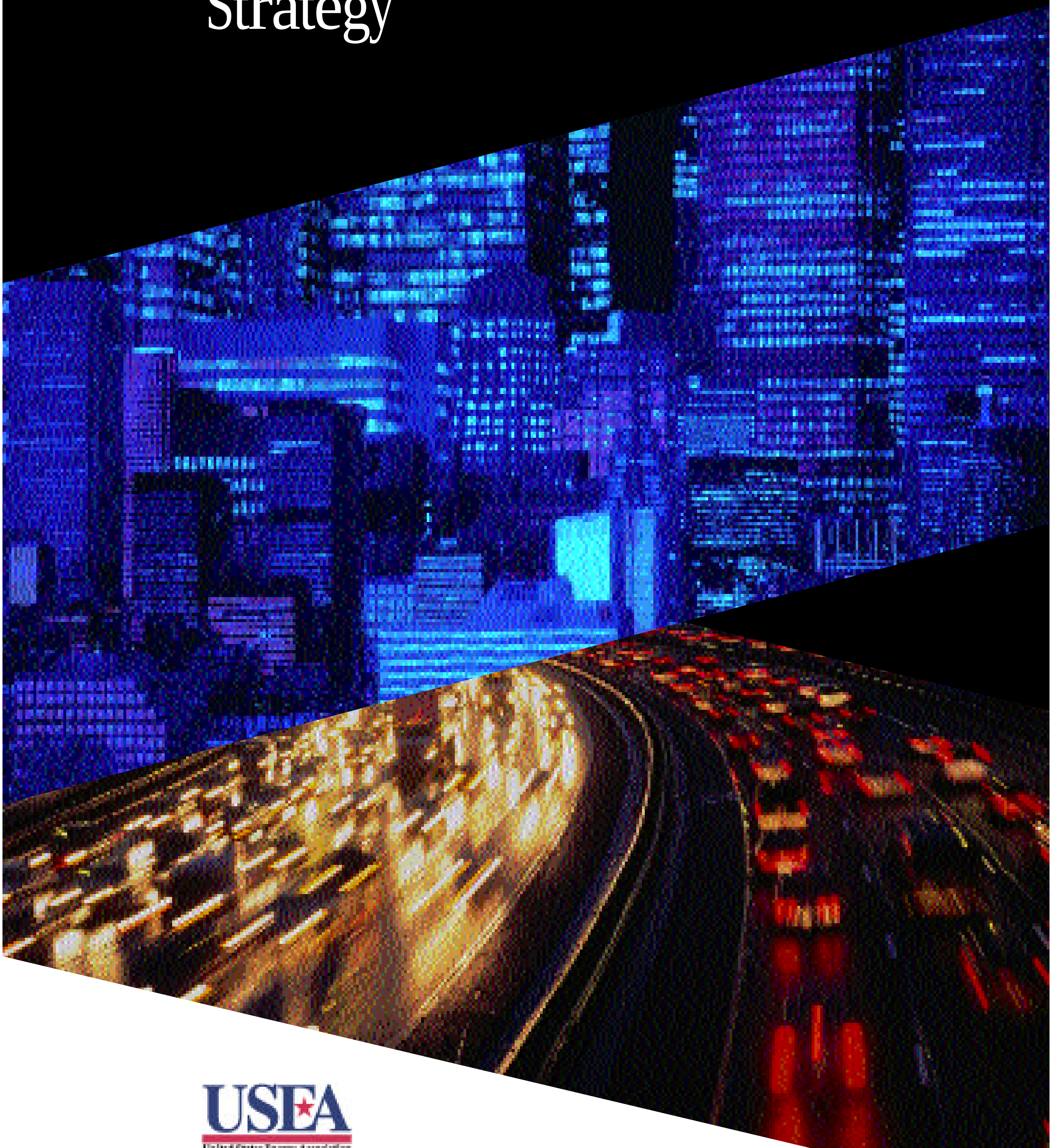
Toward a National Energy Strategy



USEA
United States Energy Association

ABOUT USEA AND THE NES STUDY

The United States Energy Association (USEA) is the U.S. Member Committee of the World Energy Council (WEC). USEA is an association of public and private energy-related organizations, corporations, and government agencies. USEA represents the broad interests of the U.S. energy sector by increasing the understanding of energy issues, both domestically and internationally.

In conjunction with the U.S. Agency for International Development and the U.S. Department of Energy, USEA sponsors our nation's Energy Partnership Program.

USEA sponsors policy reports and conferences dealing with global and domestic energy issues as well as sponsors trade and educational exchange visits with other countries.

The USEA Board of Directors agreed that the year 2000 was an appropriate time to take an in depth look at United States energy policy. Previously the USEA had published 11 Annual Assessments of U.S. Energy Policy. The Board approved the USEA National Energy Strategy project under the leadership of Richard Lawson, Chairman of its National Energy Policy Committee. The project was directed by Guy Caruso. Informed by the results of workshops on key energy issues, a working group representing all sectors of the industry has prepared the following report.

United States Energy Association

February 2001

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ELEMENTS OF AN EFFECTIVE NATIONAL ENERGY STRATEGY

SETTING THE GOAL

Members of the United States Energy Association (USEA) believe that energy policy-makers, regulators, consumers and producers face critical policy and investment choices in the decades ahead. In many markets increased demand outstrips reliable supplies. Key industries are being deregulated. Technology is advancing at an unprecedented rate. Environmental regulations have grown increasingly costly and complex. Consumers often express confusion at the array of energy choices now available. And energy companies confront both greater competition and unforgiving financial markets that can heavily penalize those companies that expand production to meet the increased energy demands of our growing population and economy.

The proper response to these uncertain times is the development and implementation of a sound National Energy Strategy (NES). USEA members propose that the objective of this strategy be the delivery to consumers—in a ready, reliable and environmentally responsible manner— of an increased supply of affordable energy resources and energy-related services from a broad range of energy providers.

CORE PRINCIPLES

USEA members believe that this National Energy Strategy should be anchored in four core principles:

- Economic efficiency. Economic efficiency is maximized when competitive markets guide decisions affecting global energy supply and demand. Moreover, given the inherent uncertaint of energy markets and of efforts to project future trends, a diversity of fuels strategy has proven moreefficient than picking “winners and losers” when addressing long-term energy problems.
- Energy security. Energy security is best achieved through diverse supplies of all forms of domestic and international energy. Similarly, contingency plans are needed to mitigate energy supplydisruptions, and these U.S. plans can be enhanced through international cooperation.
- Energy technology. Research and development can spur improvements in energy technologies that produce long-term cost-effective solutions to many environmental concerns. Research to address environmental problems and to expand energy choices is an appropriate and essential role for government. Partnerships between public and private sectors (domestic and international) can also speed this process.
- Regulation and incentives. Government officials can use regulation and incentives to ensure public health, safety and consumers rights. Decisions to use these policy tools should be based on sound science and realistic needs. Such decisions also should be timely, consistent and coordinated so that the benefits of responsible environmental protection are kept in balance with the benefits of energy use.

A national goal and these core principles alone, of course, are insufficient to build an effective National Energy Strategy. The principles must be applied to key policy issues, and input should be sought from those most affected by policy decisions. It is critical that the new Administration focus not only on the near-term issues that are in today's headlines, but also on long-term issues. The concern over potential climate change, attributed in part to fossil fuel combustion, could be a major factor in shaping future energy choices. It is critical that policymakers and energy producers look to 2050 and beyond in shaping our research and regulatory agendas, and that we consider the long-term implications of policies we adopt today. Other long-term issues, such as depletion of traditional energy resources and the need for developing technologies to find and produce non-traditional energy resources must also be contemplated in current policies. This long-term planning, conducted in an open process with non-governmental organizations (NGOs) and private sector participation, is an appropriate federal role. The following are policy issues which USEA members regard as critical to the development of a sound National Energy Strategy.

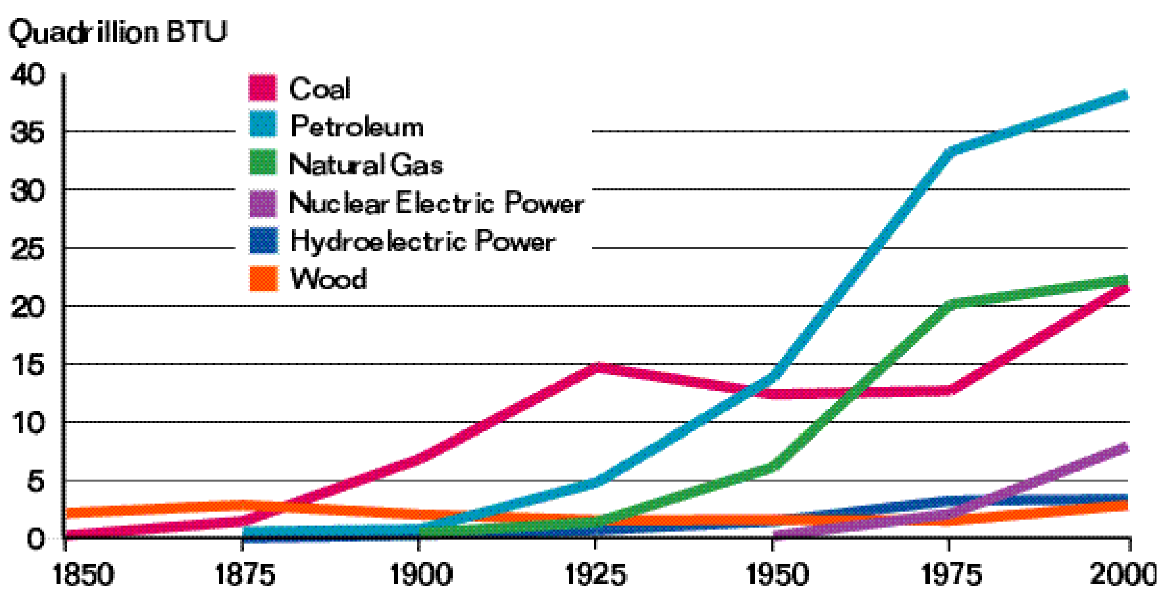
KEY ISSUES

Meeting U.S. Energy Requirements

The President and Congress can help energy producers and suppliers insure an adequate energy supply to support the nation's needs as we enter the 21st century. However, securing a reliable energy supply in the coming decades will require careful review of policy options and judicious action by policymakers and government officials at every level.

Careful deliberation is required because energy production and consumption is so inextricably tied both to economic growth and population growth. For example, the United States experienced a significant economic boom at the close of the 20th century, supported in part by a dramatic rise in consumption of affordable energy. However, this expansion of

Energy Consumption in the United States 1850 – 2000



Source: United States Department of Energy/ Energy Information Administration energy consumption occurred at a time when energy supplies, particularly in the electricity sector, barely expanded at all. Substantial reserve margins at the outset of the recent economic expansion made economic growth possible, but those margins have now been depleted. Electricity capacity and, more broadly, energy supply must be increased to support continued U.S. economic growth, even at a reduced annual rate.

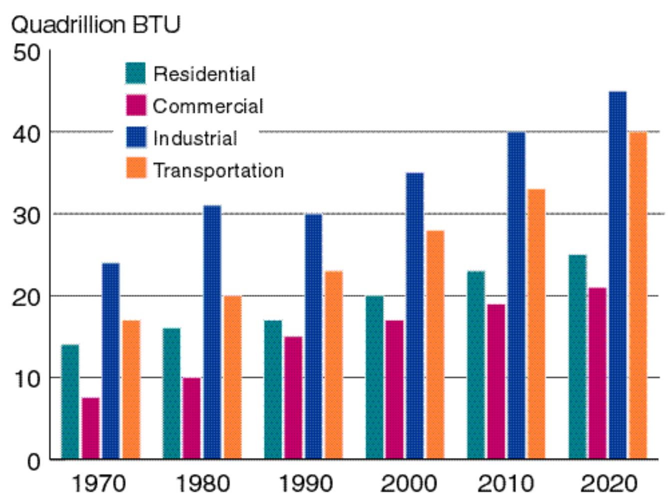
The Annual Energy Outlook 2001 Forecast

Energy policy must insure that supplies are adequate. The most recent Department of Energy/ Energy Information Administration Annual Energy Outlook 2001 (AEO) reveals that the demand for energy of all forms is likely to increase significantly over the next 20 years. By 2020, total energy consumption is forecasted to increase by 32 percent, petroleum by 33 percent, natural gas by 62 percent, coal by 22 percent, electricity by 45 percent and renewable energy by 26 percent. At the same time, energy efficiency is projected to improve by 1.6 percent per year. The forecasts in consumption are stunning. Not only has crude oil production fallen by 14 percent since its peak in 1970, natural gas production also has fallen by 14 percent since 1973 and has remained virtually flat for seven years. Moreover, refinery capacity has fallen by 11 percent since 1981 and one-half of refineries have been shutdown over the same period.

The AEO forecast implies that massive investments in infrastructure will be made to produce and deliver energy to American consumers. However, the record to date does not inspire confidence that the current regulatory structure will support these investments. For example, the AEO projects an increase in refinery capacity of 1.7 million barrels per day and an increase in refinery utilization from 93 to 95 percent. A new EPA interpretation of rules relating to the expansion of existing capacity raises considerable doubt that this capacity will be built. If the 1.7 million barrels per day requirement is to be met through new capacity additions, eight to ten new refineries would have to be built. A large-scale refinery has not been built in the U.S. in over 20 years. The forecast also calls for an increase in refined product imports of 3 million barrels per day. This raises the question: will there be sufficient foreign refinery capacity to meet our stringent fuel specifications—especially with increasing regulation?

Similarly, the forecast for oil and natural gas consumption implies the construction of major new petroleum products and natural gas pipelines. Other natural gas facilities and petroleum terminals and facilities will be needed to meet the increased demand. How are we going to do this given the daunting regulatory apparatus and the well entrenched “Not In My Back Yard” (NIMBY) culture? The answer is that we need to develop and implement an energy policy that focuses on adequacy of supply to meet the growing needs of consumers. The goal should be to provide reliable

U.S. Primary Energy Use



Source: DOE/EIA

and affordable supplies of energy to consumers. If it is not produced here, petroleum can be imported but most natural gas must be produced in North America because of very limited LNG import infrastructure. The AEO forecasts an increase in net oil import dependence from 55 to 64 percent during the next 20 years. This raises numerous questions about diversity of supply, national security concerns and the potential for increased price volatility.

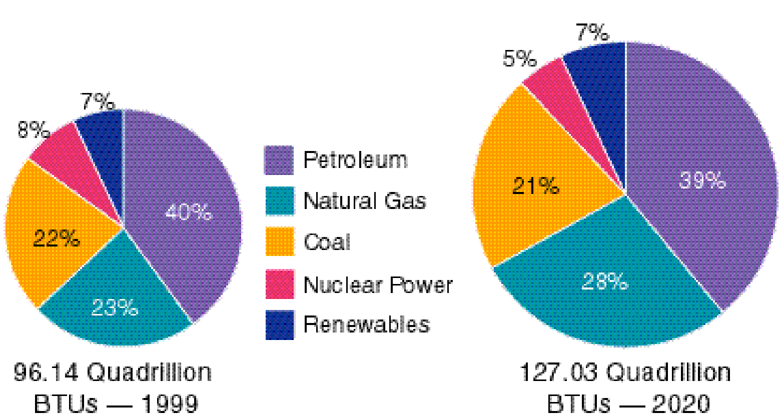
The current shortfall of reserve margins in electricity can be traced to a consistent pattern of demand growth exceeding expectations. Indeed, over the past decade almost all institutions engaged in predicting electricity demand growth have settled on the figure of an increase of about 1.5% annually. However, the actual growth rate has exceeded 2.0% annually. Recognizing this shortfall, the EIA's most recent forecast projects annual growth of 1.8% annually through the year 2020. By 2020, 393,000 MWs of new capacity will be required to meet demand growth and to offset capacity retirements. This is the equivalent of constructing approximately 40 new 500 megawatt power stations per year, over the next 20 years.

Closing this gap poses a major policy challenge. Moreover, policymakers face this challenge at a time when the national grid for electricity transmission is increasingly constrained and the ability to produce and deliver fuel to the generating facilities also is constrained. Furthermore, attracting investment and construction capital for infrastructure projects is growing increasingly difficult, as is permission to site new capacity, transmission and distribution facilities. In short, government intervention is required—in the form of an enlightened energy policy—in order to preserve economic growth, energy security and reasonable environmental protection.

Another major challenge is ensuring the reliability of the electricity transmission network, particularly at a time of increased market demand. Originally, transmission lines were used to deliver backup power and to economically exchange power among neighboring electric utilities. Today, market demand drives the use of the transmission system, and electricity is often "wheeled" great distances. Competition, in short, has turned local backup systems into a patchwork of interconnected electric super highways. This increased use has lead to concerns about congestion and reliability. Policymakers need to keep these new demands in mind and not create regulatory demands that compromise the transmission facilitates needed to carry power from where it is generated to where it is consumed.

Some have argued that America's energy problems can be resolved by increasing our reliance on solar, wind and energy efficiency measures. This report includes policy recommendations aimed at maintaining our diverse energy supplies. It also calls for more focused attention on energy research and development, and the continuation of efforts to develop solar, wind and efficiently applied technological initiatives that allow for market-based demand responses. However, the

Energy Demands to 2020



Source: DOE/EIA

principal focus of this report is on those energy resources and delivery systems that provide more than 98% of the nation's current energy supply. This is the appropriate focus for policymakers, too. Indeed, even if solar, wind, geothermal and efficiency measures quadrupled their contribution to the energy mix during the next 20 years, the dimensions of the energy supply issue described above remains essentially unchanged.

The evidence is everywhere that this nation faces a major energy supply challenge in the decades ahead. Failure to formulate effective policies to meet that challenge will likely compromise U.S. economic growth, energy security and social well-being.

Market-Based Energy Policies

The cornerstone of a sound National Energy Strategy is reliance on competitive markets to allocate energy supply and demand. This lesson is widely accepted and has proven, time and again, to be true. Of course markets are not perfect, particularly with respect to such externalities as energy security, public health and safety, and environmental protection.

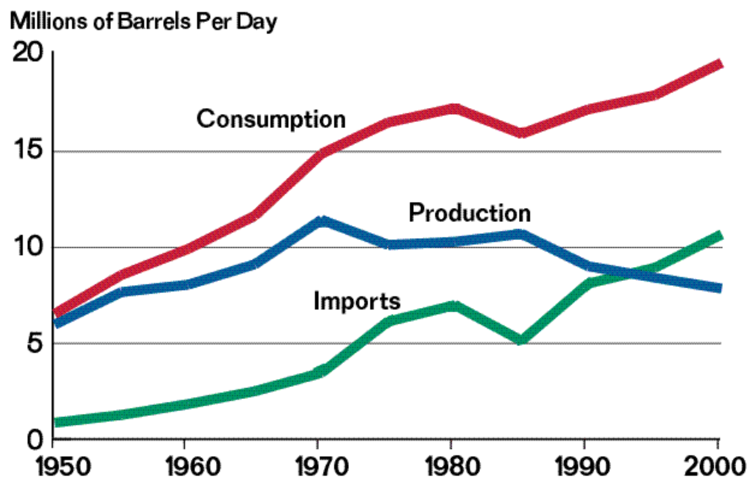
Here, government policy will continue to play an important role in the energy sector. However, government officials at all levels should not impose new regulations on the energy supply system—even in an attempt to address health, safety and environmental issues—unless those regulations are based on sound science and incorporate the most cost-effective options. Policymakers should also continue to substitute competition for regulation to achieve these same goals, whenever possible.

Security of Supply

The U.S. is the only major industrial nation that significantly limits access to its own energy resources. Because of these constraints, U.S. dependence on foreign energy supplies inevitably will increase over the next 20 years. Many of these constraints need to be reexamined. New technologies are regularly adopted for energy production, storage and delivery that address the very environmental or public safety concerns that originally led to constraints. These objections to energy development and production no longer may be relevant. As time and technologies change, so also should restrictive energy policies. Domestic energy resources, such as coal, petroleum, natural gas and uranium, must be made available for environmentally sound exploration and development.

Policymakers should also consider recent changes in the international arena. A disruption of U.S. energy supplies could cause signifi-

Petroleum Consumption, Production and Imports 1950- 1999



Source: DOE/EIA

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.

C**apital 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 economics.

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 – into 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 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 on-going 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 advise 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 and 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 in 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, expensing 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 polices 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. multinational 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.

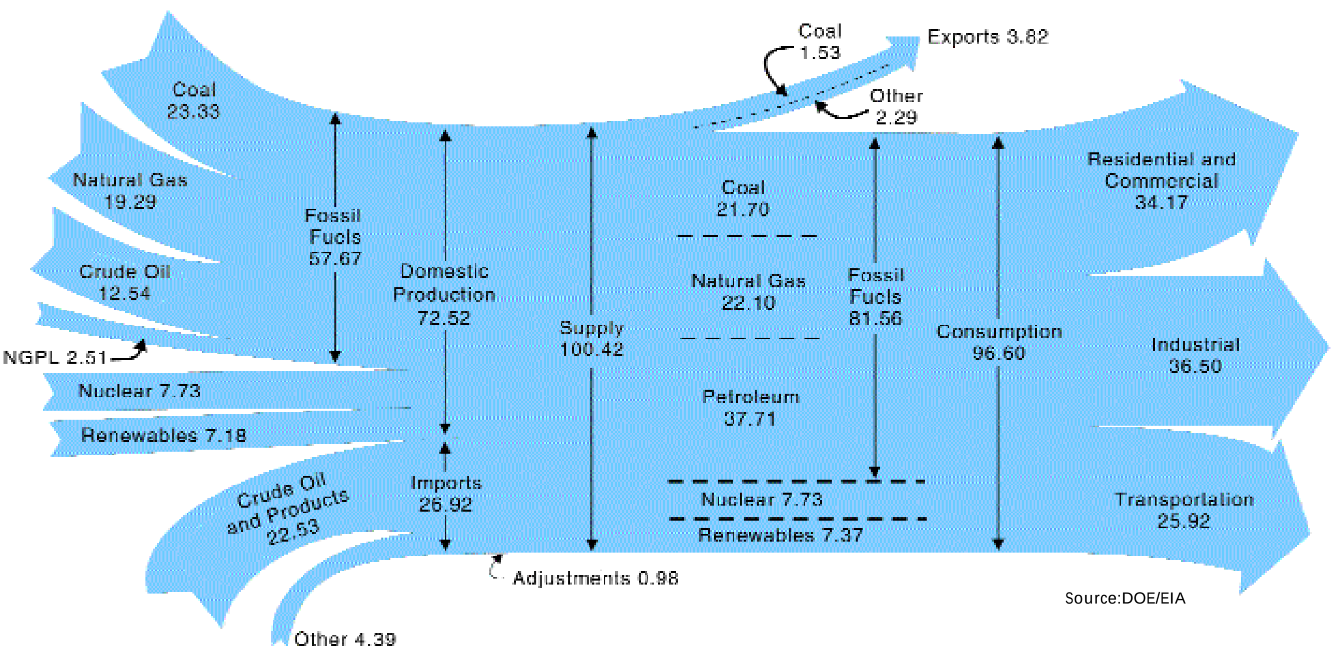
- **Energy Policy must be predictable.** In recognition of the capital-intensive and durable nature of energy infrastructure investments, energy policy requires the adoption of a long-term view. Private investors in energy projects must be able to plan such investment with the reasonable certainty that, once begun, a project can operate in a regulatory climate, which safely 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 polices 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.

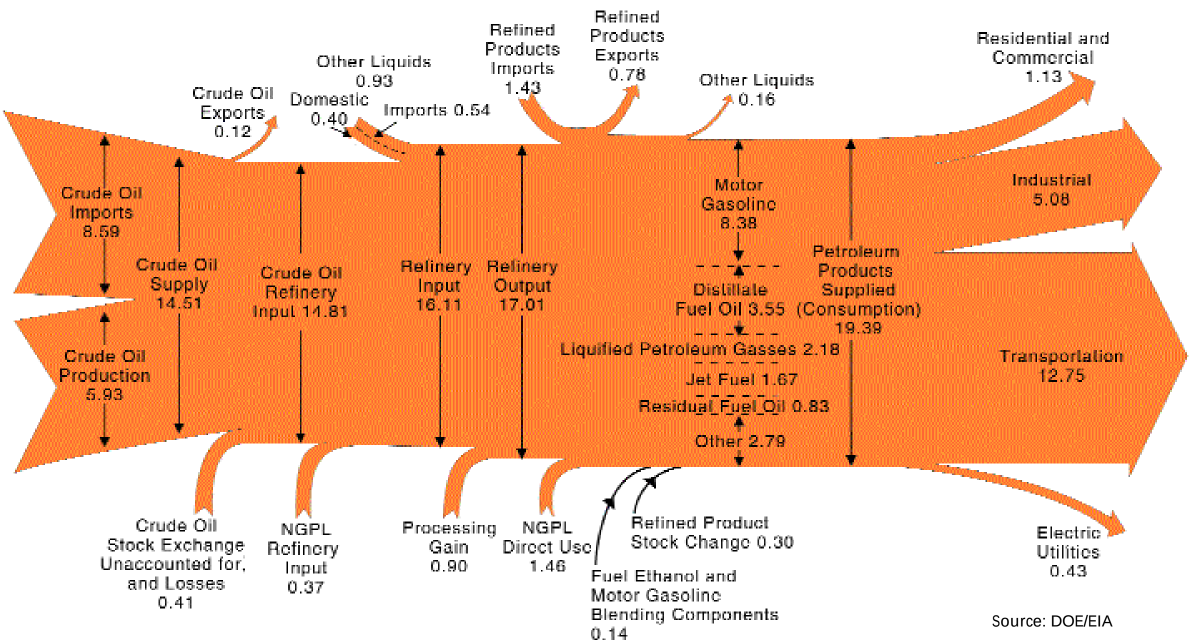
INDUSTRY SECTORS

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



PETROLEUM

Petroleum Flow Chart 1999



Source: DOE/EIA

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 reasserted 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 18.2 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 hew 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 EIA's 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, polices 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 polices 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 polices 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.

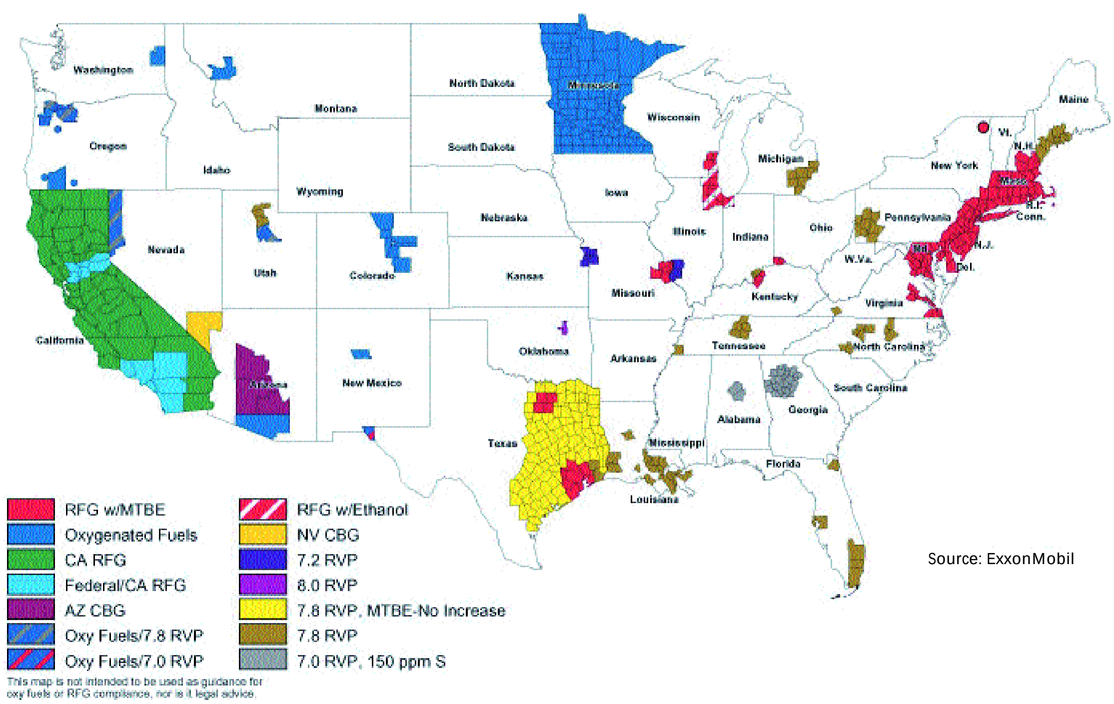
Moreover, most policymakers focus, understandably, on polices that affect cars, pickups and sport utility vehicles. However, other forms of transportation also merit consideration when formulating an effective National Energy Strategy. For example, trucks deliver over 70 percent of America's goods, measured 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.

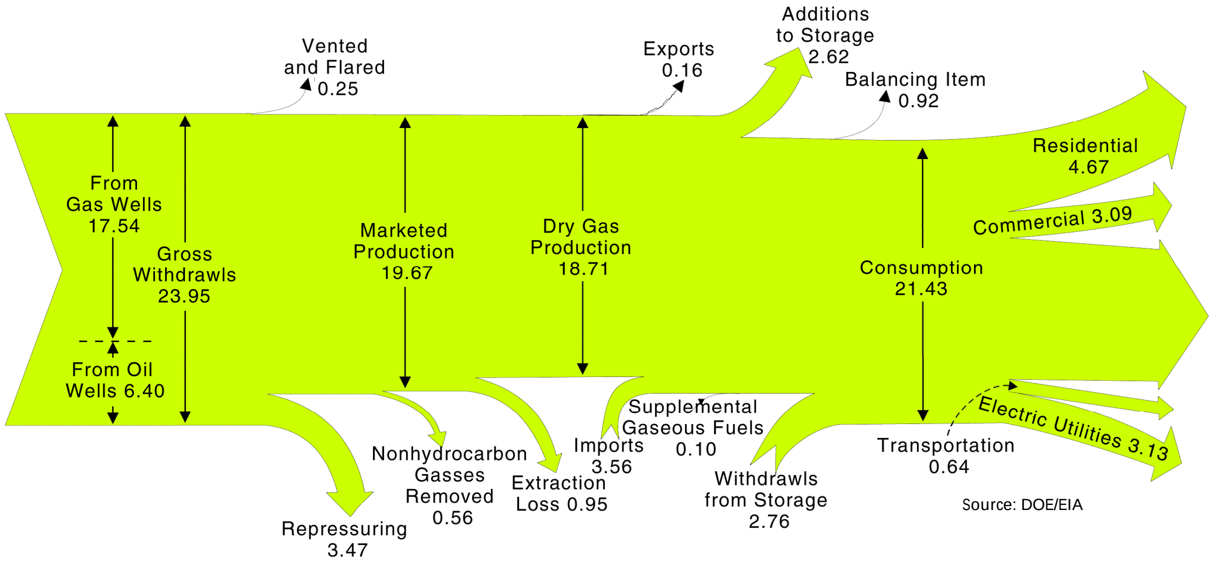
U.S. Fuel requirements in 2000



Source: ExxonMobil

NATURAL GAS

Natural Gas Flow Chart 1999
(Trillion Cubic Feet)



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 used natural gas 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 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 149 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 19-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.

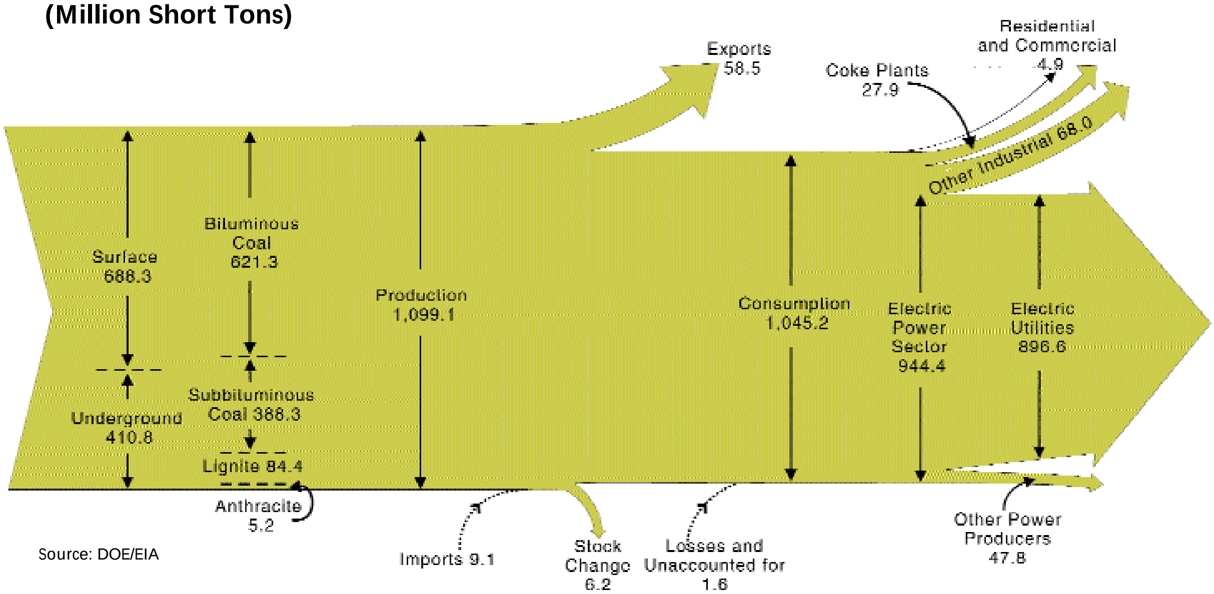
Legislators should develop supportive policies—and remove barriers—so that the natural gas industry can obtain the financing its needs to meet demand forecasts. For example, to meet the 2020 projection, current transmission and distribution line mileage must be increased some 30 percent. Doing so will 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 50,000 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

Coal Flow Chart 1999
(Million Short Tons)



Source: DOE/EIA

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 State 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 electricity 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. Export levels will depend on overseas demand, which in turn depends upon each nation's rate of economic growth and environmental policies, particularly those policies directed toward carbon reduction. The competitiveness of coal relative to other fuels likely will play only a secondary role in these export markets.

U.S. POLICY ENVIRONMENT

Whether the anticipated demand for coal is realized in the United States will largely depend on whether policymakers change existing policies that restrict both coal's availability and its use in the electricity sector.

Electric Utility Policy

As discussed in other sections of this report, demand for electricity is expected to continue to increase at a rapid rate during the next two decades. This increased electricity demand should translate into greater coal demand. However, because the electric utility industry is moving from a regulated to an unregulated market environment, both risk and uncertainty have been introduced vis-à-vis coal demand.

On the one hand, competition should dictate that the lowest cost producer of electricity—companies who use coal—should have an advantage in the open market. However, competition can also move generators of electricity toward the lowest risk option when considering new capacity additions, or even maintenance of, or modifications to, existing capacity. These considerations may dampen demand for coal.

Indeed, signs of this trend already are evident. Even though utility executives are thinking about new generating capacity and modifications of the existing fleet, electricity producers are not making investments to increase the use of coal, even though coal is the lowest cost alternative. One concern is that construction or modifications made to accommodate increased coal use will be rendered obsolete by regulation or litigation. Electric generators are facing an unprecedented wave of new environmental requirements, some of which are being imposed retroactively and thus produce protracted court action. For example, although great strides have been made in reducing emissions of SO2 and NOX, and the requirements laid out in the Clean Air Act Amendments of 1990 are being met, the Environmental Protection Agency has proposed even lower caps on emissions than those legally established by the amended Clean Air Act. The possibility of controls on mercury emissions adds yet another uncertainty.

In short, conflicting forces are at work here. The competitive market trend is toward lower cost generation—which argues for greater use of coal—while recent regulatory decisions are pressuring utilities to rapidly lower certain emissions levels—which increases the cost of using coal.

The Kyoto Protocol

The Kyoto Protocol, or the possibility of some other legally binding international agreement to reduce carbon emissions, adds to the uncertainty of the current U.S. regulatory situation. For example, a recent analysis by the Electric Power Research Institute (EPRI) shows that, if all proposed regulations and the Kyoto Protocol were to take effect, the amount of coal-generate electricity would decline to less than 300 million tons by 2020. Clearly, this is an extreme scenario, but a number of environmental issues now under consideration could sharply limit future U.S. coal use, if these issues are not resolved in a reasonable manner.

OPPORTUNITIES IN TECHNOLOGY

The Role of Technology in Energy Policy

A sound technology policy is key to balancing the growing demand for energy and the trend toward increasingly stringent environmental regulations. Effective technology policies will allow coal to reach its full potential, meet required environmental standards, and ensure that the United States utilizes its most abundant and reliable energy resource.

The nation also needs an energy policy which industry and consumers alike can depend upon for long term consistency—in other words, an energy policy that does not change rules in mid-stream, or retroactively, or based solely on political considerations.

During the past two decades, the use of new technologies and improved operating practices have improved the "environmental efficiency" per ton of coal consumed to increase by almost 70 percent. This trend will continue even as new SO2 and NOx controls come on line because advanced retrofit and repowering technologies enhance environmental performance and efficiency of existing coal-based generation plants.

The use of advanced coal technologies that are now, or will soon be, ready for deployment would effectively eliminate emissions that are considered a health risk, as well as substantially improve efficiency. The nation's energy policy must include a technology strategy that incorporates a comprehensive clean coal technology program to assist new and existing coal-fired units to remain competitive and meet environmental requirements. This technology strategy must encourage on-going research. It also must provide financial incentives sufficient to encourage application of advanced technologies at existing units, as well as encourage a program to demonstrate new technology.

Beyond control of traditional emissions, the coal industry also recognizes that carbon sequestration will be vitally important if it is found that reduction of CO2 emissions is necessary. A National Energy Strategy will not be complete unless it includes policies that stimulate the research, development and deployment of technologies to sequester carbon.

Deploying Technologies Internationally

In many countries throughout the world, energy use during the next two decades is expected to increase even more rapidly than in the United States. For example, the International Energy Outlook 2001, published by the U.S. Energy Information Administration, growth in energy consumption in the developing world, excluding Africa but including China, India and the countries in South America, is projected to exceed 3.5% per year through 2020. Conversely, United States and other industrialized countries will see an increase of approximately 1.0 percent or less per year on average. This rapid ramp up in energy use among developing countries will occur regardless of policies in the United States and other developed nations. That's because additional energy will be needed to support economic growth, and larger populations and a rising standard of living in these nations. The World Energy Council cites that up to 2 billion people lack access to commercial energy supplies in 2001 and that unserved population could reach 3 to 4 billion by 2050.

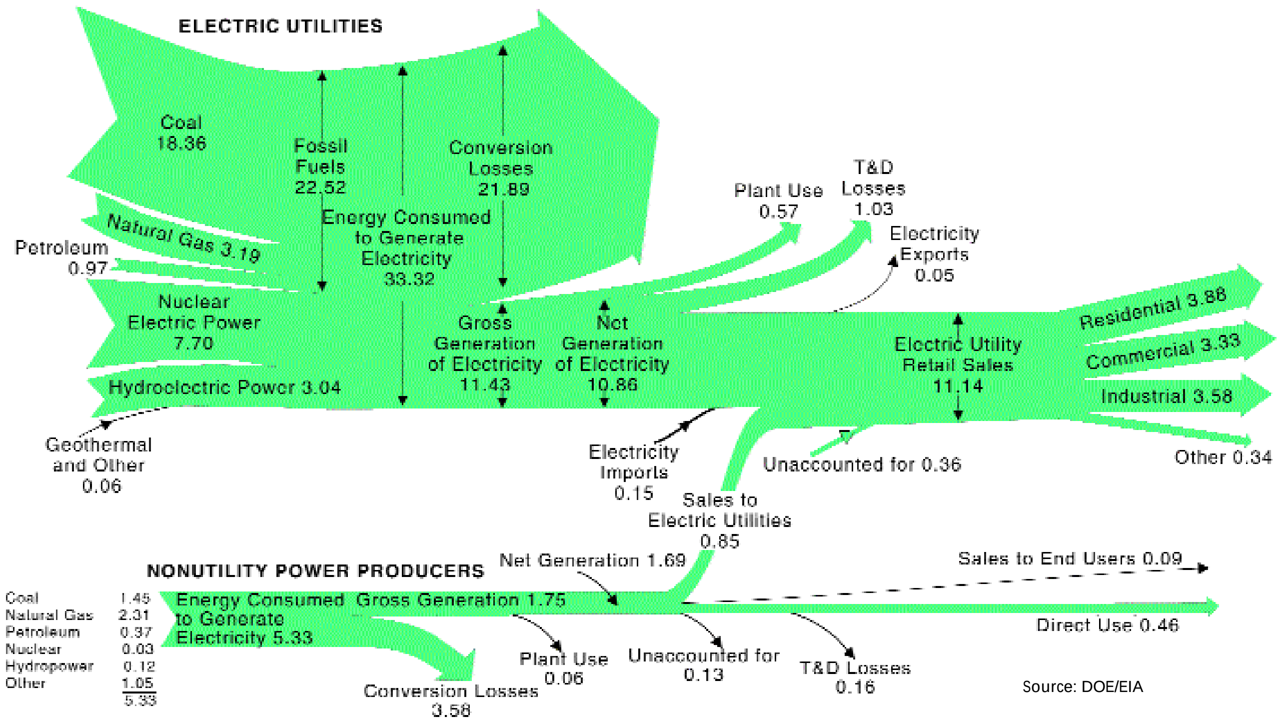
As in the United States, worldwide energy demands will increasingly be met by a reliance on electricity. Accordingly, technologies developed in the United States will need to be deployed overseas in order to meet the expected demand for twice the current level of energy and three times the current use of electricity. With proper technology policies, it is possible to meet these demands while attending to environmental concerns.

SUMMARY

An effective National Energy Strategy will keep all energy options available in order to meet growing energy demands. Coal can continue to play a vital role in global energy markets. For example, by 2020, some 3.6 billion tons of coal will be consumed in the regions comprising the "developing countries," double current consumption in those countries. Moreover, more than 44 percent of the electricity used in these countries will be generated by coal, both because it is an indigenous resource in many of these countries and because its cost is often low relative to other energy sources.

Clearly, future coal use will not be limited to the developing world. Coal is now, and will continue to be, a major energy resource in all regions of the world. Coal use in the industrialized world will remain at approximately 1.6 billion tons, increasing in the U.S., Canada, Australia and Japan and decreasing only in Western Europe and in the countries of the former Soviet Union. For the foreseeable future, coal will remain an important contributor to the global energy mix.

Electricity Flow Chart 1999
(Quadrillion BTU)



Source: DOE/EIA

OVERVIEW

Until quite recently, the electric industry has been characterized as a natural monopoly, subject to extensive rate regulation of its generation capacity, transmission lines and local distribution systems. Today, a dramatic restructuring of this industry has forced sweeping changes on the institutions, institutional relationships, and the role of regulators. Some vertically integrated utilities have unbundled their generation, transmission, and distribution functions, and in many cases, sold their generation resources. Increasingly, generation is owned and managed by independent companies or unregulated utility affiliates, not by regulated companies, and output is sold at market-based rates. Moreover, the Federal Energy Regulatory Commission (FERC) and some industry participants now seek to establish new regional transmission organizations (RTOs). Policymakers may also remove federal barriers in order to promote effective wholesale competition and facilitate state restructuring activities and retail competition.

Retail markets were most immediately affected by the Congressional passage of the Energy Policy Act of 1992 (EPAct). This bill modified federal laws in such a way as to facilitate wholesale electricity competition. Today, all fifty states and the District of Columbia have considered some reform of their retail electric service system. Moreover, almost all of the so-called "high-cost" states (i.e., where average rates are above the national average) have adopted retail competition systems that involve non-discriminatory access to the local distribution system and customer choice of energy supplier. Currently, more than 60 percent of the U.S. population lives in the 24 states and the District of Columbia that have decided to transition to open access for retail energy suppliers and customers. State officials continue to address difficult transition questions, including how to handle stranded costs, consumer education and protection, public benefits programs, and residual obligations of incumbent utilities following liberalization.

The recent problems in California's electricity markets, however, are having national implications that impact all stakeholders in the electric industry. Extreme price volatility and shortages in the California market have been brought about, in part, by inadequate market design and public policies that are incompatible with an efficient market environment. As a result, the pace of deregulation and the transition to retail competition in the other states may be affected. In the emerging market environment, it is important that public policies facilitate new investments in generation and transmission.

PATTERNS OF CONSUMPTION

Although many consumers can now choose their retail electricity supplier, most have chosen to remain with their incumbent supplier, the utility distribution company. One reason they have chosen not to switch is that state-mandated rate reductions for standard offer services undercut the entry rate of new retailers. Standard offer service typically obliges the incumbent utility to provide fully bundled electric service at fixed or indexed rates for several years (e.g., during the transition period), usually following the introduction of retail competition. In some states, standard offer rates have been set so low as to discourage customers from switching to new entrant retailers, who must recover costs associated with setting up shop in local markets as well as the cost of purchasing energy in wholesale markets. Other states have established generation credits (so-called "shopping credits") for customers who no longer take power from the incumbent. In some cases, the credit exceeds the costs of generation that the incumbent avoids when a customer switches to a new supplier. While programs with high credits appear to be more successful in getting customers to switch suppliers, they do so by offering credits that bear no relationship to wholesale power costs or retail marketing costs.

In electricity markets with effective competition, consumers may have a greater number of options, both in terms of their supplier and the type of fuel used to generate electricity. Indeed, some states now require that all registered sellers generate a portion of their electricity using renewable supplies, such as solar, geothermal, and wind resources. However, because the cost of these resources is higher than conventional (fossil) fuels, a renewable portfolio standard raises the overall costs of power purchases. This forces higher costs on all electricity consumers.

Several polls suggest that consumers are willing to pay more for electricity generated by renewable energy resources. Some factual evidence supports these polls. A number of California customers selected a "green" power supplier when they switched suppliers. Customers in open states should be allowed to choose whether to purchase power from higher cost, renewable suppliers. An important but often overlooked low-cost, renewable resource is hydropower. Although new dam sites are not being proposed, existing resources could supply more electricity if steps were taken to streamline the burdensome re-licensing process and if additional resources were channeled toward increased research and development of more efficient technologies.

Some consumers can also supply their own electricity, using internal combustion and reciprocating engines, solar panels, and emerging technologies such as fuel cells and microturbines. This approach allows customers to generate electricity at its point of use, reducing, and in some cases eliminating, the need to use a traditional transmission and distribution network.

FUTURE DEMAND

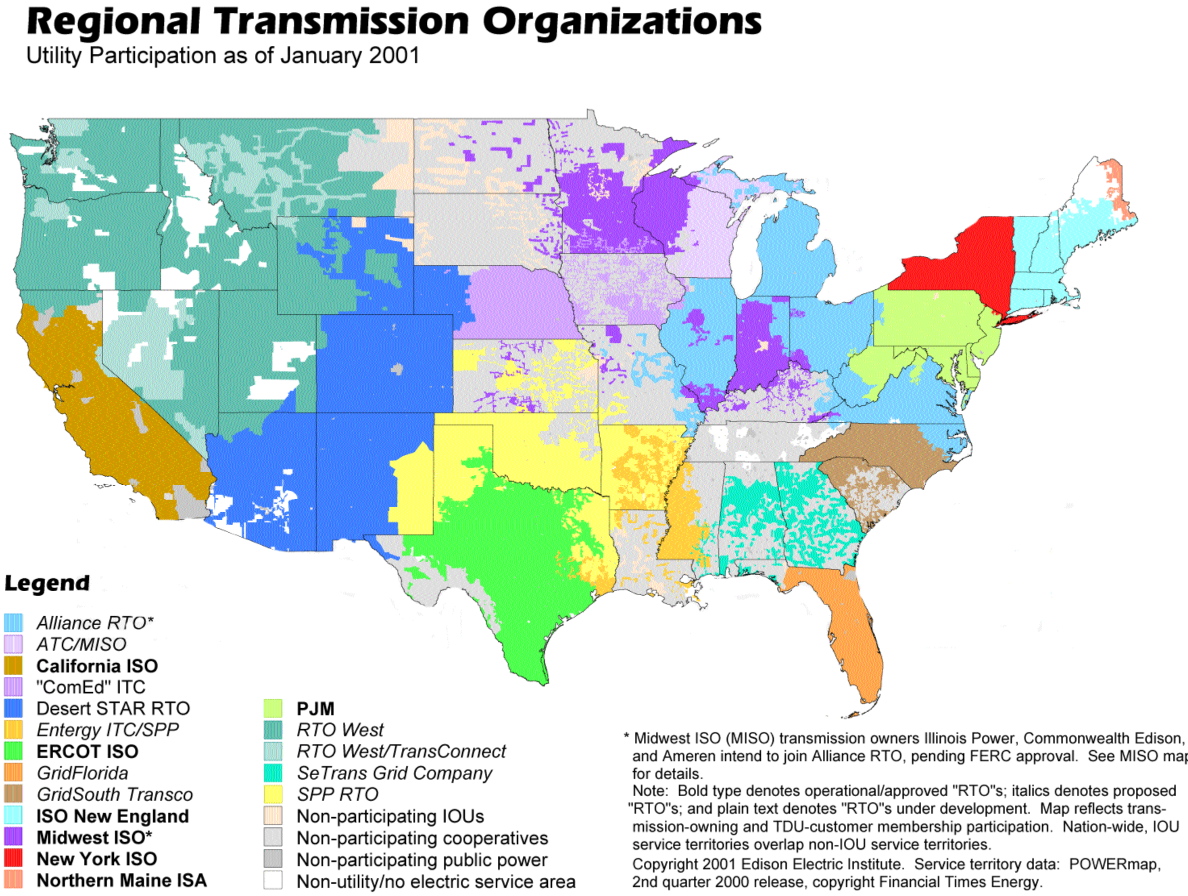
Although the U.S. Energy Information Administration recently forecast that distributed generation will provide less than one percent of the nation's electricity requirements by 2020, a number of states are looking closely at interconnection standards for distributed generation, the design of appropriate rates for standby and backup services, and the recovery of interconnection costs (or any costs of additional facilities) required to accommodate a distributed generation unit. Regulatory policy should be competitively neutral with respect to distributed generation. Indeed, market-based price signals are the best approach to developing economically efficient investment in distributed generation systems.

POLICY ENVIRONMENT

Seventeen electricity restructuring bills were introduced while the 106th Congress was in session. To date, no legislative package has gained consensus support, but significant issues embodied in many of these proposed bills are under serious consideration. For example, several bills propose the repeal of PURPA and PUHCA. Others would encourage state restructuring actions by resolving federal/state jurisdictional issues. Still others encourage the formation of regional transmission organizations (RTOs), including for profit transmission companies, propose resolving market power and transmission access problems, and/or the grandfathering of existing state restructuring plans to protect state plans from preemptive federal action.

Consensus has formed among publicly-owned and shareholder-owned companies in support of comprehensive tax legislation to facilitate fair electric competition. For shareholder-owned utilities, taxes that discourage the upgrades of distribution facilities would be eliminated. Moreover, the consensus agreement would defer taxes on the sale of transmission facilities, as well as eliminate taxes on the spin-off of such facilities. Both actions would stimulate the formation of independent RTOs. For public power utilities, the consensus agreement would modify private use provisions of the tax code, thereby encouraging these providers to open access to their transmission lines and also encourage them to participate in RTOs. Indeed, support is growing for broad tax legislation that would eliminate impediments to electric cooperatives interested in joining RTOs and opening their systems to competition.

There is recognition that critical bulk power system reliability issues need to be addressed. With the lead of the North American Electric Reliability Council (NERC), a broad consensus is being forged on reliability legislative language. Proposed legislation would extend FERC's authority for reliability (but not for economic regulation) to all segments of the U.S. electricity industry. This authority would ensure that all participants in electricity markets – independent power producers, distribution utilities, transmission utilities, system



operators, power marketers, and customers –play by the same reliability rules and share equitably in the costs of reliability. At present, FERC has jurisdiction over only shareholder-owned utilities, which encompasses about two-thirds of the transmission facilities in the country. The proposed legislation would grant FERC the authority to approve and oversee one national electricity reliability organization. This organization, expected to evolve from NERC, will be responsible for developing, implementing, and enforcing mandatory reliability standards nationwide, with FERC oversight. Currently, compliance with NERC standards is voluntary, subject only to peer pressure. This new reliability organization will also have the authority to delegate certain responsibilities to regional entities, with approval from FERC.

The Role of the Federal Energy Regulatory Commission

In its role as overseer of wholesale markets and transmission, the Federal Energy Regulatory Commission has implemented the EPAct provision that modified federal laws in order to facilitate wholesale competition. Specifically, the Commission pushed wholesale competition forward in 1996 when it issued Order Number 888 and Order Number 889. In these landmark rules, FERC required the industry to provide comparable, non-discriminatory open access to the transmission grid and to unbundle generation, transmission, and ancillary service functions. The Commission also provided for recovery of wholesale stranded costs and established standards of conduct and methods to exchange wholesale market information on same-time electronic databases, known as OASIS. Recently, both FERC Orders were upheld in the Court of Appeals of the District of Columbia Circuit Court.

Moreover, in December 1999, FERC approved another landmark order promoting the development of regional transmission organizations (RTOs). Order Number 2000 calls for voluntary participation in RTOs. FERC stated its objective that all transmission-owning entities, including non-jurisdictional utilities, join RTOs. Order Number 2000 requires that RTOs be independent of market participants, serve a region of sufficient size and arrangement to maintain reliability, support efficient and non-discriminatory power markets, serve as the security coordinator for its prescribed region, and have exclusive authority over the maintenance of short-term reliability of its part of the grid, including the authority to redispatch generation resources.

Regional Transmission Organizations

FERC expects regional transmission organization to be operational by December 15, 2001. However, the establishment of RTOs is an arduous, time-consuming process that requires a satisfactory resolution of many contentious, critical issues among many interests. Several of the existing independent system operators (ISOs, one type of RTO) were developed from existing tight power pools; other RTOs will not have this advantage and will be more difficult and take longer to construct.

As of January 2001, 12 regional transmission organizations were in their formative stage. By the December 15, 2001 deadline, these entities are expected to manage the bulk power grid for over 85 percent of the nation's electricity consumers, based on current participation figures. Five independent system operators are already operational, and currently serve 33 percent of the nation's electricity consumers. An additional three such entities are approved, but are not yet operational.

Policy Challenges in the Transmission Sector

Over the years, U.S. electric utility companies, regulators and shareholders have built the most reliable electric system in the world. This record of achievement must not be tarnished during the transition to competitive power markets. The transition from an electricity industry that consisted primarily of regulated, vertically integrated utilities to one that emphasizes competitive markets for generation raises many concerns about reliability. Even though there is little evidence that overall reliability levels have changed in recent years, dramatic changes in the structure, operation, and regulation of the U.S. electricity industry require analogous modifications in reliability practices and institutions.

The current transmission system is comparable to the national highway system, a mix of two-lane state roads, multiple lane freeways, access roads, beltways and interchanges. Originally built to move limited amounts of power over relatively short distances, the electricity interconnections that were enhanced to bolster reliability created new opportunities to reach more distant customers, some in quite distinct markets. In today's increasingly competitive electricity marketplace, a greater number of suppliers are faced with bottlenecks and congestion because they often hit a two-lane road after having been on an eight-lane interstate highway, limiting the benefit of increased marketplace transactions. If more transactions are to be accommodated, more transmission facilities will have to be built or other means will need to be found to enhance the transfer capacity of the existing system. Otherwise, the expectation of lower costs for consumers may not be realized.

Most analysts agree that expansion of the transmission grids has not kept pace with growth in electricity demand. For example, annual investments in new transmission have declined by about $100 million a year during the past two decades. Moreover, between 1989 and 1998, the miles of transmission lines per MW of summer demand declined by 16 percent, and some projections show a further decline in transmission capacity of some 13 percent by 2008. [1]

The current focus on regional transmission operations may provide incentives to build needed transmission facilities. FERC has stated its receptivity to different forms of RTO structures including non-profit independent system operators and stand-alone transmission businesses (often referred to as TRANSCOs). Advocates of ISOs argue that transmission owners can, with relative ease, turn over control of their transmission assets to an ISO and that a non-profit ISO would more likely operate the system for the ultimate benefit of consumers. In contrast, TRANSCO advocates believe that the for-profit motive underlying their approach will result in improved performance and encourage the efficient expansion of transmission grids. For its part, FERC will consider new, innovative rate mechanisms such as performance-based rate making to meet the requirements of Order Number 2000, so long as commensurate benefits to consumers can be demonstrated.

KEY MARKET ISSUES

Challenges to Expanded Generation

The issue of expanded electricity generation—as well as the issue of transmission—will challenge policymakers in the years ahead. Certainly, electricity generation has not kept pace with consumer demand. Recent events of extreme price volatility and price spikes in light of record demand has made the need to preserve reliability a paramount concern. Generation reserve margins have been declining for at least the past two decades, at a rate of almost one percent per year. Currently, reserve margins are tight in some regions of the country, suggesting that additional generation is needed soon. While few utilities are planning to build much generation as part of their regulated rate base, unregulated utility affiliates and independent power producers have announced plans for more than 100,000 MWs of new capacity, more than enough to meet expected needs for the next several years. About 90 percent of new generators will be fired with natural gas. How much of this capacity will actually get built, and when, is not known, given the recent rise in natural gas prices. The key question is whether competitive market forces, when co-mingled with policies which restrict infrastructure expansion, will be sufficient to provide enough generating and transmission capacity to provide reliable power supplies for the U.S. economy.

Marketplace Dynamics

Existing independent system operators have experienced many difficulties in establishing and operating real-time markets for energy and reliability services. The California market in particular has been hampered by extreme price volatility and shortages. The problems in California point to need to design market rules and public policies, which jointly work to effect efficient market outcomes.

For example, existing markets are largely one-sided, with competition among generators but no competition between the supply and demand sides of the equation. Although volatile electricity prices contain important information for electricity consumers and suppliers that

[1] See "Electric Reliability: Potential Problems and Possible Solutions," Eric Hirst, May 2000.

can help maintain reliability, most consumers today continue to face time-invariant prices. Customers, especially large, sophisticated industrial customers, should have the opportunity to face time-varying (hourly) electricity prices and to participate in reliability markets (e.g., by offering to sell load reductions as contingency reserves). By allowing customers to voluntarily choose among multiple pricing products with varying degrees of price risk, the magnitude of the price spikes and overall system power costs can be substantially reduced. Even if only a small fraction of retail load chooses to face real-time prices, price spikes would be less frequent and dramatic, and the need for additional generating capacity would be reduced.

Because of the physics inherent in electric system operations, generation can be operated in a manner that can reduce potential transmission imports from other regions, block or interrupt sales by competitors, restrict generation output and raise prices, or inhibit construction of new, competing generation. Many industry stakeholders believe that the key to transitioning to competitive regional markets for wholesale power will require finely tuned market rules to eliminate the potential for gaming and to prevent the abuse of market power. They advocate market monitoring of the wholesale market and regulatory oversight to prevent market manipulation and consumer abuse, with potential abuses of market power investigated, mitigated and remedied.

BALANCING ELECTRICITY USE AND ENVIRONMENTAL CONCERNS

The U.S. electricity industry faces critical energy and environmental challenges in the coming decades. Electricity producers will be called upon to provide cost-effective and reliable power to fuel U.S. economic growth and an improved quality of life. Environmental regulators will face pressures to develop more efficient policies to meet well-established challenges—including targets for air and water quality—as well as new policies to meet emerging challenges such a climate change.

Environmental and energy policies sometimes conflict with one another. For example, efforts to improve urban air quality are not always consistent with efforts to lower electricity rates, or even to provide greater competition among suppliers. Although some conflicts represent inherent public policy tradeoffs, other conflicts can be avoided or reduced through more effective and efficient policy approaches. For example, potential air quality and climate change policies strongly encourage the development of natural gas, while policies restricting energy exploration and facilities siting would make production and use of natural gas more difficult. Policymakers engaged in developing a National Energy Strategy can reduce these conflicts by developing environmental policies that minimize the cost of achieving specific environmental objectives and by limiting inappropriate interference with market-driven fuel choices.

NUCLEAR POWER

OVERVIEW

The U.S. nuclear energy industry supplies about 20 percent of our nation's electricity. Behind this seemingly simple statement lies an extraordinary story. While nuclear powered electricity capacity has remained fairly constant, the amount of nuclear energy generation—which does not release air pollutants and is our largest source of emission free electricity—has increased significantly as U.S. demand for electricity has risen. The reasons behind nuclear power's success are many.

During the past decade, the efficiency, safety and reliability of operating nuclear plants have grown steadily and dramatically. The average capacity factor of the U.S. nuclear power fleet has increased over 16 percent since 1990 to 86.8 percent. This is the result of improved maintenance conducted in shorter and shorter refueling outages and longer intervals between refuelings. The result has been the effective equivalent of adding over 23 new 1,000 MW nuclear plants on line.

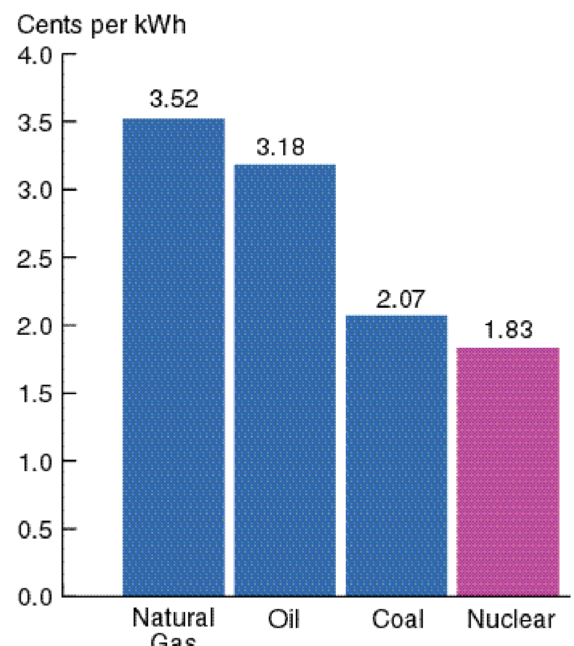
REGULATORY ENVIRONMENT

Under the careful oversight of the U.S. Nuclear Regulatory Commission (NRC), the regulatory environment for nuclear powered utilities has improved in the areas of operating safety and efficiency. Four decades of commercial nuclear operations have yielded a growing understanding of factors that influence operating safety. This experience has resulted in the revision of regulations and practices, making nuclear powered plants even safer than before.

Deregulation of the electric power industry also has sharpened the focus on safe, efficient operating practices. Industry restructuring has produced fewer nuclear power plant operating companies, but these companies include highly focused management teams able to provide consistent and reliable solutions improving efficiency and safety. Consolidation has also created new efficiencies in the administrative management of the nation's nuclear power plants.

These same trend lines have reduced overall operating costs. Today, the nuclear

Energy Production Costs in 1999



Source: Utility Data Institute

energy industry has achieved very competitive production costs, measured in cents per kilowatt-hour. At the same time, industry restructuring has recast fixed costs such that total electricity costs are highly competitive. Nuclear units across the industry can run at total costs of 2 to 2.5 cents per kilowatt-hour. Of this, the cost of nuclear fuel, including a charge for the ultimate disposition of the used fuel that all operators pay, is about one-half cent per kilowatt-hour.

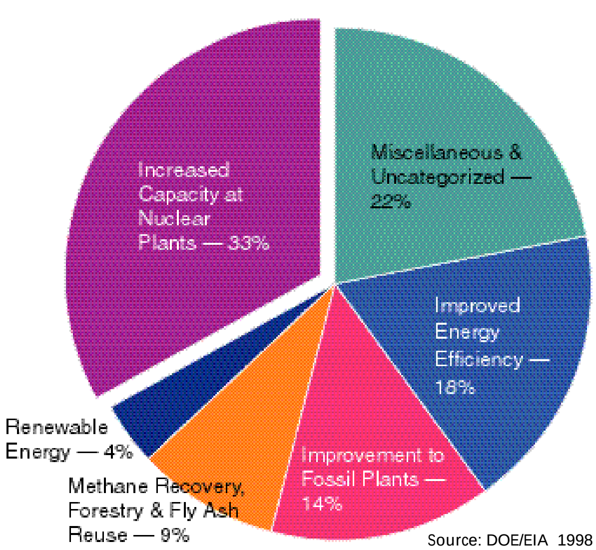
LICENSE RENEWALS

In March 2000, the NRC renewed the licenses for the two-unit Calvert Cliffs nuclear plant for an additional 20 years of operation beyond the 40 years originally licensed. Two months later the three-unit Oconee nuclear station received a 20-year renewal. These renewals recognize that conscientious operations and maintenance have sustained and improved the value of these plants. It is expected that almost all nuclear power plants will apply for and obtain a renewal license that adds 20 years to these facilities. License renewals further increase the competitiveness of nuclear powered electric utilities.

ENVIRONMENTAL ADVANTAGES OF NUCLEAR POWER

From an environmental point of view, nuclear energy offers several important advantages. Since the combustion process is not needed to produce nuclear energy, there is no adverse impact on air quality. This is an important environmental consideration. In 1999 the United States generated a record 728 billion kilowatt-hours using nuclear power. That production avoided the emission of 1.92 million short tons of NOx, 3.97 million short tons of SO2 and 167.8 million metric tons of carbon, compared to the current mix of fossil energy resources. From a policy perspective, it is ironic that environmental credits are extended to energy producers that adversely impact air quality, but not to electricity generators, such as nuclear and hydro, that entirely avoid air quality impacts. Nuclear energy is the most significant source of CO2 reduction through its increased production over the last decade in the voluntary program to mitigate carbon emissions.

Voluntary Carbon Emission Reductions



Source: DOE/EIA 1998

Indeed, if nuclear energy were not part of the nation's generating mix, most current clean air act standards—particularly those areas with large concentrated populations and heavy industrialization—would not be met. In areas of high density power use, the environmental benefits of nuclear energy can be leveraged to provide heating, cooling and transportation in the form of electrified rail and mass transportation. It is most efficient when operated at full power, 24 hours per day to supply baseline power needs. Nuclear energy is wisely used in a diverse combination with other fuels that use technologies well adapted to cycling or peaking loads. The presence of nuclear power plants in these areas of high electricity demand is a significant factor, which allows the siting of other emitting forms of generation while maintaining overall emissions within federally mandated levels.

URANIUM FUEL SUPPLY AND DISPOSAL

Uranium, the heaviest of all naturally occurring elements, powers nuclear plants. Nuclear reactors release energy by splitting uranium atoms. Since no combustion takes place during the generation of electricity from reactor fuel, air quality and the atmosphere are not affected. Once the nuclear reaction takes place, energy is transferred to turbines that generate electricity in a closed process. All waste products are retained in the solid fuel pellets and isolated from the environment.

Uranium is abundantly available in the earth's crust, both in North America and elsewhere, and the capability to extract ore and convert it to reactor fuel is available domestically. The primary, and almost sole, use of uranium is the production of energy. Robust supplies of reactor fuel can be made available from domestic sources without threat of international interference. Reactors can also consume the uranium and the man-made element, plutonium, which were produced as stockpiles for national defense purposes. Commercial reactors are being used to reduce the threat of nuclear proliferation using these inventories as fuel for the generation of electricity.

In recent years, the U.S. government has pursued policies aimed at consuming excess inventories of weapons grade uranium that had accumulated in the former Soviet Union. Such policies reduce the threat of nuclear warfare and spur international economic activity, but they also depress demand for U.S. mining, conversion and enrichment services. Indeed, U.S. businesses may become unprofitable and exit the market. The long-term impact of this possible threat to U.S. energy security should be examined closely by policymakers when they formulate a National Energy Strategy.

Some believe that the Achilles' heel of nuclear energy is the disposal of used nuclear fuel. However, this objection to its use is not based on facts. In the roughly 40 years of commercial nuclear operation in the United States, there has been no impact on the environment from used nuclear fuel. It remains at the power plants where it was used, fully accounted for, with no measurable impact on the environment. By act of Congress, a decision has been made to take central accountability for used nuclear fuel. Exercise of this option by the federal government when it is ready, will also result in negligible impact to the environment, according to federal studies. In the meanwhile, except in a few jurisdictions that have set artificial deadlines for the federal government to accept custody of the fuel, no major barrier exists to maintaining past practice of storing fuel where it was used, even though this does not represent the best public policy.

Moreover, once used fuel is deposited in a central repository, that site will become a strategic fuel reserve. Used nuclear fuel contains a high residual energy content, which can be recovered through reprocessing. Currently, U.S. policies do not allow the reprocessing of nuclear fuel, even though it is permitted elsewhere in the world. Reprocessing is not economical at the present time. If circumstances change, all fuel in the central repository could be reprocessed. In addition, future reactors can be designed to produce more fuel than they consume. This would make nuclear power a renewable energy resource.

COMPETITIVE COSTS

The abundance of uranium and the relatively low cost of converting it to reactor fuel mean that nuclear fuel costs are likely to remain stable for the next several decades. Moreover, the continued reliance on nuclear energy as part of the nation's diversified electricity portfolio should minimize price volatility in electrical markets. A stable price environment for energy means, in turn, that the overall U.S. economy should grow more efficiently.

Production of energy from nuclear fuel results in relatively high-energy yields per stable unit of fuel consumed. For example, one cubic inch of uranium 235 contains the energy equivalent of over 650 thousand gallons of oil, 3,300 tons of coal or 7 billion cubic feet of natural gas. Although there are environmental impacts from the extraction of uranium and speculative environmental impacts from the disposition of used nuclear fuel, they are relatively minimal because of the very small quantities of fuel required.

EFFECTIVE R&D AND INVESTMENT POLICIES COULD ENHANCE THE USE OF NUCLEAR POWER

Increased research and development could lead to discoveries that would improve operating efficiencies of current reactors, improve the design of future reactors and develop nuclear fuel sources that do not produce weapons material as a by-product. For example, small, transportable reactors have been designed for military use, but little work has been done to make these prototypes commercially viable. Such reactors could be put to a number of good uses, including water purification. An aggressive research program could ensure the availability and wise use of this emission free, abundant and compact source of energy.

Like other critical infrastructure systems, including railroads and highways, energy suffers from a lack of adequate capital investment. Nuclear energy is no exception. Currently, investors are not attracted to the modest return on most nuclear power plants, compared with the potential return on investments in information technology or other high technology industries. In the case of energy infrastructure, the issue is compounded by the perceived risk of investing in an industry sector that is undergoing deregulation and restructuring.

Eventually, of course, energy prices will rise to such a level that profits and return on investment in the energy industry will appear commensurate with other investment opportunities. The better approach, however, would be the creation of incentives for needed infrastructure investments in the near term. In the decades ahead, policymakers will need to devise policies that encourage investment while not interfering with free markets and the growth of competition within and among energy sectors. If such policy measures are not formulated and implemented soon, the likelihood increases that policymakers will have to respond to public outcries against high-energy costs by developing ill-conceived policies that do interfere with the market.

THE ROLE OF EDUCATION

The United States also needs to invest in an educated workforce that is capable of supporting the energy infrastructure that experts have forecast. This is not an easy task, both because the demand for skilled engineers and technicians is growing rapidly and because fewer and fewer students are pursuing courses of study that would prepare them for work in energy related industries. Indeed, enrollment is declining among institutions that offer such educational programs and degrees. Unless action is taken soon, the educational system may be unable to support the demand for energy that appears inevitable during the next decade.

Education also is needed to change the public's perception of nuclear energy. Understandably, that view is largely negative. The first demonstration of nuclear energy that commanded world attention was a bomb that yielded devastating results. The generation of electricity from nuclear fuel is physically very different from the technology required for destructive use, but the perceived connection between the two has been skillfully exploited by some to alarm the public and the political system for decades. An effective National Energy Strategy would address this adverse image by engaging every educational level, and by stressing the environmental and security benefits that the safe use of nuclear energy affords our nation.

SUMMARY

Nuclear energy has been a growing component of the energy mix in the United States for more than 40 years. No member of the public has been harmed by nuclear energy during this period. Moreover, public polls have shown for years that a substantial majority of the American public believes that nuclear energy is safe and beneficial. However, in follow-on questions, that same substantial majority incorrectly believes that, individually, they are in the minority in their support and confidence in nuclear power.

A National Energy Strategy needs to be developed that brings nuclear energy back into favor. After all, nuclear energy provides substantial environmental benefits while producing baseload levels of electricity. Because combustion is not required to release energy, no air pollutants are emitted into the environment. Moreover, because small amounts of fuel create large amounts of electricity, the extraction and disposal of nuclear fuels can be readily controlled and managed. Nevertheless, many environmental groups oppose nuclear energy, for reasons which are not clear to industry experts and scientists.

In time, some external pressures — global environmental concerns, high population densities, alternate uses for land and raw materials, or price volatility—and a heightened political grasp of the benefits of nuclear energy use will create an environment favorable to its increased use. Until that time, however, the nuclear industry will have to remain focused on activities that dispel public misconceptions about this energy resource.

Global pressures already are at work that will have an impact on the future of this industry. As energy demand increases, few developing nations will have the ability to manage this technologically complex energy resource. Developed nations such as the United States will need to adopt policies that ensure its safe use by other nations. Certainly the United States, which has led the world in the development of nuclear energy and is now reaping the environmental and economic benefits of this fuel, should provide for its continued global use in a responsible manner. The world remains hungry for energy and the countless economic, social and personal benefits from an adequate, reliable and affordable supply of energy.

ENERGY EFFICIENCY AND RENEWABLE ENERGY

OVERVIEW

In the portfolio of energy options for the 21st century, energy efficiency and renewable energy are two that have demonstrated their potential to significantly contribute to U.S. energy needs in a cost effective and environmentally friendly manner.

Diverse forms of energy efficiency are widely diffused throughout the U.S. economy. End-use efficiency improvements occur from the market penetration of process controls, thermal barrier technologies, and other design improvements in industrial, residential, commercial, and transportation equipment.

Supply-side improvements include advanced combustion/gasification technologies, combined heat and power stations, district heating and cooling, and more efficient power transmission and distribution technologies. Although micro-turbines and fuel cells have not yet had substantial market penetration due to high initial cost, they hold promise for future improvements in supply-side efficiency.

At the macroeconomic level, there has also been a shift in the share of Gross Domestic Product (GDP) from more to less energy intensive activities. Part of this shift is the result of the rapidly falling cost of information and information technologies.

Renewable energy options are also diverse. These resources may be converted into electricity, heat, or mechanical power. Renewably based electric generating plants may be connected to a central grid or freestanding. The resources from which renewable energy is extracted include:

- **Solar radiation** – Sunlight can be used to produce thermal energy for space and hot water heating, or electricity generated from either photovoltaic panels or high temperature solar collectors that produce steam to drive turbines. Diffuse radiation is available through the country, while direct radiation for concentrating collectors is strongest in the Southwest.
- **Running water** – The largest source of renewably generated electricity, hydropower, is harnessed by creating reservoirs or by installing run-of-river turbines. Future expansion of hydropower capacity is limited by resource constraints.
- **Wind** – Commercial wind-farms are sprouting up throughout the country with individual turbines as large as one megawatt. The largest wind resources are found in the midwest.
- **Biomass** – Woody and herbaceous materials can be burned directly for electricity or heat, gasified, or liquefied. In some cases, forest or agricultural residues are used; dedicated biomass feedstocks are grown for energy production.
- **Geothermal heat** – High temperature geothermal energy for large-scale power production is located primarily in the western U.S. However, low temperature heat from the earth is also used in “ground-source” heat pumps as a source of residential and commercial space conditioning.

Renewable Electricity Generating Capacity, 1999

Technology	Capacity in Operation (in MW)
Biomass	10,570
Geothermal	2,697
Hydro (includes pumped storage)	94,789
Photovoltaics	15
Solar Thermal	354
Wind	2,602

Source: "REPiS: The Renewable Electric Plant Information System" 1999 Edition, NREL.

As of 1999, renewable electric generating capacity was about 111,000 Mw, mostly from large hydropower facilities.

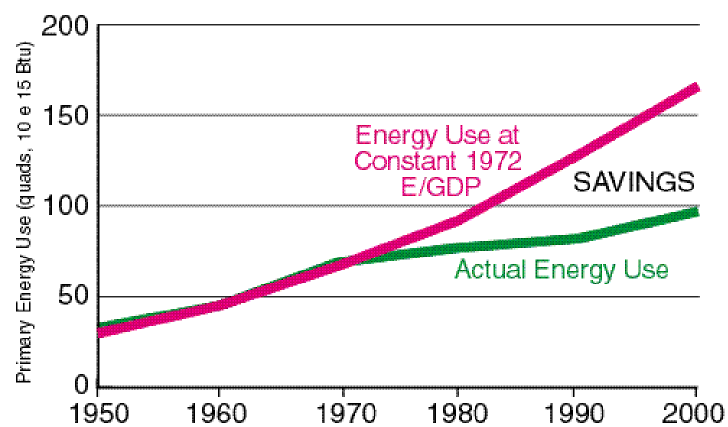
A key advantage offered by energy efficiency and renewable energy options is low environmental impacts, especially with respect to air emissions. Clearly, energy efficiency improvements and renewable energy will be essential to meet our energy needs.

TRENDS

Energy efficiency improvements have had a major impact in meeting national energy needs since the 1970s, relative to new supply. Energy intensity improvements are a combination of end-use efficiency improvements, supply-side improvements, and structural shifts in the economy toward less energy intensive sectors. If U.S. energy intensity (Quadrillion Btu per GDP) stayed constant since 1972, consumption would be about 70 Quads (74 percent) higher in 1999 than it actually was.

One of the drivers for improved energy intensity has been the implementation of appliance efficiency standards. The standards for different appliances came (or will come) into effect over the period 1988-2005. As more efficient models of appliances and equipment penetrate the market, they shift the overall efficiency of the nation's capital stock. Air conditioner manufacturers recently called for further improvements in efficiency.

U.S. Trends Shows Reduction in National Energy Intensity



Source: DOE/EIA

One recent exception to positive trends in end use efficiency is in the transportation sector, where average fuel economy of motor vehicles has been flat or deteriorating due to the increased sales of light duty trucks and 4-wheel drive vehicles and increased miles driven per vehicle.

Structural shifts in the economy have been away from manufacturing and toward the commercial and service sectors. Not only have knowledge-based sectors gained a larger share of our national GDP, the declining cost of information and communication services has allowed all sectors to substitute information for activities that use energy. Although office and network equipment constitute only a small fraction of U.S. electricity use, the digital economy requires a high level of power reliability, a characteristic that creates new opportunities both for energy efficiency in managing system load and for renewables in providing back-up power.

Renewable electric generation is projected to increase in absolute terms (from 389 billion kWh in 1999 to 448 billion kWh in 2020). At the same time, it is projected to decline in its share of the overall generation mix from 10.5 percent in 1999 to 8.5 percent in 2020, under business as usual assumptions (US Energy Information Administration, Annual Energy Outlook 2001, Market Trends).

COSTS AND COMPETITIVENESS

The cost of energy from renewable sources (notably photovoltaics and wind) has declined substantially over the past twenty years. These declines, however, have not necessarily made renewable energy competitive since the cost of competing energy sources has in some cases also declined.

Electricity industry restructuring has had a major impact on utility investment in energy efficiency and renewable power generation. Electric utilities have been a major source of investment in both end use efficiency (called demand-side management) and renewable electricity. Since the early 1990s, however, utility investment has diminished as competition or the threat thereof grew and regulatory mandates waned. At the same time, restructuring has been accompanied by falling reserve margins and concerns over system reliability, trends that may offer new opportunities for distributed supply and demand side resources.

Finally, certain global trends have implications for energy efficiency and renewables. In particular, developing countries are projected to make enormous investments in energy-producing and consuming capital stock during the coming decades. This long-lasting infrastructure will commit these countries to levels and types of energy use for decades to come thereby creating an excellent opportunity to improve developing country energy efficiency by utilizing new end-use energy technology.

POLICY ENVIRONMENT

Electricity Restructuring

The decision by policymakers to unbundle heavily regulated electric utilities while simultaneously introducing wholesale and retail competition into the U.S. electricity industry has thinned reserve margins, increased investment risks in new power generation, and increased price volatility. Under these circumstances, energy efficient practices and technologies (especially ones that can be targeted to specific times and locations) have added value. For example, some small-unit renewable energy technologies can now compete with conventional energy suppliers in geographic areas where the cost of conventional energy is high. Moreover, some power retailers have offered their customers the option of paying a bit more for power generated from renewable sources through green pricing and marketing initiatives. Policymakers should strive to ensure that compensation to distributed generation (DG) and combined heat and power (CHP) owners for sales back into the grid include payment of their fair share of the distribution systems they use, while eliminating unreasonable or unnecessary barriers to DG/CHP deployment. By preventing cost-shifting (e.g., from DG/CHP customers to other utility customers) policymakers can ensure that customers are encouraged to deploy DG/CHP where they are efficient.

Policymakers should take these trends into consideration when developing a National Energy Strategy. While energy efficiency practices do not generate additional electricity reserves, good energy management practices do extend the resources that are available. Policymakers can encourage such practices by ensuring that consumers face accurate time and location-specific price signals and have access to accurate information about the environmental implications of their energy use. Where necessary, policymakers should also implement initiatives that assist low-income consumers in paying higher prices and that overcome market barriers inhibiting all consumers from responding to energy price signals.

International Cooperation and Technical Assistance

U.S. security analysts are increasingly aware of global competition for fossil fuels and potential threats to the global environmental. The United States can diminish both risks by encouraging developing countries to use the most energy-efficient and clean technologies available. One way to do so would be through educational programs aimed at encouraging developing countries to utilize advanced U.S. energy technologies, energy management practices and market-based policies. The United States is also uniquely positioned to help emerging nations build energy capacity, institutional capacity and finance energy-related activities and services. Doing so could prove to be a cost-effective investment, both for the United States and emerging economies.

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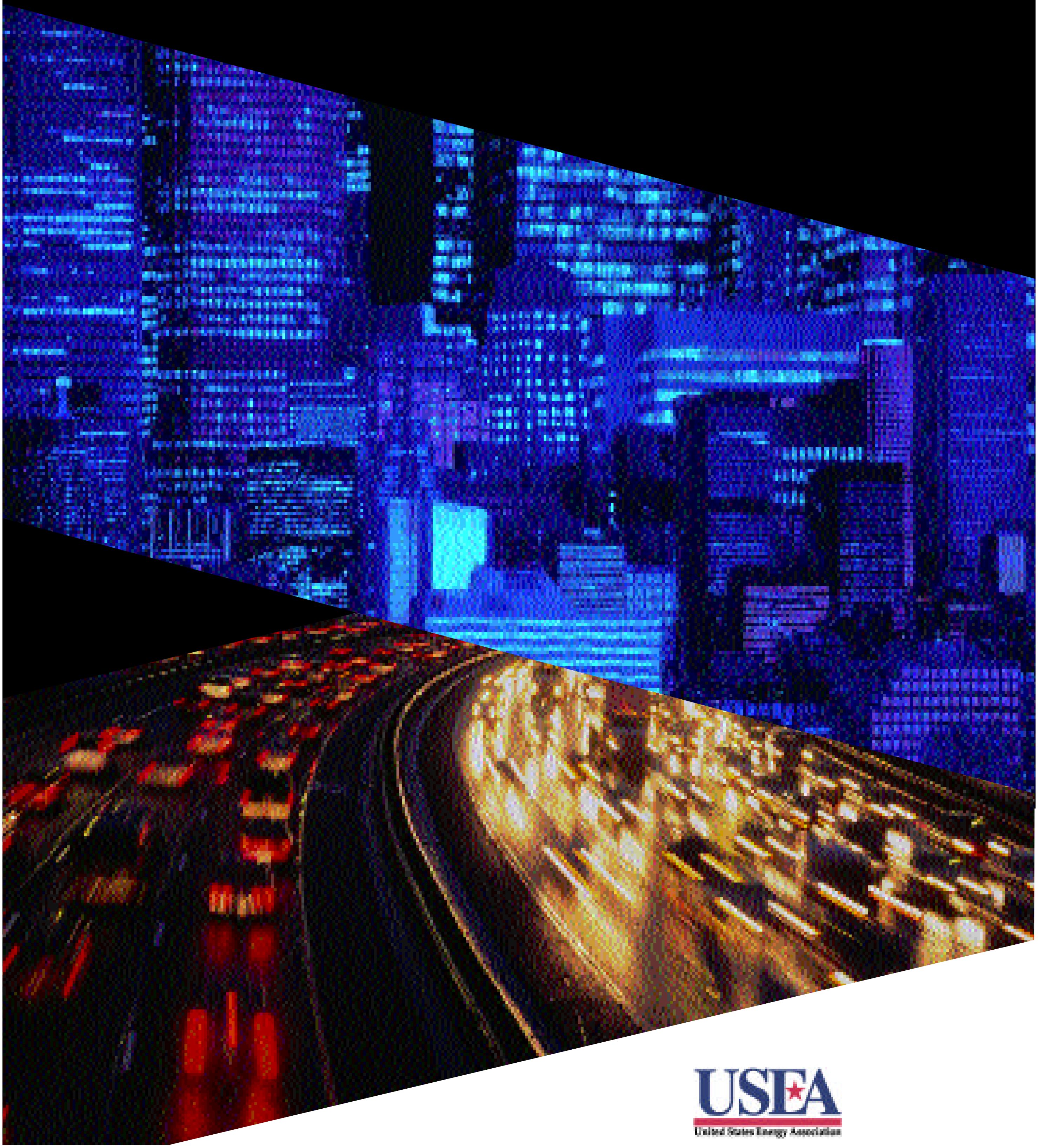

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