

# ENDING THE ENERGY STALEMATE

A Bipartisan Strategy to Meet America's Energy Challenges

**THE NATIONAL COMMISSION ON ENERGY POLICY**

**SUMMARY OF RECOMMENDATIONS**  
December 2004

## PREAMBLE

This report is a product of a bipartisan Commission of 16 members of diverse expertise and affiliations, addressing many complex and contentious topics. It is inevitable that arriving at a consensus document in these circumstances entailed innumerable compromises. Accordingly, it should not be assumed that every member is entirely satisfied with every formulation in the report, or even that all of us would agree with any given recommendation if it were taken in isolation. Rather, we have reached consensus on the report and its recommendations *as a package*, which taken as a whole offers a balanced and comprehensive approach to the economic, national security, and environmental challenges that the energy issue presents to our nation.

## ACKNOWLEDGEMENTS

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*The Commission would also like to thank the following Commissioner representatives for their many contributions to the Commission's ongoing work and to this report:*

**Gordon Binder**, Principal, Aqua International Partners;

**Kelly Sims Gallagher**, Director, Energy Technology Innovation Project, Belfer Center for Science & International Affairs, Harvard University;

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**Ralph Loomis**, Executive Assistant to the Chairman, Exelon Corporation;

**Meredith Montgomery**, District Aide, Office of Texas State Senator Rodney Ellis.

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# KEY RECOMMENDATIONS

## 1. ENHANCING OIL SECURITY

- Increase and diversify world oil production and expand global network of strategic petroleum reserves.
- Reform and significantly strengthen vehicle efficiency standards.
- Provide \$3 billion over ten years in manufacturer and consumer incentives for domestic production and purchase of efficient hybrid-electric and advanced diesel vehicles.

## 2. REDUCING RISKS FROM CLIMATE CHANGE

- Establish a mandatory, economy-wide tradable-permits program to limit greenhouse gas emissions while capping initial costs at \$7 per metric ton of CO<sub>2</sub>-equivalent reduction.
- Link further U.S. action to developed and developing nation commitments.

## 3. INCREASING ENERGY EFFICIENCY

- Update and expand efficiency standards for new appliances, equipment, and buildings to capture additional cost-effective energy-saving opportunities.
- Integrate improvements in efficiency standards with targeted technology incentives, R&D, consumer information, and programs sponsored by electric and gas utilities.
- Pursue cost-effective efficiency improvements in the industrial sector.

## 4. ENSURING AFFORDABLE, RELIABLE ENERGY SUPPLIES

- Natural Gas: expand and diversify supplies of this critical resource
  - Adopt effective public incentives for the construction of an Alaska natural gas pipeline.
  - Encourage the siting and construction of liquefied natural gas (LNG) infrastructure.
- Advanced Coal Technologies: ensure a future for the nation's most plentiful energy resource
  - Provide \$4 billion over ten years in public incentives for integrated gasification combined cycle (IGCC) coal technology and for carbon capture and sequestration.
  - Provide \$3 billion over ten years in public incentives to demonstrate commercial-scale carbon capture and geologic sequestration at a variety of sites.
- Nuclear Energy: address the obstacles
  - Fulfill existing federal commitments on nuclear waste management.
  - Provide \$2 billion over ten years from federal energy research, development, demonstration, and deployment budgets for demonstration of one to two new advanced nuclear facilities.
  - Significantly strengthen the international non-proliferation regime.



- **Renewable Energy Sources: tap America's technological potential**
  - Increase federal R&D funding for renewable electricity technologies by \$360 million annually.
  - Expand and extend from 2006 through 2009 the federal tax credit for electricity production from non-carbon energy resources.
  - Support efforts by the Federal Energy Regulatory Commission (FERC) to address the need for better integration of intermittent renewable resources (such as wind and solar power) into the interstate grid system.
  - Establish a \$1.5 billion program over ten years to increase domestic production of non-petroleum renewable transportation fuels.

## 5. STRENGTHENING ESSENTIAL ENERGY SYSTEMS

- Reduce barriers to the siting of critical energy infrastructure.
- Protect critical infrastructure from accidental failure and terrorist threats.
- Support a variety of generation resources — including both large-scale power plants, small-scale “distributed” and/or renewable generation — and demand reduction (for both electricity and natural gas) to ensure affordable and reliable energy service for consumers.
- Encourage increased transmission investment and deployment of new technologies to enhance the availability and reliability of the grid, in part by clarifying rules for cost-recovery.
- Enhance consumer protections in the electricity sector and establish an integrated, multi-pollutant program to reduce power plant emissions.

## 6. DEVELOPING ENERGY TECHNOLOGIES FOR THE FUTURE

- Double federal government funding for energy research and development, while improving the management of these efforts and promoting effective public-private partnerships.
- Increase incentives for private sector energy research, development, demonstration, and early deployment (ERD<sup>3</sup>).
- Expand investment in cooperative international ERD<sup>3</sup> initiatives and improve coordination among relevant federal agencies.
- Provide incentives for early deployment of (1) coal gasification and carbon sequestration; (2) domestically produced efficient vehicles; (3) domestically produced alternative transportation fuels; and (4) advanced nuclear reactors.





# INTRODUCTION

**This report recommends a revenue-neutral package of measures designed to ensure affordable and reliable supplies of energy for the twenty-first century while responding to growing concern about energy security and the risks of global climate change driven by energy-related greenhouse gas emissions. Through these recommendations and associated analysis, the Commission seeks to establish a constructive center in the often polarized debate over national energy policy.**

This report presents key findings from an intensive, three-year effort to develop consensus recommendations for future U.S. energy policy. Bringing together a diverse and bi-partisan group of leaders from business, government, academia, and the non-profit community, the National Commission on Energy Policy has sought to establish a constructive center in the often polarized debate about energy and to advance a coherent strategy for meeting the energy challenges of the 21<sup>st</sup> century that has the economic, environmental, and political integrity to overcome the current stalemate in national energy policy.

## KEY CHALLENGES

The challenges that must be addressed are at once familiar and new. Long-standing anxieties about the nation's underlying energy security have resurfaced at a time of record high oil and gas prices and in the wake of the largest cascading power outage in U.S. history. Recent developments in world oil markets, including rapid growth in global demand and the emergence of terrorist threats to oil facilities, are bringing new urgency to perennial concerns about the nation's exposure to oil price shocks and supply disruptions. Similar price and supply concerns increasingly apply to natural gas markets where sustained price increases and extreme volatility have begun to signal a steadily widening gap between domestic supply and demand for this economically and environmentally valuable fuel. At the same time, the uncertain state of restructuring efforts in the nation's electric industry is prompting urgent questions about the prospects for needed investment in an infrastructure that

is essential to nearly every facet of modern life.

All of these issues present formidable challenges in their own right, even as the inability of the 108<sup>th</sup> Congress to pass comprehensive energy legislation in 2003 and 2004 demonstrated the political difficulty of addressing them. Meanwhile, the overall picture is vastly complicated by the inescapable linkages between energy production and use and the environment. In particular, the risk of global climate change from emissions released by fossil fuel combustion will exert a profound influence on the world's energy options and choices over the decades ahead. In this context, the old notion of energy security acquires new dimensions. Reliable access to the energy resources needed to support a healthy economy remains the core imperative, but in the 21<sup>st</sup> century energy security also means reducing the macroeconomic and terrorism-related vulnerabilities inherent in the current geopolitical distribution of oil supply and demand and coming to grips with the environmental impacts of the current energy system.

## GOALS

The pages that follow set forth the Commission's specific recommendations for addressing these linked objectives, beginning with oil security and climate change risks — arguably two of the most difficult issues for U.S. energy policy. Thus, the first chapter of this report describes a package of measures designed to **improve U.S. oil security** by increasing global oil supply and reducing growth in domestic demand. The next chapter proposes a mandatory, economy-wide tradable-permits system for **limiting emissions of carbon dioxide and**



*other greenhouse gases.* The third and fourth chapters describe a set of complementary proposals for, on the one hand, substantially *improving energy efficiency* throughout the economy (i.e., in buildings, equipment, industry, and transportation) and, at the same time, *promoting energy supply* options that advance a number of cross-cutting policy objectives, from reducing the nation's exposure to resource constraints and supply disruptions to reducing climate change risks.

Specifically, Chapter IV recommends a number of policies to help *ensure adequate supplies of natural gas and to promote the expanded deployment of low-carbon energy alternatives* — including advanced coal technologies with carbon sequestration, next-generation nuclear technology, and renewable sources for electricity production and transportation fuels. Recognizing that a robust and resilient energy infrastructure and healthy markets provide the necessary foundation for ensuring continued access to needed energy resources, Chapter V addresses the need to *site critical infrastructure, protect key energy facilities from terrorist attack, and improve the performance and reliability of the nation's electricity system.* Finally, the Commission recognizes that continued technological advances are essential to ensure that clean, secure, and affordable energy will be available in the quantities required to sustain long-term economic growth for the United States and the world. In Chapter VI, the Commission therefore recommends that the federal government promote technology innovation in both the public and private sectors by *significantly expanding and refocusing federal energy research and development programs.*

## **POLICIES THAT WORK TOGETHER**

It is important to emphasize that the Commission's various recommendations were designed to be mutually reinforcing and are intended to function as a package. Each component of that package is the product of extensive discussions and rigorous analysis, informed by many of the nation's top energy experts. The resulting consensus is a product of detailed technical

exploration, substantive debate, and principled compromise. Early on, Commissioners agreed that a strong economy, affordable energy, and adequate energy supplies were essential prerequisites for tackling all other policy objectives; that markets — appropriately regulated — should be relied upon wherever possible to produce the most efficient solutions; that policies must be designed and implemented with great care and due appreciation for the law of unintended consequences; and that gradual adjustments are generally preferable to dramatic interventions.

## **REJECTING MYTHS ON THE LEFT AND RIGHT**

Equally important, Commissioners found common ground in rejecting certain persistent myths — on the left and on the right — that have often served to polarize and paralyze the national energy debate. These include, for example, the notion that energy independence can be readily achieved through conservation measures and renewable energy sources alone, or that limiting greenhouse gas emissions is either costless or so costly as to wreck the economy if it were tried at all. Most of all, Commissioners rejected the proposition that uncertainty justifies inaction in the face of significant risks.

Given current trends, the consequences of inaction are all too clear. Under business-as-usual assumptions, the United States will consume 43 percent more oil and emit 42 percent more greenhouse gas emissions by 2025.<sup>1</sup> At the global level, oil consumption and emissions will grow 57 and 55 percent respectively over the same timeframe<sup>2</sup> and the Earth will be heading rapidly — perhaps inexorably — past a doubling and toward a tripling of atmospheric greenhouse gas concentrations. In the Commission's view, this is not a scenario that should inspire complacency, nor is it consistent with the goal of reducing the nation's exposure to potentially serious economic, environmental, and security risks.

## POLICY CRITERIA

In choosing among a large number of potential policy options, the Commission applied several general criteria, including: economic efficiency; cost-effectiveness and consumer impacts; ability to provide appropriate incentives for future action; flexibility for adjustment in response to further experience, new information, and changed conditions; equity; political viability; and ease of implementation, monitoring, and measurement.

## REVENUE NEUTRALITY

Another important consideration was impact on the U.S. Treasury. Here the Commission sought to ensure that, as a package, its proposed policies achieved revenue neutrality; that is, they are expected to roughly pay for themselves (see Table 1).<sup>3</sup> Commission estimates suggest that implementing these recommendations will require additional federal outlays of approximately \$36

billion over ten years. To cover those outlays, the Commission outlines proposals that would raise about the same amount between 2010 and 2020 from the sale of a small portion of emission allowances under the proposed tradable-permits system for greenhouse gases.

Taken together, the Commission's recommendations aim to achieve a gradual but nevertheless decisive shift in the nation's energy policy. Their near-term impacts, by design, will be modest, and some will undoubtedly find them grossly inadequate to the challenges at hand. Others will criticize the same recommendations for going too far, precisely because they initiate a process of long-term change with consequences that no one can fully predict. These refrains are familiar. They characterize the stalemate in views that has too long resulted either in outright gridlock or in a piecemeal, special interest-driven approach to energy policy. These outcomes are no longer acceptable. It is time for the stalemate to end.

### Notes:

1. United States Department of Energy, Energy Information Administration, *Annual Energy Outlook 2004 with Projections to 2025* DOE/EIA-0383 (Washington, DC: Energy Information Administration, 2004), 8, 95, <http://www.eia.doe.gov/oiaf/aeo/index.html>.

2. United States Department of Energy, Energy Information Administration, *International Energy Outlook 2004* DOE/EIA-0484 (Washington, DC: Energy Information Administration, 2004), 28, 137, Fig. 72, <http://www.eia.doe.gov/oiaf/ieo/index.html>.

3. Expected auction revenue over the first decade of program implementation (i.e., from the beginning of 2010 to the beginning of 2020) amounts to a discounted and annualized value of \$2.6 billion per year. Expected safety valve revenues contribute an additional \$1.0 billion per year. Over ten years, the total revenue generated is projected to equal roughly \$36 billion.

# SUMMARY OF KEY RECOMMENDATIONS



## IMPROVING OIL SECURITY

To enhance the nation's energy security and reduce its vulnerability to oil supply disruptions and price shocks, the Commission recommends:

- Increasing and diversifying world oil production while expanding the global network of strategic petroleum reserves.
- Significantly raising federal fuel economy standards for cars and light trucks while reforming the 30-year-old Corporate Average Fuel Economy (CAFE) program to allow more flexibility and reduce compliance costs. New standards should be phased in over a five-year period beginning no later than 2010.
- Providing \$3 billion over ten years in manufacturer and consumer incentives to encourage domestic production and boost sales of efficient hybrid and advanced diesel vehicles.

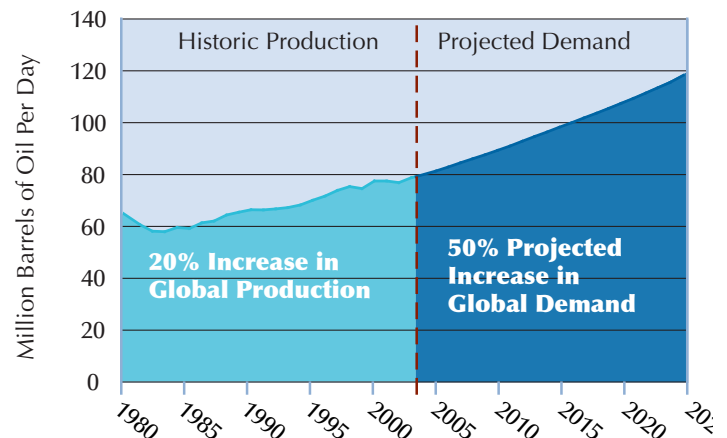
Today's combination of tight oil supplies and high and volatile prices is likely to continue, given trends in global consumption (expected to grow by more than 50 percent over the next two decades), continuing instability in the Middle East and other major oil-producing regions, and a global decline in spare production capacity.

Oil production in the United States peaked in the 1970s and has been flat or declining since. Although highly important to the nation's economy and energy security, it cannot compensate for anticipated growth in domestic demand, which is expected to reach 29 million barrels per day by 2025 — a more than 40 percent increase over current consumption levels.

Improving the nation's energy security and reducing its vulnerability to high oil prices and supply disruptions are more meaningful and ultimately

## Trends in Global Oil Production and Future Demand

Future demand for oil is projected to grow at more than double the historical rate since 1980.



Data Source: Energy Information Administration, 2004

achievable policy goals than a misplaced focus on energy independence *per se*. Achieving these goals requires focusing in equal measure on expanding and diversifying oil supplies and improving efficiency, especially in the transportation sector. Additional Commission recommendations aim to expand transportation fuel supplies by enabling production of unconventional oil and alternative fuels.

The Commission's recommendations for improving passenger vehicle fuel economy, increasing the contribution from alternative fuels, and improving the efficiency of the heavy-duty truck fleet and passenger vehicle replacement tires, could reduce U.S. oil consumption in 2025 by 10–15 percent or 3–5 million barrels per day. These demand reductions, in concert with increased oil production, would significantly improve domestic oil security.



## REDUCING RISKS FROM CLIMATE CHANGE

To address the risks of climate change resulting from energy-related greenhouse gas emissions without disrupting the nation's economy, the Commission recommends:

- Implementing in 2010 a mandatory, economy-wide tradable-permits system designed to curb future growth in the nation's emissions of greenhouse gases while capping initial costs to the U.S. economy at \$7 per metric ton of carbon dioxide-equivalent.
- Linking subsequent action to reduce U.S. emissions with comparable efforts by other developed and developing nations to achieve emissions reductions via a review of program efficacy and international progress in 2015.

The Commission believes the United States must take responsibility for addressing its contribution to

the risks of climate change, but must do so in a manner that recognizes the global nature of this challenge and does not harm the competitive position of U.S. businesses internationally.

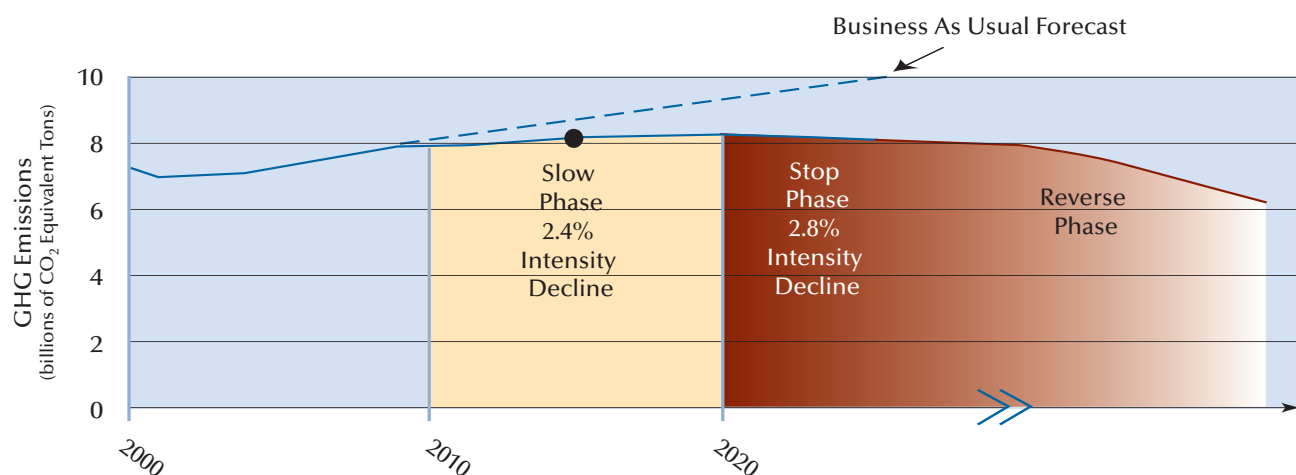
The Commission proposes a flexible, market-based strategy designed to slow projected growth in domestic greenhouse gas emissions as a first step toward later stabilizing and ultimately reversing current emissions trends if comparable actions by other countries are forthcoming and as scientific understanding warrants.

Under the Commission's proposal, the U.S. government in 2010 would begin issuing permits for greenhouse gas emissions based on an annual emissions target that reflects a 2.4 percent per year reduction in the average greenhouse gas emissions intensity of the economy (where intensity is measured in tons of emissions per dollar of GDP).

Most permits would be issued at no cost to existing emitters, but a small pool, 5 percent at the

### Commission Climate Proposal Timeline

The Commission recommendation is to slow, stop, and eventually reverse emissions growth, through an intensity-based target, contingent on action by other countries.



● Determination that major U.S. trading partners and competitors have implemented measurable and effective climate policies

NCEP

outset, would be auctioned to accommodate new entrants, stimulate the market in emission permits, and fund research and development of new technologies. Starting in 2013, the amount of permits auctioned would increase by one-half of one percent each year (i.e., to 5.5 percent in 2013; 6 percent in 2014, and so on) up to a limit of 10 percent of the total permit pool.

The Commission’s proposal also includes a safety valve mechanism that allows additional permits to be purchased from the government at an initial price of \$7 per metric ton of carbon dioxide (CO<sub>2</sub>)-equivalent. The safety valve price would increase by 5 percent per year in nominal terms to generate a gradually stronger market signal for reducing emissions without prematurely displacing existing energy infrastructure.

In 2015, and every five years thereafter, Congress would review the tradable-permits program and evaluate whether emissions control progress by major trading partners and competitors (including developing countries such as China and India) supports its continuation. If not, the United States would suspend further escalation of program requirements. Conversely, international progress, together with relevant environmental, scientific, or technological considerations, could lead Congress to strengthen U.S. efforts.

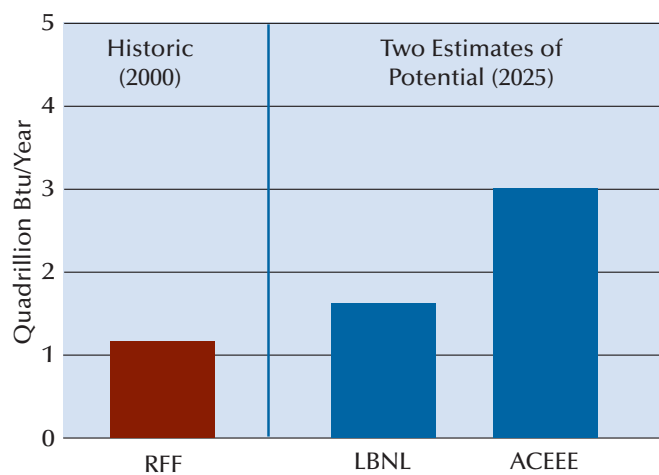
Absent policy action, annual U.S. greenhouse gas emissions are expected to grow from 7.8 billion metric tons of CO<sub>2</sub>-equivalent in 2010 to 9.1 billion metric tons by 2020 — a roughly 1.3 billion metric ton increase. Modeling analyses suggest that the Commission’s proposal would reduce emissions in 2020 by approximately 540 million metric tons. If the technological innovations and efficiency initiatives proposed elsewhere in this report further reduce abatement costs, then fewer permits will be purchased under the safety valve mechanism and actual reductions could roughly double to as much as 1.0 billion metric tons in 2020, and prices could fall below the \$7 safety valve level.

The impact of the Commission’s proposed greenhouse gas tradeable-permits program on future energy prices would be modest. Modeling indicates

that relative to business-as-usual projections for 2020, average electricity prices would be expected to rise by 5–8 percent (or half a cent per kilowatt-hour); natural gas prices would rise by about 7 percent (or \$0.40 per mmBtu); and gasoline prices would increase 4 percent (or 6 cents per gallon). Coal use would decline by 9 percent below current forecasts, yet would still increase in absolute terms by 16 percent relative to today’s levels, while renewable energy production would grow more substantially; natural gas use and overall energy consumption, meanwhile, would change only minimally (1.5 percent or less) relative to business-as-usual projections.

Overall, the Commission’s greenhouse gas recommendations are estimated to cost the typical U.S. household the welfare equivalent of \$33 per year in 2020 (2004 dollars) and to result in a slight reduction in expected GDP growth, from 63.5 percent to 63.2 percent, between 2005 and 2020.

### Energy Savings from Appliance Standards



Data Source: Resources for the Future 2004, Lawrence Berkeley National Laboratory 2004, American Council for an Energy Efficient Economy 2004

## IMPROVING ENERGY EFFICIENCY

To improve the energy efficiency of the U.S. economy, the Commission — in addition to an increase in vehicle fuel economy standards — recommends:

- Updating and expanding efficiency standards for new appliances, equipment, and buildings to capture additional cost-effective energy-saving opportunities.
- Integrating improvements in efficiency standards with targeted technology incentives, R&D, consumer information, and programs sponsored by electric and gas utilities.<sup>1</sup>
- Pursuing cost-effective efficiency improvements in the industrial sector.

In addition, efforts should be made to address efficiency opportunities in the heavy-duty truck fleet, which is responsible for roughly 20 percent of transportation energy consumption, but is not subject to fuel economy regulation, and in the existing vehicle fleet where a substantial opportunity exists to improve efficiency by, for example, mandating that replacement tires have rolling-resistance characteristics equivalent to the original equipment tires used on new vehicles.

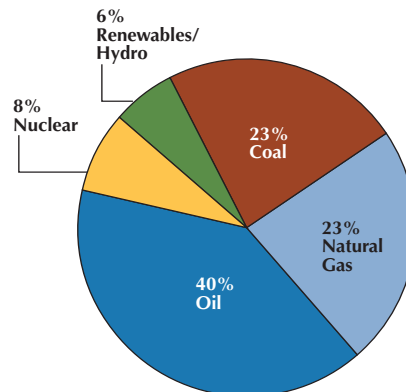
In updating and implementing efficiency standards, policy makers should seek to exploit potentially productive synergies with targeted technology incentives, research and development initiatives, information programs (such as the federal ENERGY STAR label), and efficiency programs sponsored by both electricity and natural gas utilities.

Energy efficiency advances all of the critical policy objectives identified elsewhere in this report and is therefore essential to successfully managing the nation's, and the world's, short- and long-term energy challenges. Absent substantial gains in the energy efficiency of motor vehicles, buildings, appliances, and equipment, it becomes difficult to construct credible scenarios in which secure, low-carbon energy supplies can keep pace with increased demand. As a nation that consumes more energy than any other in the world,

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## Total Domestic Energy Use by Source

The U.S. relies upon fossil fuels to meet over 85% of its total energy needs (2003).



Data Source: Energy Information Administration, 2004

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improving domestic energy efficiency can have a notable effect on global energy demand.

## EXPANDING ENERGY SUPPLIES

The United States and the world will require substantially increased quantities of electricity, natural gas, and transportation fuels over the next 20 years. In addition to the measures discussed previously for improving oil security, the Commission's recommendations for assuring ample, secure, clean, and affordable supplies of energy address established fuels and technologies (such as natural gas and nuclear power), as well as not-yet-commercialized options, such as coal gasification and advanced biomass (including waste-derived) alternative transportation fuels.

### Natural Gas:

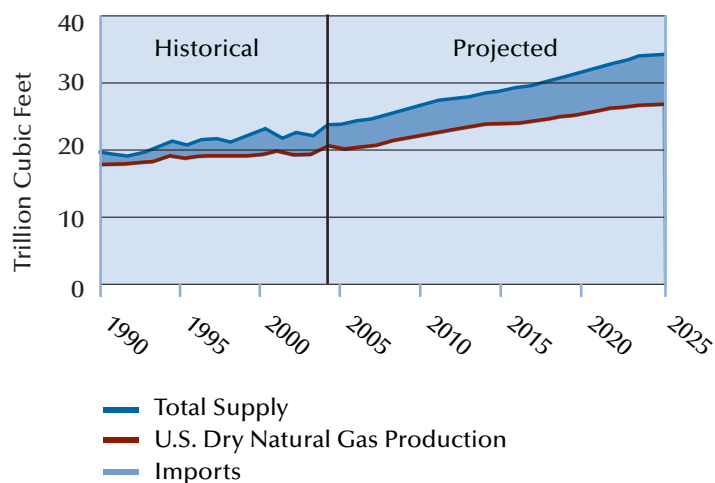
To diversify and expand the nation's access to natural gas supplies, the Commission recommends:

- Adopting effective public incentives for the construction of an Alaska natural gas pipeline.
- Addressing obstacles to the siting and construction of infrastructure needed to support increased imports of liquefied natural gas (LNG).

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## U.S. Natural Gas Supply

Even with construction of the Alaska pipeline, the United States will need more natural gas imports in the years to come.



Data Source: Energy Information Administration, 2004

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Other Commission recommendations aim to: (1) improve the ability of agencies like the Bureau of Land Management to evaluate and manage access to natural gas resources on public lands and (2) increase R&D efforts to develop technologies for tapping non-conventional natural gas supplies, such as natural gas hydrates, which hold tremendous promise.

The above recommendations are intended to address growing stresses on North American natural gas markets that have already resulted in sharply higher and more volatile gas prices, and created substantial costs for consumers and gas-intensive industries. Construction of a pipeline would provide access to significant natural gas resources in Alaska's already-developed oilfields (potentially lowering gas prices by at least 10 percent over the pipeline's first decade). Support for a pipeline in the form of loan guarantees, accelerated depreciation, and tax credits was included in legislation passed by

Congress late in 2004, but the Commission believes that additional incentives are likely to be necessary given the high cost, lengthy construction period, uncertainty about future gas prices, and other siting and financing hurdles associated with the project.

In addition to the Alaska pipeline, expanded LNG infrastructure would further increase the nation's ability to access abundant global supplies of natural gas, providing important benefits in terms of lower and less volatile gas prices and more reliable supplies for electricity generators and for other gas-intensive industries. Accordingly, the Commission recommends concerted efforts to overcome current siting obstacles, including improved federal-state cooperation in reviewing and approving new LNG facilities and efforts to educate the public regarding related safety issues.

### Advanced Coal Technologies:

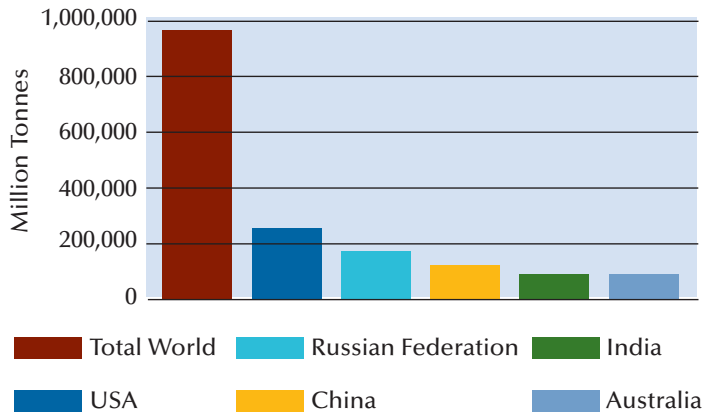
To enable the nation to continue to rely upon secure, domestic supplies of coal to meet future energy needs while addressing the risks of global climate change due to energy-related greenhouse gas emissions, the Commission recommends:

- Providing \$4 billion over ten years in early deployment incentives for integrated gasification combined cycle (IGCC) coal technology.
- Providing \$3 billion over ten years in public incentives to demonstrate commercial-scale carbon capture and geologic sequestration at a variety of sites.

Coal is an abundant and relatively inexpensive fuel that is widely used to produce electricity in the United States and around the world. Finding ways to use coal in a manner that is both cost-effective and compatible with sound environmental stewardship is

## Proved Coal Reserves

The United States has the largest proved coal reserves of any nation in the world (the top five nations are shown here).



Data Source: BP, 2004

imperative to ensure a continued role for this important resource.

IGCC technology — in which coal is first gasified using a chemical process and the resulting synthetic gas is used to fuel a combustion turbine — has the potential to be significantly cleaner and more efficient than today's conventional steam boilers. Moreover, it can assist in effectively controlling pollutants such as mercury and can open the door to economic carbon capture and storage. The gasification process itself is already commonly used in the manufacture of chemicals, but — with the exception of a handful of demonstration facilities — has not yet been widely applied to producing power on a commercial scale.

## Nuclear Power:

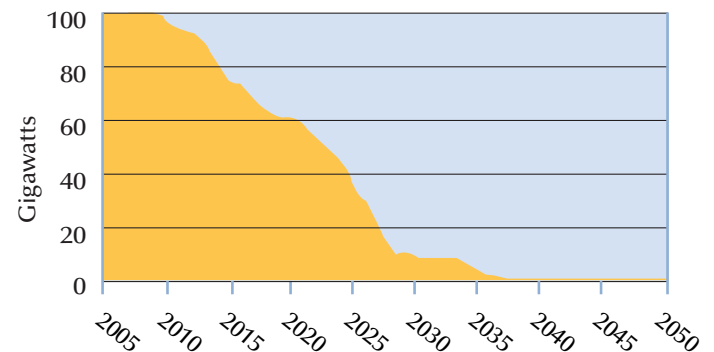
To help enable nuclear power to continue to play a meaningful role in meeting future energy needs, the Commission recommends:

- Fulfilling existing federal commitments on nuclear waste management
- Providing \$2 billion over ten years from federal research, development, demonstration, and deployment (RDD&D) budgets for the demonstration of one to two new advanced nuclear power plants.
- Significantly strengthening the international non-proliferation regime.

Worldwide, some 440 nuclear power plants account for about one-sixth of total electricity supplies and about half of all non-carbon electricity generation. In the United States, 103 operating nuclear power plants supply about 20 percent of the nation's electricity and

## Total U.S. Nuclear Power Plant Capacity (by License Expiration Date)

Today's existing nuclear fleet will gradually be retired over the next 50 years — if current licenses expire — depriving the nation of one of its key non-carbon electricity sources.



Data Source: Energy Information Administration, 2003



almost 70 percent of its non-carbon electricity. The contribution of nuclear energy to the nation's power needs will decline in the future absent concerted efforts to address concerns about cost, susceptibility to accidents and terrorist attacks, management of radioactive wastes, and proliferation risks.

Government intervention to address these issues and to improve prospects for an expanded, rather than diminished, role for nuclear energy is warranted by several important policy objectives, including reducing greenhouse gas emissions, enhancing energy security, and alleviating pressure on natural gas supplies from the electric-generation sector.

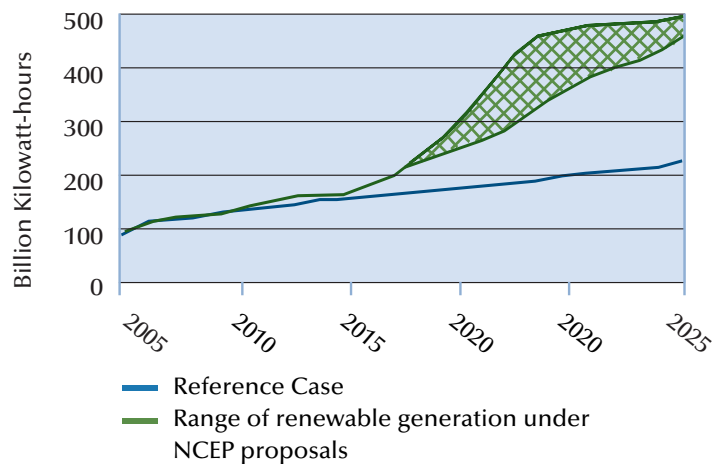
### Renewable Energy:

To expand the contribution of clean, domestic, renewable energy sources to meeting future energy needs, the Commission recommends:

- Increasing federal funding for renewable technology research and development by \$360 million annually. Federal efforts should be targeted at overcoming key hurdles in cost competitiveness and early deployment.
- Extending the federal production tax credit for a further four years (i.e., from 2006 through 2009), and expanding eligibility to all non-carbon energy sources, including solar, geothermal, new hydro-power generation, next generation nuclear, and advanced fossil fuel generation with carbon capture and sequestration. (This is in addition to the extension recently passed by Congress for 2004-2005.)
- Supporting ongoing efforts by the Federal Energy Regulatory Commission (FERC) to promote market-based approaches to integrating intermittent resources into the interstate grid system, while ensuring that costs are allocated appropriately and arbitrary penalties for over- and under-production are eliminated.
- Establishing a \$1.5 billion program over ten years to increase domestic production of advanced non-petroleum transportation fuels from biomass (including waste).

## Projected Renewable Electricity Generation

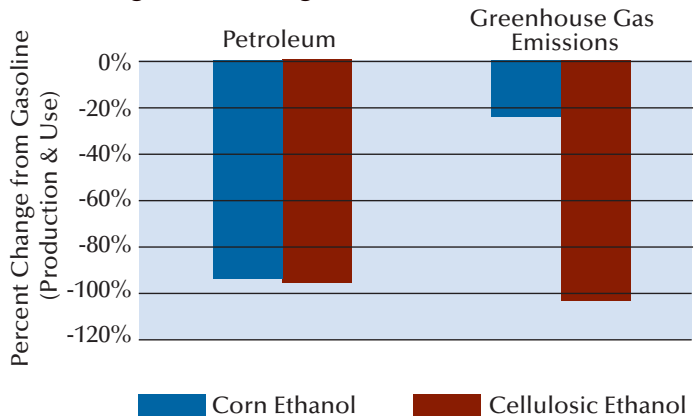
Non-hydro renewable electricity generation is expected to more than double in 2025 compared to forecasted business-as-usual levels as a result of the Commission's proposed greenhouse gas emissions trading program and other policy recommendations.



Data Source: NCEP NEMS Modeling

## The Attributes of Corn Ethanol and Cellulosic Ethanol

While both corn and cellulosic ethanol are effective at offsetting petroleum consumption, cellulosic ethanol has the added benefit of substantially reduced greenhouse gas emissions.



Data Source: Lynd, Greene, and Sheehan, 2004

Renewable energy already plays an important role in the nation's energy supply, primarily in the form of hydropower for electricity production and corn-based ethanol as a transportation fuel. Other renewable options — including wind, solar, and advanced biomass technologies for power generation together with alternative transportation fuels from woody or fibrous (cellulosic) biomass and organic wastes — have made considerable progress in recent years, but still face substantial cost or technology hurdles as well as, in some cases, siting challenges.

The Commission's recommendations aim to improve the performance and cost-competitiveness of renewable energy technologies while also addressing deployment hurdles by providing more planning certainty in terms of federal tax credits, boosting R&D investments, and addressing issues related to the integration of renewable resources with the interstate transmission grid.

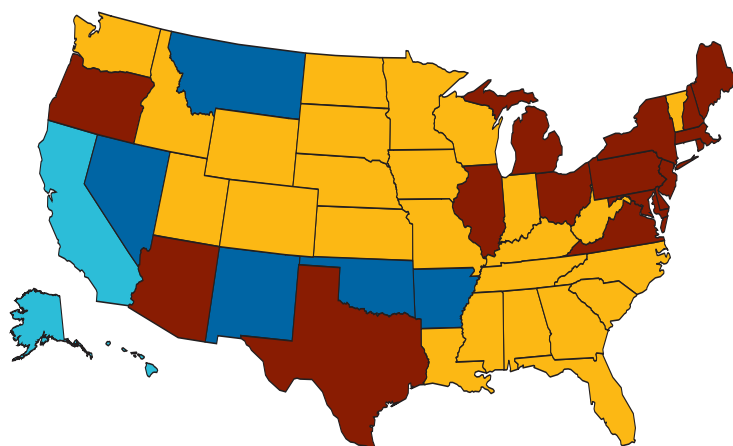
## STRENGTHENING ENERGY SUPPLY INFRASTRUCTURE

To sustain access to the essential energy supplies and services on which the economy depends, the Commission recommends:

- Reducing barriers to the siting of critical energy infrastructure.
- Protecting critical infrastructure from accidental failure and terrorist threats.
- Supporting a variety of generation resources — including both large scale power plants and small scale “distributed” and/or renewable generation — and demand reduction (for both electricity and natural gas), to ensure affordable and reliable energy service for consumers.
- Encouraging increased transmission investment and deployment of new technologies to enhance the availability and reliability of the grid, in part by clarifying rules for cost-recovery.

## The State of Electricity Restructuring

Roughly half of the states in the United States have taken action on electricity restructuring, although several chose to suspend or delay retail competition as a result of the California power crisis in 2001. The remaining states have chosen instead to maintain traditional state-regulated monopolies.



Energy Information Administration, 2003

- Enhancing consumer protections in the electricity sector and establishing an integrated, multi-pollutant program to reduce power plant emissions.

The Commission believes there is a national imperative to strengthen the systems that deliver secure, reliable, and affordable energy. Priorities include: siting reforms to enable the expansion and construction of needed energy facilities; greater efforts to protect the nation's energy systems from terrorist attack; and reforms to improve the reliability and performance of the electricity sector.

## DEVELOPING ENERGY TECHNOLOGIES FOR THE FUTURE

To ensure that technologies capable of providing clean, secure, and affordable energy become available in the timeframe and on the scale needed, the Commission recommends:

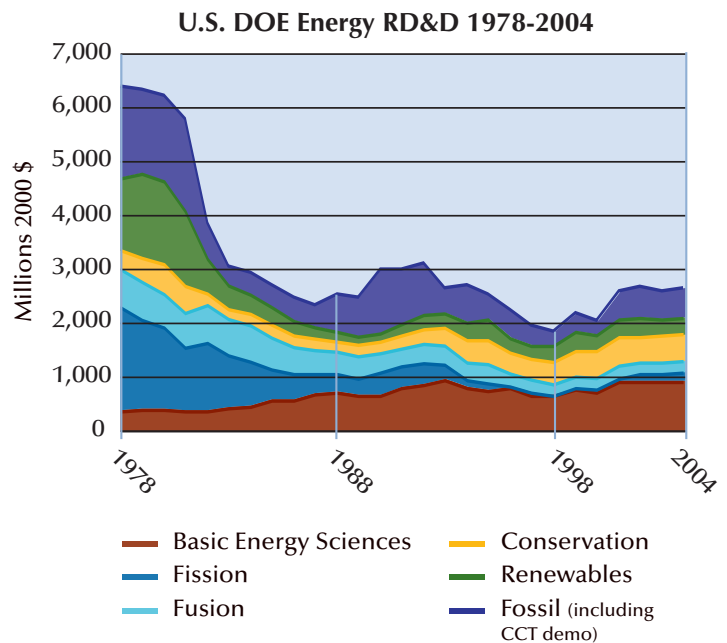
- Doubling federal government funding for energy research and development, while improving the management of these efforts and promoting effective public-private partnerships.
- Increasing incentives for private sector energy research, development, demonstration, and early deployment (ERD<sup>3</sup>).
- Expanding investment in cooperative international ERD<sup>3</sup> initiatives and improving coordination among relevant federal agencies.
- Providing incentives for early deployment of (1) coal gasification and carbon sequestration; (2) domestically-produced efficient vehicles; (3) domestically-produced alternative transportation fuels; and (4) advanced nuclear reactors.

Overcoming the energy challenges faced by the United States and the rest of the world requires technologies superior to those available today. To accelerate the development of these technologies, the federal government must increase its collaboration with the private sector, with states, and with other nations to develop and deploy technologies that will not be pursued absent greater federal support.

Investments by both the private and public sectors in energy research, development, demonstration, and early deployment have been falling short of what is likely to be needed to meet the energy challenges confronting the nation and the world in the 21<sup>st</sup> century. This insufficiency of investment is compounded by shortcomings in the government's management of its energy-technology-innovation portfolio and in the coordination and cooperation among relevant efforts in state and federal government, industry, and academia.

## Declining Public Support for ERD&D in the United States

Analysis of DOE data shows that, over the 25 years from FY1978 to FY2004, US government appropriations for ERD&D fell from \$6.4 billion to \$2.75 billion in constant year-2000 dollars, a nearly 60-percent reduction. The part of these appropriations devoted to applied-energy-technology RD&D fell from \$6.08 billion to \$1.80 billion.



Gallagher and Sagar, 2004

The Commission proposes that the nation devote the resources generated by the sale of greenhouse gas emissions permits to enhance the development and deployment of improved energy technologies. The approximately \$36 billion that Commission analysis indicates will be generated over ten years by the proposed greenhouse gas tradeable-permits program — most of which will come from auctioning a small portion of the overall permit pool — will offset the specific additional public investments summarized below.

## A Revenue Neutral Strategy for Investing in Energy Technology Development

The Commission proposes to double current federal spending on energy innovation, substantially expand early deployment efforts for advanced energy technologies, and triple investment in cooperative international energy research. To offset additional costs to the Treasury, the Commission proposes that the federal government each year auction a small percentage of greenhouse gas emissions permits.

Additional Expenditures		Annual	10 Year Total
RD&D	Double current investment	\$1.7 billion	\$17 billion
Incentives for Early Deployment	Coal IGCC, biofuels, advanced nuclear, non-carbon production tax credit (PTC), manufacturer and consumer auto efficiency incentives, Alaska pipeline	\$1.4 billion	\$14 billion
International Cooperation	Triple Current Investment	\$500 million	\$5 billion
<b>Total</b>			<b>\$36 billion</b>
Additional Revenues			
Greenhouse Gas Permit Sales	<ul style="list-style-type: none"> <li>• 5 percent permit auction in 2010 with 0.5 percent annual increase starting in 2013</li> <li>• Revenue from expected permit sales under the safety valve</li> </ul>		\$26 billion
			\$10 billion
<b>Total</b>			<b>\$36 billion</b>

### Notes:

1. See, e.g., the constructive joint proposal on these issues to the National Association of Regulatory Utility Commissioners by the American Gas Association and the Natural Resources Defense Council (July 2004); available at [www.aga.org](http://www.aga.org).





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