generation to storage to transmission and distribution to improved end-use efficiency. A sound National Energy Strategy can help create the predictable operating and investment environment that all energy sectors require in order to thrive.

The regulatory process and tax policies are particularly important to attracting the requisite capital investment for growth in the energy sector, and the U.S. economy. Regulatory policies should be simple, durable and predictable, both at the national and local level. This is especially true of efforts to deregulate and restructure many U.S. energy markets. Such efforts are leading siting and transmission issues to become a matter of national policy. Federal policymakers should take these changes into account when reviewing energy laws and energy regulatory authorities. Tax policies should encourage investment for all forms of energy supply and infrastructure.

International Energy Trade and Development

Petroleum imports to the United States will likely increase for the next several decades, regardless of efforts to develop additional domestic energy resources. This reality, plus the continued globalization of the energy economy, will force U.S. policymakers to address international trade and development issues. Indeed, the future well-being of Americans and citizens of other countries will depend on the ability of U.S. leaders to promote open and fair trade practices in an effort to stimulate sustained economic growth in developing and transition economies.
Administration officials and Congressional members can take a number of steps to open energy markets. For example, they can:

- Include energy when negotiating Western Hemisphere free trade agreements.
- Work with the new government in Mexico to allow U.S. companies to participate in the oil, natural gas, coal and electric power sectors.
- Work with Canada as well as Mexico to develop a North American energy trade strategy.
- Incorporate as broad a definition of energy services as possible in the World Trade Organization's upcoming round of negotiations on "services."
- Drop unilateral trade and economic sanctions.
- Support the opening of markets currently closed to U.S. companies as a cornerstone of U.S. foreign policy.
- Utilize U.S. influence and credibility to discourage actions that damage the U.S. economy by the Organization of Petroleum Exporting Countries.

The new Administration should refocus development priorities, giving top priority to programs that encourage domestic resource development and utilization. For example, policymakers could establish a more direct link between trade promotion and international development. After all, emerging democracies cannot develop into modern, civil, stable societies unless those nations provide their citizens affordable and reliable energy supplies. Additional U.S. assistance would help develop these much-needed energy supplies.

For example, hospitals cannot refrigerate vaccines, schools cannot provide adequate lighting and clean water systems cannot function without energy. Poverty stricken families in Africa may spend eight hours a day gathering fuel wood and animal waste to burn for light and heat. Providing basic supplies of energy can allow a mother these eight hours to teach children to read or to raise a crop for income. The cycle of poverty will never be broken without access to energy.

The World Energy Council indicates that as many as two billion people lack access to energy. The potential for social instability from poverty is a clear threat to U.S. security and our national interests. Increasing the supply of reliable and affordable supplies of energy to stimulate economic growth in developing and reforming nations must be a cornerstone of U.S. foreign policy. A new model of foreign assistance launched in 1990, energy partnerships, has proven to be more effective than traditional models in this area. The U.S. private sector, by donating their expertise, have fostered the development of economic climates conducive to trade and direct investment by U.S. corporations. These efforts have led to one dollar of matching expenditures by U.S. private sector organizations for every dollar of U.S. government assistance.

Another priority should be fostering international trade and investment, which is best done by creating appropriate legal, regulatory, tax, trade and financial frameworks that open markets and facilitate foreign investment. Energy related economic development assistance has created investment and trade opportunities in South America and Eastern Europe and are on the verge of paying off in Asia and Africa. These programs administered by the U.S. Agency for International Development (USAID) should be expanded.

Funding of programs to support international development, export and investment also should be strengthened in the U.S. Department of Energy, Trade & Development Agency, Export-Import Bank, Overseas Private Investment Corporation and the U.S. Department of
Commerce. Jobs for Americans and employment opportunities for citizens of client countries are enhanced when energy driven economic growth becomes possible in developing and transitional economies. Global trade and investment in creating the energy infrastructure critical for a modern, civil, democratic society pays dividends in terms of U.S. energy, economic and national security.

The need for global attention to developing countries energy requirements rivals the need after World War II for a Marshall Plan to rebuild Europe. In fact, an energy Marshall Plan for developing countries and transitional economies can re- establish U.S. global leadership in this area and mitigate our domestic energy problems and improve our economic and national security.

Energy Research, Development, and Deployment

Technological advances have allowed us to find, produce, transport and utilize energy in ways unimaginable only a few decades ago. Technology has contributed dramatically to an energy supply system that is efficient, safe, and environmentally secure. Future technological advances are expected to stimulate continued improvement in all of these areas as well as contribute to a diverse, robust, and economical energy future.

However, investments to maintain and improve the existing energy system have declined over the past few years, thus jeopardizing system reliability. The downward trend in investment is in part responsible for a rash of power system interruptions in the eastern and midwestern regions of the country in the summer of 1999, and the rolling blackouts in California in 2001.

Paralleling the reductions in investment in capital improvements is a sharp decline in both public sector and private sector energy R&D expenditures during the 1990s. Analysis currently underway within the World Energy Council indicates that this phenomenon is not limited to the United States, but is true of all OECD countries. Total research appears to be less than half of 1990 levels. Increases in research and development budgets are needed to create a new technology base on which to build modern infrastructures for the production and delivery of oil, natural gas, coal and electricity.

A key element of technology advance is the achievement of consensus on the issue of the role of the federal government in research, development, and deployment. Particularly in the case of technologies for critical energy infrastructures, where system failures can have consequences that reach far beyond state boundaries, a role for the federal government should be defined. In addition, where technical and business risks of new technologies are high, risk sharing through collaborative leadership initiatives involving the public and private sectors seems appropriate.

Priority should be given to research efforts that can contribute to production and utilization of domestic energy resources. The federal government should focus on basic and applied research that can increase energy supply while improving both energy efficiency and environmental protection. Research and development priorities should be reviewed to insure that those energy sources most likely to contribute to a diverse and robust fuel supply system over the next twenty years are adequately funded. Increased federal funding for research and development in all arenas—oil, gas, coal, nuclear, and renewable energy—should be considered.

Initiatives to improve energy delivery—including natural gas pipelines, electricity transmission systems, and energy storage facilities—also require increased funding. Near-term
programs are needed to ensure reliability of supply while system upgrades are needed to handle the new patterns of traffic on electricity transmission systems and pipelines caused by wholesale and retail competition. Finally, new technologies must be developed to begin the process of transforming the entire electricity power system—from generation to end use—to the equivalent of continental-scale integrated circuit, able to respond rapidly to changes in system loading while retaining power stability. The result will be a digital infrastructure that links an upgraded transmission system to a new distribution system, capable of supplying all customers with affordable, abundant energy, and differentiated energy products and services.

U.S. public spending for R&D should be better coordinated with other OECD countries. Doing so will improve the efficiency of research efforts and minimize duplication of efforts. U.S. research programs should reflect the potential for applications outside of the U.S., particularly in developing economies. As energy issues increasingly become global concerns, federal government investments in R&D will have higher paybacks if the new technologies are deployed globally as well as domestically.

**Education and Public Awareness**

Well-educated energy consumers enhance market efficiency, especially in an era of deregulation. Accordingly, policies that promote consumer awareness and education about key energy issues need to be an integral part of the proposed National Energy Strategy.

Workers in the energy sector can also benefit from education and training. This is particularly true at a time when labor markets are tight and enrollments in energy related disciplines are declining at most colleges and universities. The explosive growth during the 1990s of information technology companies—which compete directly with potential energy workers, especially for technically trained people—has reduced the workforce pool for energy companies. Unless action is taken soon, the U.S. education system may be unable to produce a sufficient number of well-trained graduates to meet demand in the coming decades.

**Balancing Energy Demand and Environmental Concerns**

Energy and environmental issues have become inextricably linked to one another, and to national policy decisions. This linkage is both broad and deep, and involves concerns about air quality, toxic wastes and global climate change, to name a few policy issues. Balancing the economic efficiency and reliability of a competitive energy market with appropriate environmental policies is key to developing an effective National Energy Strategy. When balancing America's energy needs and our nation's broad economic and social goals, policymakers should be guided by sound scientific and economic analysis. They should also apply cost-benefit and risk analyses when reviewing environmental laws and regulations.

In short, environmental regulation should be formulated in a way that achieves reasonable environmental objectives while recognizing the ongoing need to provide companies and consumers a reliable and affordable supply of energy so U.S. economic growth remains robust.

**Global Climate Change - a Way Forward**

Climate change is a long-term global issue that, in the last decade, moved from a scientific question into the international political arena. As recently as 1990 the United Nations-sponsored Intergovernmental Panel on Climate Change (IPCC) reported that a global
warming trend may be underway, and that greenhouse gases emissions from human sources may increase the potential impact of global warming. The IPCC recommended that an international agreement be negotiated setting forth a pathway to limit man-made greenhouse gas emissions, especially energy-related carbon dioxide emissions. In 1992, 160 nations heeded this advice and signed the Rio Agreement on Climate Change, formerly known as the “United Nations Framework Convention on Climate Change” (FCCC).

The United States was among the nations to ratify this agreement, which has as its objective stabilizing the atmospheric concentration of greenhouse gases at a level that prevents dangerous anthropogenic interference with the climate system. In ratifying the FCCC, the United States, Europe, Japan and other industrialized countries agreed to take the lead in modifying longer-term trends in anthropogenic emissions, to make best efforts to reduce emissions to 1990 levels by 2000 and to provide technology aid funds to developing countries to ensure that emission levels would remain as low as possible—without jeopardizing economic development.

In the months that followed, many U.S. companies, and even entire industry sectors, began to develop programs to increase operating efficiencies, put new technologies in place, and implement business practices aimed at lowering greenhouse gas emissions—while, at the same time, maintaining a growing U.S. economy. These voluntary programs, often in conjunction with government partners, have paid off. Recently, the Department of Energy released a report showing that U.S. greenhouse gas emissions are more than two hundred million tons per year lower than they would be had industry and business not taken these voluntary actions.

A sound long-term climate change policy that complements a sound long-term energy policy must be developed to ensure that the greenhouse gas emissions growth line continues to bend downward while the economic growth curve continues to move upward. Sound climate change policies can make this happen, particularly if these policies:

- Emphasize voluntary action;
- Are cost effective, flexible and focus on long-term solutions that recognize that our economy is built on the availability of reasonably priced energy of all forms;
- Address both cost-effective mitigation actions—such as avoiding emissions through enhanced energy or operating practices—and adaptation to changes that occur for whatever reason;
- Expand research programs that address science, economics and technology development;
- Remove barriers to the deployment of new technologies and encourage rapid deployment through incentives;
- Address the needs of developing nations, including their desire to build their domestic capabilities and grow their economies; and,
- Encourage local action and actions by governments as well as by industry.

Unfortunately, as we enter the 21st Century U.S. climate policy is not based on a long-term strategy. Over the last three years, the US Administration’s strategy has been short term and directed at ratifying and implementing the 1997 Kyoto Protocol. This agreement, concluded in December 1997, would require the U.S. and other developed countries to meet mandatory emission reduction targets by 2008-2012. For the United States, the Kyoto Protocol would mean a reduction of greenhouse gas emissions to a level that is seven percent below 1990 levels with additional but as yet unidentified reductions, after 2012. To meet the
initial target the U.S. would have to cut its emissions by 30-35 percent below projected levels. Doing so would be very costly. Most analyses show that reaching this target in such a short time period would reduce the U.S. GDP by several percentage points.

To date, the Kyoto Protocol has not been submitted to the U.S. Senate. If it were, it likely would not be ratified, which is a requirement for the United States to be bound by that agreement. The United States is not alone in its concerns about the impact of the Kyoto Protocol. As of January 2001, no developed country has ratified the agreement. Most nations realize that the Protocol would require significant changes in energy, economic and trade policies and would seriously affect the lives of every citizen. Moreover, the European Union has strenuously resisted elements in the Protocol that theoretically could reduce the cost of compliance. These elements include a proposed emissions trading program, the Clean Development Mechanism (directed toward emissions abatement in developing countries) and land use and forestry programs. Such elements are key to offsetting costly short-term mandatory emission reduction targets. To date, nations are looking for reasonable and cost effective approaches to deal with the climate issue. Increasingly, it is appears likely that most nations will concentrate on new technology development, deployment and transfer to limit greenhouse gas emissions.

In the decade ahead, the federal government should seek to meet the commitment expressed in the FCCC by devoting sufficient scientific resources to determine the maximum atmospheric concentration of greenhouse gases that would “prevent dangerous anthropogenic interference with the climate system” (From Article 2 of the FCCC). Additionally, the U.S. should work with other nations, including developing countries, to establish an equitable long-range plan to prevent the exceeding of this unacceptable concentration. This plan should include all market-based measures that contribute to the ultimate goal, including making maximum use of cost-reducing implementation measures. Moreover, governments should work with industry to develop a broad suite of technology options from which energy users could select in order to meet climate change policy goals in 2050, 2075 and 2100.
POLICY RECOMMENDATIONS

Competitive markets, investment tax credits, deregulation, environmental impact statements and licensing permits are among the tools available to National Energy Strategy policymakers. The following are the policy recommendations and tools that members of the United States Energy Association believe would most effectively help a wide array of U.S. energy producers and energy-related service companies meet America's growing demand for ready, reliable, secure and affordable energy resources:

Enhancing Energy Supplies

- The nation should encourage power supply expansion with policies that fully recognize that no single energy source can meet our growing energy needs. This means that any federal incentive that encourages energy production should promote maintenance of a diverse energy portfolio made up of fossil fuels, nuclear and renewable energy sources. Sufficient availability of basic energy fuels as feedstock for non-energy applications should also be considered in the development of a diverse energy portfolio.

- Policies that restrict access to energy sources should be modified to provide environmentally sound access to domestic resources in a way that supports the continuance of a diversified energy portfolio and reduces foreign dependence. Such policies should not merely focus on one aspect of the energy supply system, but rather support and encourage all components of a sector’s production and delivery of its energy supply (e.g., from oil exploration and production through the building of refining capacity). Congressional mandates under the Federal Land Policy Management Act and related acts should be adhered to. These acts require agencies to give balanced consideration to multiple competing uses of federal lands. Experience has shown that federal lands do not have to be restricted solely to environmental or aesthetic uses.

- National policy should specifically focus on diversifying energy resources in the national portfolio. The U.S. Strategic Petroleum Reserve should be maintained and utilized only for severe supply disruptions.

- Investment tax credit mechanisms and accelerated depreciation (or equivalent mechanisms) should be primary government tools to encourage reliable, affordable and environmentally effective energy supplies, end-use technologies and a sound energy infrastructure. Private investment should be encouraged through flexible tax mechanisms that insure equitable opportunities for all energy sectors. In the interest of stimulating the use of the most market efficient technologies, tax incentives should encourage facility construction but not subsidize the delivery of products to consumers.

- Tax incentives should be enacted to spur capital investment in the energy sector. These tax incentives will help the U.S. energy industry ensure adequate and uninterrupted energy supplies and services to U.S. consumers and enhance U.S. national
security through the preservation of a viable domestic energy industry. For example, expending of geological and geophysical (G&G) expenditures for oil and gas wells should be enacted. Tax incentives should also be utilized to encourage energy efficient capital stock.

**Encouraging Energy Efficiency and Affordable Prices**

- Energy efficiency should be promoted through governmental policies that focus both on production and demand. For example, the convergence of retail competition, wholesale competition, and improved technologies should greatly expand the type and magnitude of price-responsive demand in electricity markets. Efficiency products should be promoted through directed research and subsequent market availability. Artificial efforts to mandate market penetration of efficiency schemes should be avoided. Regulatory policies that allow and encourage retail customers to respond to market prices will improve economic efficiency, discipline market power, improve reliability, and reduce the need to build new generation and transmission facilities.

- Policymakers should rely on a properly structured marketplace for energy decisions regarding pricing, technology deployment, energy efficiency, and selection of fuels and energy suppliers. Market competition is a dynamic process that produces long-term benefits for the public. Governmental policies should seek to establish and preserve the conditions necessary for efficient competition to work. Government officials at all levels should only cautiously impose new regulations on the energy chain. Moreover, efforts to address health, safety, and environmental concerns should be based on sound science and cost-effective options. Specifically, regulations should not be imposed in the hope of reaching a goal that researchers cannot demonstrate as achievable at a reasonable cost.

- Energy markets should be free and competitive, and utilities should be allowed to compete fairly in these markets. Energy markets have been opened to competition, and increasingly consumers need to be free to buy their energy and energy-related services from whichever supplier they choose, including natural gas and electric utilities that wish to offer these services. Regulatory authorities should reject attempts to impose restrictions or competitive handicaps that limit the ability of distribution utilities to compete in newly emerging energy service markets, while ensuring against cross-subsidization between regulated and unregulated businesses. By doing so, regulators can preserve the social benefits of efficient competition in energy markets.

- The low-income home energy assistance program (LIHEAP) should be extended and funding increased. Currently LIHEAP funds are reaching only 15% of the households eligible for assistance. The low-income weatherization program should also be expanded.

**Stimulating Global Energy Trade and International Development**

- U.S. leadership in energy services and technology should be promoted on a global basis. Artificial constraints on exports and global market penetration should be severely limited. For example, unilateral trade sanctions damage U.S. companies, workers and consumers by excluding them from key markets in which foreign-based companies are free to invest.
- Tax provisions which diminish the international competitiveness of U.S. multinationa energy companies by exposing those firms to double taxation (i.e., the payment of tax on foreign source income to both the host country and the United States), and to restrictive anti-deferral rules, should be eliminated. The complexity of the U.S. international tax rules obfuscates tax planning and often introduces substantial risks, hindering effective capital investment.

- A cornerstone of U.S. foreign policy and development assistance should be to institute a "Marshall Plan" to increase the supply of reliable, affordable and market-based energy for developing countries and countries in economic transition in a manner that opens markets to U.S. goods and services, fosters cooperative partnerships between the U.S. and overseas energy firms, and enhances international economic and political security. This plan would encourage the export of advanced U.S. technologies, policies and practices appropriate to developing countries for the efficient supply and use of energy.

- Foster more open political, legal and institutional structures in developing and reforming countries so as to encourage energy trade and investment. U.S. expertise and technology can be utilized to serve the global market through capacity-building, sectoral reform and financing.

Promoting Energy Technology Development and Long-Range R&D Initiatives

- Investments in energy technology research and development should focus on energy sources and uses that realistically can be expected to have a significant impact on economic growth and environmental performance over the next 20 - 30 years. This requirement implies the development of a balanced portfolio of energy sources and fuels (fossil, nuclear, renewables) to promote national security. Structural changes and technologies that increase the flexibility and value to the user of the energy system should also be encouraged. Finally, technologies must be developed to assure that we will be able to handle increased traffic levels and meet the needs of a digital economy.

Balancing Energy Use and Environmental Concerns

- Government sponsored education programs should recognize the importance of energy infrastructure and energy sources to continued energy security and economic development. Energy and environment programs should be deployed at all educational levels that recognize energy supply and energy efficiency as critical to the modern economy and national energy security. Maintenance of robust educational programs capable of producing engineers and technicians in sufficient numbers to meet the growing needs of the nation's energy infrastructure should be an important consideration in all government programs affecting educational institutions.

- The development and deployment of energy infrastructure should favor all technologies that are capable of producing energy at emissions levels below existing national standards. For example, if investment and production tax credits are used to encourage investment, the credits or other mechanisms should be available to all technologies that produce end-use energy below the emissions standards without the
application of administrative credits. Moreover, national policies should promote—at current or better levels—the maintenance of non-emitting energy technologies in the nation’s energy portfolio.

- **The safe and efficient movement of energy goods and services requires that increased attention be given to improving the United States transportation infrastructure.** For example, oil products and coal are heavily dependent on safe waterways and harbors and coal relies greatly on adequate railroad capacity. Most movement of energy goods and services require a well maintained road system.

Unifying the Energy Policy Process and Creating Regulatory Predictability

- **The President should establish an interagency task force on energy policy chaired by the Secretary of Energy.** The membership of the task force should include economic policy departments and agencies and the appropriate national security organizations.

- **Energy Policy must be predictable.** In recognition of the capital-intensive and durable nature of energy infrastructure investments, energy policy requires the adoption of a long-term view. Private investors in energy projects must be able to plan such investment with the reasonable certainty that, once begun, a project can operate in a regulatory climate, which safety can be forecast for the duration of the construction period and operating life of that facility. Revised regulatory standards should not be imposed until acceptable technology to achieve the new standards is demonstrable. This requires the use of fresh approaches to coordination by relevant agencies, such as regulatory bodies and those federal agencies responsible for sponsoring energy R&D. The net effect may extend considerably the time required to alter regulatory standards, but this approach is consistent with practices affecting operating licenses, which, at least nominally, provide for use of a new facility for four or more decades.

- **Comprehensive electric industry restructuring should seek to encourage long-term improvements to the electric system.** Finding the right mix of market solutions and government oversight to ensure an economical and reliable electricity supply will be difficult—but is possible. For example, 17 electricity restructuring bills were introduced in the 106th Congress. While no consensus legislative package has yet developed, significant issues embodied in the proposed legislation include, among others, repealing PURPA and PUHCA, facilitating new state restructuring actions by resolving federal/state jurisdictional issues, resolving market power and transmission access problems, and grandfathering existing state restructuring plans to protect them from federal preemption. Tightly linked with the emergence of efficient competition in the electric industry is the need for comprehensive tax legislation that facilitates the construction of new transmission facilities and provides fair electric competition among publicly owned, cooperatively-owned and shareholder-owned electric companies.

Moreover, Congress and policymakers should develop policies that promote investment in new generation and transmission lines. Policies should also promote voluntary flexible approaches to the creation of regional transmission organizations and electricity markets. Finally, the North American Electric Reliability Council should evolve into a self-regulating organization, with FERC oversight, that enforces reliability rules on all transmission operators and users.
INDUSTRY SECTORS

U.S. Energy Flow Chart 1999
(Quadrillion BTU)

Source: DOE/EA

Obtained and made public by the Natural Resources Defense Council, March/April 2002
OVERVIEW

While petroleum currently supplies 40 percent of America's primary energy needs, reliance on this fuel varies greatly by sector. For example, petroleum supplies 97 percent of transportation needs, 35 percent of industrial needs, 8 percent of commercial needs and 13 percent of residential needs. The most common—and important—petroleum products are gasoline, diesel fuel, kerosene, heating oil, residual fuel oil, liquefied petroleum gases, asphalt and petrochemical feedstocks.

Since 1970, production of crude oil has declined from 9.6 million barrels per day to 5.8 million barrels per day. At the same time, consumption has increased from 14.7 million barrels per day to about 20 million barrels per day, or some 300 billion gallons per year. During these same 30 years, oil imports have increased from 23 percent of U.S. petroleum demand to the current level of about 55 percent. The U.S. Department of Energy's Energy Information Administration forecasts that petroleum demand will continue to grow during the next two decades.

The Energy Information Administration's (EIA) Annual Energy Outlook 2001 highlights several other important facts about the role of petroleum in our nation's future:

- Net petroleum imports are projected to increase to 64 percent of U.S. demand in 2020.
- The greatest growth in petroleum demand will occur in the transportation sector, where increased travel more than offsets fuel efficiency gains.

Clearly, petroleum will provide a major source of energy for years to come.
EMERGING CONSUMPTION PATTERNS

The Energy Information Administration projects an increase in demand for all petroleum products of 1.4 percent per year for the next twenty years, or slightly higher than the 1.3 percent per year that EIA projects for all energy sources during this same period. This projection for higher petroleum demand comes at a time when consumers have endured a heating oil price spike and a gasoline price spike, and at a time when petroleum refiners have faced significantly higher crude oil prices.

As demand has increased and supplies tightened, the Organization of Petroleum Exporting Countries (OPEC) has reassessed its grip on world oil supplies, keeping crude oil prices above $30 per barrel for almost one year. U.S. imports of crude oil and products have grown during this same period, as has utilization of refinery capacity. Indeed, the petroleum industry continues to strain as it seeks to meet the growing demand for home heating oil, gasoline, diesel fuel and petrochemicals. In recent months the U.S. economy has slowed somewhat, but overall economic growth remains a healthy 2.4 percent and demand for petroleum continues to grow despite higher product prices.

EIA's Supply-Demand Scenario

In Annual Energy Outlook 2001, EIA analysts set forth a scenario that they believe will close the gap between rising petroleum imports and product prices and America's need for affordable, reliable energy supplies. Here are the outlines of that scenario, which looks out to the year 2020:

- Crude oil production declines by 0.7 percent per year.
- Crude oil imports increase by 1.6 percent per year.
- Petroleum product imports increase by 4.6 percent per year.
- New light duty vehicle efficiency increases from 24.2 to 28.0 miles per gallon.
- Freight truck and aircraft efficiency increase by about 0.7 percent per year.
- Refinery capacity expands from 16.5 to 16.2 million barrels per day.
- Refinery utilization increases from 93 to 95 percent.

Policymakers concerned about our nation's economic and energy future must decide whether this scenario is realistic. While it is impossible to assess precisely the likelihood of any forecast, or even the many elements of the EIA forecast, it is possible to compare EIA's projections to historical experience. It is also possible to identify the policy assumptions used to create this forecast and, of equal importance, to present a series of ideas to help policymakers forge an effective National Energy Strategy for the decades ahead.

History vs. Projections

EIA analysts argue that domestic crude oil production will slow significantly during the next 20 years. However, when they quantify that argument, they propose a modest decline in petroleum production of a mere 0.7 percent per year. This figure does not represent historical trends, which show a decline in U.S. crude oil production during the 1990s of some 2.5 percent per year. This slower rate of decline in petroleum production translates into a lower than expected rate of growth in crude imports, at least in EIA's scenario.

More specifically, EIA forecasts that during the next two decades the United States will...
increase its crude oil imports at the modest rate of 1.6 percent annually. However, during the past decade, U.S. crude oil imports actually increased a substantial 3.9 percent per year. The EIA scenario for petroleum products also is at variance with the historical record. EIA projects that petroleum product imports will increase at the rate of 4.6 percent per year. During the past decade, petroleum product imports actually declined by 1.2 percent per year.

History is no guide, either, to EIA projections about increases in vehicle efficiency. The EIA scenario foresees a faster rate of vehicle efficiency in the next two decades than occurred during the past decade, but the projected rate is slower than the actual rate of improvement during the mid-1980s.

On the other hand, EIA projections are fairly close to historical fact in the area of petroleum refinery capacity and utilization. During the past decade, U.S. refinery capacity has increased a total of approximately 850,000 barrels per day. This figure is comparable to EIA's forecast that within two decades, U.S. refinery capacity will have increased 1,700,000 barrels per day. The projected increase in refinery capacity utilization also appears to be close to the likely mark. While capacity utilization has increased from 86.6 percent to 93 percent during the past decade, EIA analysts forecast an increase of 2 percentage points by 2020.

POLICIES TO MEET AMERICA'S GROWING PETROLEUM DEMAND

While EIAs forecast is often at variance with the historical record, both history and EIA's most recent forecast indicate that petroleum demand will grow significantly in the decades ahead, even if all projected energy efficiency gains are realized. The only way to meet this increased demand for petroleum is to adopt national policies that support growth in petroleum supplies. The alternative is to limit demand by imposing sharply higher petroleum prices on U.S. homeowners, commuters, transportation companies and factories. However, these higher prices would slow U.S. economic growth.

Ensuring Adequate Supply

A National Energy Strategy can be developed that meets America's growing demand for petroleum without substantially raising prices. Studies have shown that vast amounts of proven crude oil reserves and undiscovered crude oil resources exist, both domestically and abroad. However, policies that support continued investments in finding and producing these resources are needed to bring these crude oil supplies to market.

Companies will make the decisions to invest in finding and producing the needed petroleum once policies are in place to support such long-term capital commitments. Unfortunately, the recent EIA forecast simply implies that significant investments will be made, domestically and abroad, without addressing the need to develop policies favorable to increased crude oil production.

The same is true of petroleum products. Stakeholders must come together to adopt policies that insure an adequate supply of gasoline, diesel fuel, home heating oil and petrochemicals. Concerns about environmental impact should take into consideration the unparalleled improvement in exploration and production technology. For example, the exploration footprint has been improved by 90 percent during the past decade, and similar, if less dramatic examples, exist in other areas of petroleum production.
Ensuring the Security of Petroleum Supplies

As noted, EIA analysts forecast a sharp increase in petroleum imports—the current rate of 55 percent to a rate of 64 percent in 2020. This increase in imports raises legitimate questions about security of America’s petroleum supplies. What countries can supply this growing volume of crude oil and petroleum products to U.S. consumers? Are these countries reliable suppliers? Do new and more diverse sources of petroleum exist that are not included in the EIA forecast? What role will OPEC play with respect to future oil supplies and prices?

Clearly, OPEC members have constrained supply during 1999 and 2000 and maintained relatively high prices. Will this pattern continue? If new petroleum producing countries join the world energy markets, will these countries become members of OPEC or another cartel?

As these questions suggest, the United States has less control over the security of its petroleum supply as long as we are heavily dependent on petroleum imports. Policies that promote diversification of supply would reduce this uncertainty. So would policies that enhance domestic petroleum production.

Stimulating Needed Investments

Policies that encourage investments in crude oil exploration and production need to be included in the National Energy Strategy. So, too, should policies that encourage major investment in petroleum refining, distribution and marketing. For example, the EIA forecasts that an additional 1.7 million barrels of capacity will be needed to meet demand in 2020. Who will finance this increased capacity, and who will build it? Will companies expand existing refineries, or will they need to build new ones—as many as eight to 10 major refineries to meet EIA’s petroleum demand projections?

And if refinery capacity utilization cannot increase to the 95 percent level that EIA forecasts, two additional new refineries will need to be constructed. However, no major refinery has been built in the United States during the past 25 years. What policies will Congress enact to support the construction of eight or more new refineries during the next 20 years? What policies will encourage major investment in the pipelines and terminals that will be needed to transport an additional 5 million barrels of oil per day to consumers?

The National Petroleum Council (NPC) published a study in June 2000 entitled “U.S. Petroleum Refining—Assuring the Adequacy and Affordability of Cleaner Fuels.” The study assessed government policies and actions that would affect product supply and refinery viability. The study concludes that the refining and distribution industry will be significantly challenged to meet the increasing domestic light petroleum product demand with the substantial changes in fuel quality specifications recently promulgated and currently being considered. The NPC study contains specific recommendations and findings related to petroleum product supply and future refinery viability. The Secretary of Energy, in consultation with the governmental departments and federal agencies, shall report to the applicable committees in the houses of Congress on the findings and conclusions of the NPC study and on the adjustments to federal policy required to implement those findings and conclusions.

Encouraging International Energy Trade and Development

Because the United States faces increased dependence on petroleum imports during the coming decades, U.S. energy companies will need to be able to find and produce oil internationally. American companies are well positioned to do this. Most have gained a
technological advantage that ensures a fairly high rate of discovery and production. However, policies to support these international initiatives, which often involve considerable financial risk, need to be place. Some existing tax laws and other public policies hamper international efforts to find and produce oil in promising areas. Such policies should be reviewed and, if needed, revised to strengthen U.S. leadership in new petroleum exploration and production.

Energy Technology R & D

The U.S. petroleum industry is one of the most technologically advanced in the world. In recent decades, American petroleum companies have dramatically reduced exploration and production costs while sharply reducing as well the footprint required for new oil exploration. Policies should be put in place that assign a value to these technological advancements that is equal to the value assigned to technological advances in other energy areas. Certainly, government officials should not select winners and losers. Rather, a range of energy technologies should be encouraged, and the market should be allowed to adopt the most successful technologies as each new technology proves its worth to consumers.

Environment

The U.S. petroleum industry has dramatically improved its environmental performance by investing more than $8 billion per year in environmental initiatives, or a total of more than $90 billion during the 1990s. The industry remains committed to ongoing environmental improvements, but any additional environmental rules or regulations need to reflect sound science and the likely impact of such policies on U.S. petroleum supplies and the U.S. economy.

Indeed, some existing regulatory policies require close scrutiny. Over the years, a patchwork quilt of conflicting and overlapping regulations has made expansion of the petroleum supply structure nearly impossible. Policies should be put in place that reflect growing demands on the U.S. petroleum supply infrastructure as well as the need to maintain environmental quality.

Transportation

The internal combustion engine—running on petroleum—will remain the dominant powertrain for personal vehicles for the foreseeable future. Even if promising advances in fuel cell and hybrid technologies produce a new breed of vehicle, years will pass before these new technologies significantly replace the current U.S. fleet of more than 200 million gasoline and diesel powered cars, buses and trucks.

For example, a recent study by the WEFA Group found that over 80 percent of the vehicles purchased today would still be on the road in 2008. In short, several decades are likely to pass before the current fleet is replaced by a new powertrain technology, or by significantly more efficient vehicles. Policymakers need to bear this hard fact in mind when developing transportation and environmental policies.

Moreover, most policymakers focus, understandably, on policies that affect cars, pickups and sport utility vehicles. However, other forms of transportation also merit consideration when formulating an effective National Energy Strategy. For example, trucks deliver over 70 percent of America's goods, measured by value. Rails, ships, pipelines and aircraft deliver the
rest. All of these transportation modes rely on petroleum as their major source of fuel, not only to move freight but also to move passengers.

To be effective, future transportation policies must reflect the complex interrelationship between petroleum, people, the delivery of goods and services, the environment and economic vigor—and the inestimable capital investment Americans have made in the current transportation infrastructure.

The safe and efficient movement of goods through the United States' port system, including a significant share of energy products, requires that channels be dredged and maintained at safe depths on a consistent basis. Safe navigation also requires accurate and current navigational charts for U.S. waterways. To date, however, these programs have been and continue to be so severely underfunded that it will take the National Oceanic and Atmospheric Administration (NOAA) 20 years to eliminate the survey backlog. Hydrographic survey data, which is the basis for nautical charts, should be collected using the latest hydrographic survey equipment. Some hydrographic data still being used is over 40 years old. All available resources, both public and private, should be fully utilized, without limits placed on the sources of certifiable survey data. The Harbor Maintenance Trust Fund should be taken off budget and used exclusively for harbor services. This would guarantee that resources are available to meet the growing needs of maritime commerce.

Finally, a national energy policy needs to recognize the international nature of oil transportation. Accordingly, the U.S. government should look to and support broad-based international solutions to marine regulatory issues. The International Maritime Organization (IMO) is the appropriate forum for discussions of such issues as vessel operations, ballast water management, marine air emissions, and vessel scrapping. The U.S. needs to remove barriers to the timely replacement of aging domestic tonnage and stimulate a robust domestic fleet.

**U.S. Fuel requirements in 2000**

Source: ExxonMobil

18205

DOE019-0172

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OVERVIEW

Natural gas—a fossil fuel composed almost entirely of methane—accounts for approximately one-quarter of the nation's primary energy consumption. Residential and commercial uses of natural gas include space heating, water heating, cooking, and clothes drying. Natural gas is used by industry both as feedstock in chemicals and in process applications. Moreover, power plants use natural gas to generate electricity, while private citizens use it for space cooling, as a vehicle fuel and in fireplaces.

Three segments of the natural gas industry deliver natural gas from the wellhead to the consumer. Production companies explore, drill and extract natural gas from the ground. Transmission companies operate the pipelines that link gas fields to major consumer areas. And local utilities, acting as distribution companies, deliver natural gas to individual customers.

The number of natural gas consumers has grown through the years, and now totals nearly 175 million Americans. Natural gas from 288,000 producing wells is forwarded by 125 natural gas pipeline companies through a 1.3 million-mile network of underground pipes to more than 1,200 gas distribution companies who provide customer service in all 50 states. Almost all of the gas consumed in the U.S. is produced in North America.

CONSUMPTION PATTERNS

U.S. consumption of natural gas has increased by roughly 13 percent over the last decade, and demand is expected to increase significantly in the future. This growth has occurred in
all sectors of the economy. In the residential sector, for example, 70 percent of new single-family homes use natural gas as their main source of heating fuel during 1998 and 1999. In the ten years since 1989, U.S. commercial use of natural gas has increased nearly 14 percent, and industrial consumption of natural gas has increased almost two quadrillion BTUs (quads). During this same period, natural gas use to generate electricity has risen approximately 12 percent.

This trend toward greater reliance on natural gas—which is expected to continue—can be attributed to a variety of factors, including favorable economic conditions, superior environmental qualities, and the high efficiency of gas systems. In addition, the natural gas resource base is far stronger than many people realized a decade ago. Moreover, opening natural gas markets to competition in recent years has contributed to efficiency improvements within the industry. The National Energy Strategy should encourage the continuation of these trends.

ENVIRONMENTAL BENEFITS

Natural gas offers numerous environmental advantages relative to many other energy sources. For example, natural gas emits negligible amounts of sulfur dioxide, particulate matter, ash, and sludge. Also, because it emits low levels of nitrous oxide and carbon dioxide, natural gas can help reduce acid rain, ozone, visibility problems, solid wastes and greenhouse gases. Of course no energy source is completely benign with respect to its environmental impacts, but natural gas is an extremely attractive option that can contribute significantly to a number of environmental objectives.

ENERGY EFFICIENCY BENEFITS

Only about ten percent of the natural gas produced is used or lost during production, processing, transmission, and distribution to the consumer. This gives natural gas a competitive advantage over many other energy sources. Equipment that utilizes gas is also far more efficient today than in the past. For example, gas-fired direct contact water heaters used in the textile industry achieve efficiency levels in excess of 99 percent, compared to a 33 percent efficiency level achieved using a prior technology. Similarly, new processes have enabled gas-fired infrared burners to triple their efficiency as well.

RESOURCE BASE

In the decades ahead, natural gas supplies likely will remain strong. Indeed, the North American resource base for this fuel should prove capable of sustaining current consumption levels well into the 21st century, and perhaps beyond. The National Energy Strategy should draw on this secure resource, secure because 87 percent of the natural gas consumed in America is produced in the United States, with the balance coming from Canada. Moreover, Mexico has a large natural gas resource base, and its high production capability makes this neighbor to the South a potential major natural gas supplier.

Although some have characterized the world's gas resource base as "finite," estimates of its size continue to grow. Indeed, as the tools and technologies used to estimate this resource base improve, most estimators have increased their numbers over time. For example, at year-end 1998, the Potential Gas Committee (PGC) estimated the United States' future supply of 18207

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natural gas at 1.241 quads, or more than 60 years of supply at the current rate of domestic production and consumption. For the past 30 years, PGC members have produced their estimates every other year, drawing on the expertise of hundreds of petroleum geologists and engineers. Interestingly, despite the consumption of more than 140 quads since 1990, the Committee's 1998 estimate exceeds its 1990 estimate (1.207 quads) by 34 quads. This is a 15 percent larger estimate than the 1990 figure, even though significant production (and consumption) has occurred. Much of this increase can be attributed to technological advances, which permit producers to harvest portions of the resource base that previously were unattainable.

PRODUCTION CAPABILITY AND TECHNOLOGY

The National Energy Strategy should reflect the fact that the natural gas resource base has become increasingly diversified. For example, coalbed methane—which accounts for six percent of domestic gas production—was not acknowledged as an important source 10 or 15 years ago.

Tremendous technological advances in natural gas exploration and production also have occurred in the past decade, including three-dimensional seismology, horizontal drilling, and innumerable computer-related breakthroughs. Similar advances will be needed to satisfy potential demand levels. With such advances, domestic gas production can increase from today's 18-plus quads to more than 29 quads in 2020.

Canada will contribute a slightly greater share of total supply in the future by increasing its exports to the U.S. from its current three quad level. Abundant gas resources worldwide and in Alaska offer mid-term insurance, while methane hydrates and other more exotic sources of gas provide long-term potential.

POLICIES TO MEET AMERICA'S GROWING NATURAL GAS DEMAND

The Impact of Deregulation

Policymakers devising a National Energy Strategy will need to consider the dramatic impact that deregulation, or "unbundling," has had on the natural gas industry. Deregulation gives customers the opportunity to purchase natural gas from someone other than the local natural gas distribution company. This trend toward greater customer choice at first gathered strength slowly as local gas utilities increased customer service options, then accelerated dramatically following a 1985 Federal Energy Regulatory Commission (FERC) decision to promote open access to transportation on the interstate natural gas pipeline system for all gas buyers.

By 1999, customer choice volumes accounted for 61 percent of end-use natural gas purchases by customers. Under current and proposed tariffs and choice programs, 81 percent of the volumes could be purchased from a source other than the local gas utility. Almost all industrial and electric utility customers have this option, while almost 70 percent of commercial customers and almost half of residential customers have a choice as well.
Demand Forecast

Natural gas deregulation, the environmental benefits that natural gas can provide, improvements in end-use natural gas applications technologies, and the strong and secure resource base that this fossil fuel enjoys places it in a favorable position vis-à-vis policymakers and consumers in the coming decades. Indeed, both the Energy Information Administration's forecast and the American Gas Association's Fueling the Future study's accelerated demand projections estimate that, by 2020, natural gas consumption could reach 35 quads, compared to a demand for approximately 21 quads in 1999.

While the EIA forecast assumes most of the increased demand will be generated from the electric generation sector. Fueling the Future estimates that nearly half of this projected increase could come in the residential and commercial sectors, where more new customers are choosing natural gas and more existing customers are switching from other fuels to natural gas. The study also shows continued expansion in the amount of natural gas sold for relatively new applications such as residential gas fireplaces and commercial gas cooling systems. In addition, advances in distributed generation (e.g., reciprocating engines, microturbines, and fuel cells) are anticipated, and these advances could account for roughly 20 percent of all new electricity generating capacity in the coming decades.

Moreover, during the next 20 years industrial gas demand could grow approximately 2.5 quads under the accelerated projection, continuing the robust growth of the past 10 to 15 years. Although the cogeneration market shows signs of saturation, other forms of distributed generation are expected to prosper. Highly efficient heating, cooling and process equipment continues to evolve, enabling natural gas to remain the dominant source of energy for the nation's factories.

Natural gas-powered transit buses, trucks, vans and cars currently consume about one quad more natural gas under the accelerated projection. Although these vehicles account for less than one percent of the overall vehicular market in 2020, they can make significant contributions to air quality and operational economics, primarily in fleet applications in congested urban areas.

Although natural gas consumption used by central-station power plants to generate electricity more than doubles by 2020 under the accelerated case, this figure is lower than the EIA forecast. For example, natural gas would remain the dominant fuel for new generating capacity, even if some new coal-based capacity were to be added after 2010.

More significantly, less new generating capacity is expected to be required under the accelerated scenario than under other projections. That's because the accelerated scenario assumes that the lives of some existing nuclear and coal power plants will be extended and that strong growth will occur in the use of distributed generation. In the increasingly deregulated energy marketplace, consumers will determine the pace at which new energy technologies are brought on line. The forces of the deregulated natural gas marketplace need to be incorporated in a National Energy Strategy.

Investment Needs and the Policy Environment

The U.S. natural gas industry is both large and capital intensive. Existing natural gas industry assets total more than $250 billion, including a 1.3 million-mile transmission and distribution system valued at nearly $150 billion. Of the 1.3 million-mile total, nearly 1 million miles is devoted to distribution. The U.S. natural gas industry also counts more than 400 storage facilities among its holdings. These facilities are often located close to end-user
markets, where the gas is injected during off-peak periods and withdrawn in periods of peak demand. The natural gas industry employs more than 150,000 people, and this figure does not include exploration and production employees.

Legislators should develop supportive policies—and remove barriers—so that the natural gas industry can obtain the financing its needs to meet demand forecasts. For example, to meet the 2020 projection, current transmission and distribution line mileage must be increased some 30 percent. Doing so will cost more than $150 billion. Moreover, additions to the distribution system will cost nearly twice as much as additions to the pipeline system. Although these investment levels are certainly significant, they are not dramatically different from the levels experienced in the 1990s—a modest increase for distribution and a modest decrease for transmission.

The investment required for the necessary exploration and production activity assumed in the forecasts will certainly be greater than the requirement for transmission and distribution system expansion. More wells will need to be drilled, and more drilling rigs will be required. Although the number of oil and gas wells drilled per year may have to double—to approximately 30,000 new wells per year—this figure is well below the peak levels of the early 1980s, when from 70,000 to 90,000 new wells were drilled each year.

Finally, formulators of the National Energy Strategy should bear in mind that the natural gas industry’s drilling fleet has aged, and that significant investments will be required for upgrades. Capital investments of $40 billion per year ($1998) may be necessary, and acquiring this level of capital may prove difficult in an economy that still places a premium on “high-tech” investment opportunities. However, raising these funds is not an insurmountable task. Compared with the investment levels of the mid-1980s, future investment requirements appear less extreme. Moreover, drilling activity slowed significantly in the 1990s, so the expanded drilling activity needed to meet the accelerated projection demand looks quite dramatic—until one compares it to a longer historical standard.
COAL

OVERVIEW

Coal accounts for approximately one-third of the United States' primary energy production, the single largest share of any domestically produced fuel. Estimated recoverable reserves in the United States total 275 billion short tons, or a 250-year supply at today's production rates, according to a 1997 Energy Information Administration update. Reserves are located throughout the nation, and current productive capacity is sufficient to meet the expected continued increase in demand.

Currently, coal accounts for approximately 23 percent of U.S. energy consumption. While coal is primarily used to generate electricity, it is also essential to the production of steel and cement. Other industries, including paper and chemical manufacturers and the food processing industry, use coal to create steam and electricity. Finally, coal is used to generate heat in some small commercial establishments, but this use is diminishing rapidly.

Coal is an affordable and reliable domestic energy source and therefore contributes significantly to the security of the nation's overall energy supply. The coal that is not consumed here is exported to other major industrial or emerging economies, thus contributing positively to the U.S. balance of trade and the global economy.

PRODUCTION AND CONSUMPTION PATTERNS

The U.S. coal industry grew at a slow but steady pace during the 1990s. Production increased an average of 1 percent per year and is expected to reach 1.1 billion short tons when figures for the year 2000 are finalized.
Coal is Produced in 26 States

An effective National Energy Strategy will take into account the fact that coal is produced in 26 states, which the industry typically groups in three geographically distinct regions:

- The Appalachian states, ranging from Pennsylvania to Alabama, which produce approximately 40 percent of the nation's coal, the entire nation's metallurgical coal, and most of our export coal. Underground operations are dominant in this broad region.
- The Interior states, which include Illinois, Indiana and Western Kentucky. Here, steam coal is produced by medium sized surface mines.
- The Western states, and particularly Wyoming—the largest coal producing state in the country—which use large surface mines to produce steam coal.

During the past decade, coal production has shifted from the eastern to the western United States. For example, in 1999 more than half the 1.1 billion tons of production originated in western states. Moreover, as demand has increased for lower sulfur coal, larger users of coal also have shifted from east to west.

Economic Benefits

The U.S. coal mining industry generates some $160 billion in economic activity, including $19 billion in revenue for federal and state governments and $105 billion in income to coal and its supporting industries. The coal industry directly employs 80,000 workers, and the nearly one million industry-related jobs produce $37 billion in annual wages throughout all 50 states.

Productivity, Reserves and Demand

During the past decade, productivity in the coal industry has nearly doubled. This trend is expected to continue as new technologies and more productive mining methods are brought on line. These same new technologies make mining safer than ever. Moreover, new technologies and advances in mining techniques have increased coal resources and output while protecting the environment. Whether meeting air or water quality standards, protecting wetlands or reclaiming surface mined land to better than original conditions, coal producers meet and exceed all current legal standards. The industry is committed to continuing this high level of performance.

POLICIES THAT THREATEN MINING CAPACITY

Current production capacity and coal reserves are sufficient to meet any increase in domestic demand. However, at least two current policies discourage investment that would expand coal mining capacity in the United States. Indeed, several policies could eliminate some current mining capacity. Such policies should be reviewed during the formation of a National Energy Strategy.

For example, the Environmental Protection Agency (EPA) interprets Clean Water Act regulations regarding valley fills in a way that threatens even near term coal production from several operating mines in some Appalachian states. Eliminating production from these
mines would strain productive capacity in other coal producing areas and would significantly disrupt the coal transportation system.

Similarly, land access policies affect both current and future coal production capacities. For example, the decision to use the Antiquities Act to declare certain federal lands "National Monuments" effectively removes a large portion of the western reserve base from production. Actions by the Bureau of Land Management and the U.S. Forest Service, which place reserves on federal lands managed by those agencies off-limits to development, also potentially limit mining capacity. Over time, such actions could deplete the U.S. coal reserve base.

LOOKING TO THE FUTURE

Coal Consumption Data

Almost all the 1.1 billion tons of coal produced in the United States is used domestically. In 2000, utilities and independent power producers will use 973 million tons of coal to generate almost 2 trillion-kilowatt hours of electricity for use in homes and businesses throughout the United States. Coal use for electricity is an even 200 million tons, or 25 percent more than coal used by the utility sector in 1990. Coal is a popular fuel for the utility industry because, on a cents-per-million Btu basis, coal remains the lowest cost fuel available for the generation of electricity. This gives coal-fired utilities an advantage in an increasingly deregulated and competitive, market. Moreover, advances in combustion technology have increased fuel efficiency while lowering the emission of all legally identified pollutants.

Coal use is not exclusive to the electric utility industry, however. Steel mills are expected to consume some 28 million tons of special grade metallurgical coal to make coke in 2000. Major industrial users of energy and retail users, such as homes, hospitals, schools and small commercial establishments, are expected to use approximately 70 million tons of coal this year. Finally, in 2000, U.S. coal producers will export 58 million tons of coal to steel mills and electric utilities in Canada, Europe, South America and to a lesser extent to the Far East and Japan. Given the domestic abundance of coal, import figures are insignificant and are expected to remain so in the coming decades.

Demand Forecasts

All forecasts of future energy demand show that coal will continue to play a vital role in the United States energy picture. Most forecasts estimate that production will increase from today's level of 1.1 billion tons to from 1.2 to 1.4 billion tons by 2020.

In the future, coal is expected to continue to be used to generate electricity, with as much as 1.1 to 1.25 billion tons consumed annually for this purpose by 2020. The deregulation—and increased competitiveness—of the electric generating industry places a premium on coal, which is both inexpensive and abundant relative to other domestic fuel sources available to this sector of the economy.

Coal use in other markets is expected to remain at current levels for the foreseeable future. For example, coking coal use by U.S. steel mills is expected to remain in the 25 -- 28 million ton range in the years ahead. This is a floor below which steel cannot go in the near term, but, because technological advances will likely continue in the steel making process, coal consumption is not likely to grow soon. Industrial coal use also is expected to remain fairly steady at 70 -75 million tons annually over the next 20 years. Expert levels will depend...