DOE/ME-0030

The Department of Energy Strategic Plan

"Protecting National, Energy, and Economic Security with Advanced Science and Technology and Ensuring Environmental Cleanup"

September 30, 2003

Editor's Notes:

This strategic plan covers the Department of Energy including the National Nuclear Security Administration, the Energy Information Administration, and the Power Marketing Administrations. As an independent regulatory agency, the Federal Energy Regulatory Commission (FERC) prepares separate documents. See their web page at: http://www.ferc.gov/about/strat-docs.asp.

This document is also available on the Department of Energy's web site: http://www.energy.gov.

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Secretary's Message

I am pleased to present the Department of Energy's 2003 Strategic Plan.

The Department of Energy is responsible for meeting the Nation's energy and National security challenges. This Strategic Plan charts the course for the next 25 years – focusing our capabilities to meet today's needs and provide innovative solutions to tomorrow's challenges.

We have updated our mission, established long-term goals, laid out our strategies to achieve them, and identified key intermediate objectives along the way. This Plan, therefore, provides the basis for evaluating our performance which we will be doing regularly.

All of us at the Department are committed to meeting the Department's overarching mission of ensuring national security.

We welcome your support as we continue to fulfill our responsibility to the Nation.

Spencer Abraham

Secretaries of Energy James Watkins, James Schlesinger, James Edwards, Spencer Abraham and Hazel O'Leary at the 25th Anniversary of the U.S. Department of Energy, October 8, 2002.

25th Anniversary

1977-2002

Major DOE Laboratories and Field Facilities

The Department of Energy Strategic Plan

The Department of Energy contributes to the future of the Nation by ensuring energy security, maintaining the safety, security and reliability of the nuclear weapons stockpile, cleaning up the environment from the legacy of the Cold War, and developing innovations in science and technology. After 25 years in existence, the Department now operates 24 preeminent research laboratories and facilities and four power marketing administrations, and manages the environmental cleanup from 50 years of nuclear defense activities that impacted two million acres in communities across the country. The Department has an annual budget of about $23 billion and employs about 14,500 Federal and 100,000 contractor employees.

The Department of Energy is principally a national security agency and all of its missions flow from this core mission to support national security. That is true not just today, but throughout the history of the agency. The origins of the Department can be traced to the Manhattan Project and the race to develop the atomic bomb during World War II. Following the war, Congress engaged in a vigorous and contentious debate over civilian versus military control of the atom. The Atomic Energy Act of 1946 settled the debate by creating the Atomic Energy Commission, which took over the Manhattan Project's sprawling scientific and industrial complex.

The Atomic Energy Commission was specifically established to maintain civilian government control over the field of atomic research and development. During the early Cold War Years, the Commission focused on designing and producing nuclear weapons and developing nuclear reactors for naval propulsion. The Atomic Energy Act of 1954 ended exclusive Government use of the atom and began the growth of the commercial nuclear power industry, giving the Atomic Energy Commission authority to regulate the new industry.

In the 1970s, the Atomic Energy Commission was abolished and the Energy Reorganization Act of 1974 created two new agencies: the Nuclear Regulatory Commission to regulate the nuclear power industry and the Energy Research and Development Administration to manage the nuclear weapon, naval reactor, and energy development programs.

However, the extended energy crisis of the 1970s soon demonstrated the need for unified energy organization and planning. The Department of Energy Organization Act brought the Federal Government's agencies and programs into a single agency. Established on October 1, 1977, the Department of Energy assumed the responsibilities of the Federal Energy Administration, the Energy Research and Development Administration, and parts and programs from several other agencies.

The Department provided the framework for a comprehensive and balanced national energy plan by coordinating and administering the energy functions of the Federal Government. The Department undertook responsibility for long-term, high-risk research and development of energy technology, power marketing, energy efficiency, the nuclear weapons program, energy regulatory programs, and a central energy data collection and analysis program.

Over its 25-year history, the Department has shifted its emphasis and focus as the needs of the Nation have changed. During the late 1970s, the Department emphasized energy development and regulation. In the 1980s, nuclear weapons research, development, and production took a priority. Since the end of the Cold War, the Department has focused on environmental cleanup of the nuclear weapons complex, nuclear nonproliferation and nuclear weapons stewardship, reliable energy supplies and delivery, energy efficiency and conservation, and technology transfer.

Science and technology are the Department's principal tools in the pursuit of its national security mission. The Department has amassed tremendous scientific and technical capabilities serving America in ways never anticipated 25 years ago. Those capabilities will be applied to the overarching mission of ensuring the national security.

The development of this strategic plan was the work of only Federal employees and was guided by major policy documents and program evaluations. In May 2001, the Administration issued its National Energy Policy which had several recommendations for the Department of Energy. The Administration's Nuclear Posture Review of 2002 revised the Nation's nuclear weapons policy affecting the Department's nuclear weapons programs. Focused internally, the Department conducted major "top-to-bottom" program evaluations of the environmental management and fossil energy programs and has had the benefit of program evaluations conducted by the Department's Inspector General and the General Accounting Office. There are additional discussions of program evaluations with the resulting goals throughout this document.

This document charts the course for the next 25 years—focusing on the Department's technical capabilities to meet its needs and provide innovative solutions for the future.

The Department of Energy's overarching mission is to advance the national, economic and energy security of the United States; to promote scientific and technological innovation in support of that mission; and to ensure the environmental cleanup of the national nuclear weapons complex.

The Department has four **strategic goals** toward achieving the mission:

- **Defense Strategic Goal:** To protect our national security by applying advanced science and nuclear technology to the Nation's defense.
- **Energy Strategic Goal:** To protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy.
- **Science Strategic Goal:** To protect our national and economic security by providing world-class scientific research capacity and advancing scientific knowledge.
- **Environment Strategic Goal:** To protect the environment by providing a responsible resolution to the environmental legacy of the Cold War and by providing for the permanent disposal of the Nation's high-level radioactive waste.

The Department has adopted seven long-term general goals to implement these strategic goals.

U.S. Department of Energy Headquarters in Washington, D.C.

Strategic Goals	General Goals
Defense Strategic Goal: To protect our national security by applying advanced science and nuclear technology to the Nation's defense.	Goal 1. NUCLEAR WEAPONS STEWARDSHIP: Ensure that our nuclear weapons continue to serve their essential deterrence role by maintaining and the enhancing safety, security, and reliability of the U.S. nuclear weapons stockpile.
	Goal 2. NUCLEAR NONPROLIFERATION: Provide technical leadership to limit or prevent the spread of materials, technology, and expertise relating to weapons of mass destruction; advance the technologies to detect the proliferation of weapons of mass destruction worldwide; and eliminate or secure inventories of surplus materials and infrastructure usable for nuclear weapons.
	Goal 3. NAVAL REACTORS: Provide the Navy with safe, militarily effective nuclear propulsion plants and ensure their continued safe and reliable operation.
Energy Strategic Goal: To protect our national and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy.	Goal 4. ENERGY SECURITY: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable, and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.
Science Strategic Goal: To protect our national and economic security by providing world-class scientific research capacity and advancing scientific knowledge.	Goal 5. WORLD-CLASS SCIENTIFIC RESEARCH CAPACITY: Provide world-class scientific research capacity needed to: ensure the success of Department missions in national and energy security; advance the frontiers of knowledge in physical sciences and areas of biological, medical, environmental, and computational sciences; or provide world-class research facilities for the Nation's science enterprise.
Environment Strategic Goal: To protect the environment by providing a responsible resolution to the environmental legacy of the Cold War and by providing for the permanent disposal of the Nation's high-level radioactive waste.	Goal 6. ENVIRONMENTAL MANAGEMENT: Accelerate cleanup of nuclear weapons manufacturing and testing sites, completing cleanup of 108 contaminated sites by 2025.
	Goal 7. NUCLEAR WASTE: License and construct a permanent repository for nuclear waste at Yucca Mountain and begin acceptance of waste by 2010.

Meeting National Security Challenges

The Department protects U.S. national security by ensuring the continued safety, security, and reliability of our Nation's nuclear deterrent, working to reduce the global danger from the proliferation of nuclear materials and other weapons of mass destruction, fulfilling the U.S. Navy's requirements for new nuclear propulsion plants that meet current and future national defense requirements, and in providing technical expertise in advancing Homeland Security. Secretary Abraham has made it clear that all Department missions flow from the core mission to protect national security.

Defense Strategic Goal: To protect our national security by applying advanced science and nuclear technology to the Nation's defense.

In 2000, the National Nuclear Security Administration (NNSA) was established as a semi-autonomous agency within the Department in response to a Congressional mandate to reinvigorate the security posture throughout the nuclear weapons program and to reaffirm the Nation's commitment to maintaining the nuclear deterrence capabilities of the United States. NNSA was chartered as a distinct organization within the Department of Energy to better focus management attention on enhanced security, proactive management practices, and mission focus within the Department's defense programs. The Department performs its national security missions through NNSA.

Following the September 11, 2001 attacks, the Department immediately implemented measures to augment safeguards and security for its most critical assets to fully protect nuclear weapons, materials, facilities, classified information, and personnel of the Department of Energy.

Department sites have significantly increased the level of security, increasing the size of protective forces, enhancing training, upgrading equipment, limiting access to key areas, and improving cyber security. The Department also upgraded its emergency response assets, which are available to be deployed in emergencies around the world. The Department, and NNSA, will continue to ensure effective performance of our safeguards and security systems through consistent implementation of Departmental and other relevant security policies.

Two strategies will be used to accomplish this goal. First, the Department will ensure that clear roles, responsibilities and organizational structures are fully implemented in the safeguards and security program. Second, the Department will collaborate with other offices and agencies in the development and deployment of technologies to replace costly and manpower-intensive physical protection strategies.

The evolving global threat scenario could require flexibility in the identification and implementation of revised protection strategies for facilities and information. Throughout the planning period, the Department utilizes both internal and independent reviews and assessments to validate systems performance, and will pursue technology alternatives that are cost-effective and responsive to emerging threats.

Recently, Secretary Abraham directed the Department to update the Design Basis Threat based on the latest intelligence, which provides the basis for establishing and assessing protective effectiveness at Department facilities. The new Design Basis Threat, approved in May 2003, is derived from national intelligence threat information and reflects the most credible threats to Department assets and operations. It is effective immediately and will be implemented over the next several years.

The Department will apply advanced science and nuclear technology to the Nation's defense and focus resources to achieve the following general goals:

Goal 1. NUCLEAR WEAPONS STEWARDSHIP: Ensure that our nuclear weapons continue to serve their essential deterrence role by maintaining and enhancing the safety, security, and reliability of the U.S. nuclear weapons stockpile.

Goal 2. NUCLEAR NONPROLIFERATION: Provide technical leadership to limit or prevent the spread of materials, technology, and expertise relating to weapons of mass destruction; advance the technologies to detect the proliferation of weapons of mass destruction worldwide; and eliminate or secure inventories of surplus materials and infrastructure usable for nuclear weapons.

Goal 3. NAVAL REACTORS: Provide the Navy with safe, militarily effective nuclear propulsion plants and ensure their continued safe and reliable operation.

Secretary Spencer Abraham and Homeland Security Secretary Tom Ridge at DOE.

Goal 1. NUCLEAR WEAPONS STEWARDSHIP: Ensure that our nuclear weapons continue to serve their essential deterrence role by maintaining and enhancing the safety, security, and reliability of the U.S. nuclear weapons stockpile.

The most important responsibility of the Secretary of Energy in cooperation with the Secretary of Defense is certifying to the President that the Nation's nuclear weapons stockpile is safe, secure, and reliable, and that there is no requirement to resume underground testing. Our nuclear deterrent protected the Nation and our allies, helped win a 50-year Cold War, and continues to be a key strategic component of our national security posture.

The Administration's Nuclear Posture Review (NPR) revised the Nation's nuclear weapons policy to reflect the end of the Cold War. The Department is responding to these changing requirements. The NPR shifted planning for U.S. strategic forces from the threat-based approach of the Cold War era to a capabilities-based approach, relying on a significantly smaller nuclear stockpile to serve as a key deterrent to threats from nations which might wish to employ weapons of mass destruction. Key to the capabilities-based approach is to build and sustain a force structure that is flexible enough to deal with the highly dynamic strategic environment.

> "[M]y most important responsibility as Secretary of Energy [is] certifying to the President the safety and reliability of our nuclear stockpile."
>
> *Spencer Abraham*
> *Secretary of Energy*
> *February 3, 2003*

Our challenge today continues to be both technically complex and compelling: the Department must maintain the safety, security, and reliability of an aging nuclear weapons stockpile without resorting to underground testing; continue stockpile surveillance activities; refurbish and extend the lives of several warhead types; advance the science and technology base; recruit and train the next generation of scientists and engineers; reinvigorate the weapons complex infrastructure; enhance the test readiness posture; revitalize advanced concepts work and restore lost production capabilities.

To ensure that the existing stockpile continues to meet its military requirements, the NNSA also has a comprehensive refurbishment program known as Stockpile Life Extension. This program designs, builds, tests, and installs new subsystems and components, extending the operational service life for these warheads for 30 years. The first Life Extension Program for the W87 ICBM warhead is nearly complete. Life extension work on the B61, W76, and W80 warheads will begin later this decade.

NNSA is also restoring the full range of manufacturing capabilities needed to respond to any stockpile contingency. In particular, NNSA is moving to restore the capability and capacity to manufacture plutonium pits – the key component of modern nuclear weapons. This has been a central challenge for Stockpile Stewardship since the closure of the Rocky Flats Plant in 1989. NNSA will continue planning for the design and construction of a modern pit facility to support long-term pit manufacturing. This fall, NNSA will take the next

step in the resumption of tritium production when several hundred Tritium Producing Burnable Absorber Rods are inserted into a Tennessee Valley Authority (TVA) reactor. Tritium is an isotope of hydrogen which decays and must be replenished and is used in all modern nuclear weapons.

NNSA is also investing in the leading edge scientific and engineering tools required to support the stockpile now and into the future. Three areas deserve special mention. First, with the Advanced Simulation Computing Initiative, NNSA is working with U.S. computer manufacturers to acquire the world's fastest and most capable computers to address nuclear weapons performance issues that several years ago were impossible to solve. Several of these advanced computer systems are already in place at the National laboratories and are providing powerful data analysis capabilities for stockpile evaluations. Second, the Dual-Axis Radiographic Hydrodynamic Test (DARHT) Facility is providing images of weapons implosion processes, which provides essential data to validate computer codes. Third, later this year, the world's most energetic laser, the National Ignition Facility at Lawrence Livermore National Laboratory, will begin to carry out experiments in support of the nuclear weapons stockpile.

> "Our nuclear capability protected the nation and helped us to win a 50-year Cold War. Today it continues to be a key strategic component of our Nation's security posture. Our challenge today is large and complex: We must maintain the safety, security, reliability, and effectiveness of our aging nuclear weapons stockpile without resort to underground testing—and also provide a manufacturing base for the production of a replacement weapon if the need should arise."
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> *Spencer Abraham*
> *Secretary of Energy*
> *February 3, 2003*

Strategies

For the next 25 years, the Department will pursue two strategies to ensure the safety, security, and reliability of the U.S. nuclear weapons stockpile. NNSA will:

1. Continue to work with the Department of Defense to conduct a program of warhead evaluation, maintenance, refurbishment, and production.
2. Develop the science, design, engineering, testing, and manufacturing capabilities needed for long-term stewardship of the stockpile without underground testing.

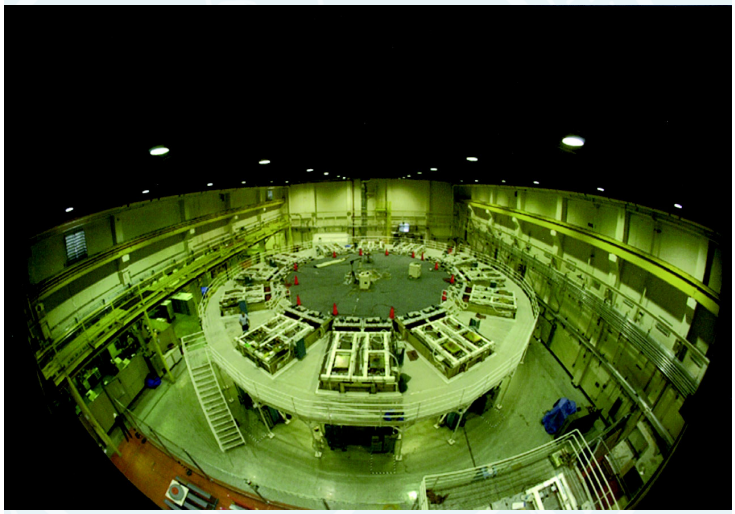
External Factors

The following external factors could affect our ability to achieve this goal:

- **Technology**: Technological development is inherently unpredictable. The discovery of an insurmountable scientific or engineering obstacle in a crucial stockpile weapon could force the resumption of nuclear testing.
- **Nuclear Posture Review**: Changes in the nuclear threats posed to the United States could require changes to our nuclear weapons stewardship programs.
- **Funding**: A significant reduction in funding would adversely affect the efforts to revitalize the weapons complex, execute the life extension programs, and continue the work of stockpile stewardship.

Key Intermediate Objectives

- In Fall 2003, NNSA initiates tritium production in TVA's Watts Bar Reactor.
- By December 2003, the National Ignition Facility will begin operations at limited power.
- By 2005, a 100 Teraflops advanced computational machine will be in operation at Lawrence Livermore National Laboratory.
- By 2007, NNSA will deliver the first war reserve pit for the stockpile since the closure of Rocky Flats.
- Throughout the 25-year planning period, the Secretary of Energy, jointly with the Secretary of Defense, will annually certify to the President whether the stockpile is safe, secure, and reliable and whether a resumption of nuclear weapons testing is necessary.
- Throughout the 25-year planning period, NNSA will develop and maintain the facilities and infrastructure necessary to ensure the safety, security, and reliability of the stockpile.



The Atlas Pulsed Power Facility is being reassembled at the Nevada Test Site as part of the Stockpile Stewardship Program to validate certain hydrodynamic elements of nuclear weapons computer codes.

Goal 2. NUCLEAR NONPROLIFERATION: Provide technical leadership to limit or prevent the spread of materials, technology, and expertise relating to weapons of mass destruction; advance the technologies to detect the proliferation of weapons of mass destruction worldwide; and eliminate or secure inventories of surplus materials and infrastructure usable for nuclear weapons.

During the past two and one-half years, the Department has significantly improved its ability to prevent and reverse the proliferation of weapons of mass destruction, and to eliminate or secure nuclear weapons, weapons-usable nuclear material, and the infrastructure that supports them. The Department has expanded its efforts to prevent the spread of nuclear weapons and materials, enhanced its ability to detect weapons of mass destruction and other terrorist threats, expanded its strategies to eliminate or secure inventories of surplus materials usable for nuclear weapons, taken steps to protect against new threats from radiological dispersal devices, and reduced the risk of accidents in nuclear fuel cycle facilities worldwide.

Nuclear material must be made more physically secure. Border monitoring and export controls also help to ensure that nuclear materials stay where they belong. Nuclear materials can be consolidated. By reducing the number of sites storing this material, vulnerability to threat or sabotage can be reduced. Nuclear material can be reduced by downblending highly enriched uranium or burning plutonium as mixed oxide fuel in nuclear energy plants. The production of excess nuclear material can be ended.

The Department is addressing the problem at its source—such as developing and implementing detection technologies for more effective international border controls, as well as enhanced law enforcement efforts aimed at thwarting the trafficking in illicit nuclear materials. It also includes new efforts to strengthen the international framework to reduce the threat of a radiological attack against the United States and its interests abroad.

The International Atomic Energy Agency (IAEA) is essential to the success of Department nonproliferation programs. The Department is working closely with the IAEA to both ensure IAEA can effectively carry out its duties and to help all nations understand and deal with materials challenges. However, nuclear materials security is ultimately a national responsibility. The responsibility for securing nuclear and radiological materials rests, in the end, with each individual member of the international community.

September 11 made these concerns more immediate. After September 11 there could be no doubt that terrorists would use nuclear materials to harm innocent citizens of the civilized nations of the world—if they could acquire them. The margin of error is small. There are any number of states and sub-state actors interested in acquiring nuclear or radiological materials. The IAEA

has reported some 200 attempts at the illicit smuggling of nuclear materials in the past decade alone. Even a little success in smuggling or theft can have a great impact. Based on IAEA calculations, only a relatively small amount of highly-enriched uranium could be enough for a nuclear explosive device. And if the goal is to build a radiological dispersal device, or dirty bomb, the amount can be even less, depending on the material used. The Department needs to apply the best technologies, the best know-how, experience, and expertise to this problem. The Department has the scientific and technical expertise to address this threat.

The threat continues to evolve. The international community has long been concerned about rogue states seeking to acquire weapons of mass destruction. Now terrorist networks are seeking such weapons and materials. Likewise, much more attention is being paid to the risks associated with the misuse of radiological materials—a possibility hardly considered before September 11. The problem of undersecured radiological sources that would be used in a radiological dispersion attack is an urgent one. Radiological dispersal devices, or dirty bombs, are much simpler to make and use than nuclear weapons. While dirty bombs are not comparable to nuclear weapons in destructiveness, they are far easier to assemble and employ. The materials that might be used in a dirty bomb exist in many everyday forms, including medical isotopes, radiography sources, scientific research facilities, and sources that provide electric power. Such material can be found in virtually every country. While the physical destruction they would cause is comparable to conventional explosives, the disruption and panic caused by widespread contamination is far greater. And it is disruption and panic that terrorists seek.

Despite the wide use of radioactive sources, only a small portion of them pose a real threat as potential ingredients in a dirty bomb. The Department is reviewing what it can do to preclude the sources presenting the greatest threat from becoming useful to terrorists and is working closely with the IAEA to put these issues at the top of the international agenda.

The United States and Russia have taken major steps to secure Russian surplus materials usable for nuclear weapons. The unprecedented levels of cooperation between our countries have resulted in great strides in eliminating and securing inventories of surplus materials usable for nuclear weapons. The Department is making major progress on work related to plutonium disposition facilities in the U.S. and Russia which would eliminate excess weapons plutonium, and accelerate our program for the elimination of Russian highly enriched uranium.

There are good reasons to focus on Russia. The demise of the Soviet Union led to the dissolution of an empire having over 40,000 nuclear weapons and over a thousand metric tons of nuclear materials. At the same time, Russia lacked the infrastructure to assure that chains of command remain intact and nuclear weapons and materials remain securely beyond the reach of terrorists and weapons-proliferating states. Russia is not the only nation with surplus nuclear materials. The U.S. is working with other countries to improve nuclear materials security and working with a number of countries to repatriate and consolidate weapons-grade fuel in Russia, where it can be eliminated or secured.

> "The gravest danger our Nation faces lies at the crossroads of radicalism and technology. Our enemies have openly declared that they are seeking weapons of mass destruction, and evidence indicates that they are doing so with determination. The United States will not allow these efforts to succeed. . . . We will cooperate with other nations to deny, contain, and curtail our enemies' efforts to acquire dangerous technologies."
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> *National Security Strategy of the United States of America, September 17, 2002*

Strategies

Five strategies will be followed to achieve our nuclear nonproliferation goal. NNSA will:

1. Prevent the spread of materials, technology, and expertise relating to weapons of mass destruction.
2. Eliminate or secure inventories of surplus materials usable for nuclear weapons and redirect excess foreign weapons expertise to civilian enterprises.
3. Secure nuclear radioactive sources that pose the greatest threat as potential ingredients in radiological dispersal services, or dirty bombs.
4. Enhance our ability to detect weapons of mass destruction, including nuclear, chemical, and biological systems.
5. Work to reduce the risk of accidents in nuclear facilities worldwide by improving safety regimes in Russia and other countries.

External Factors

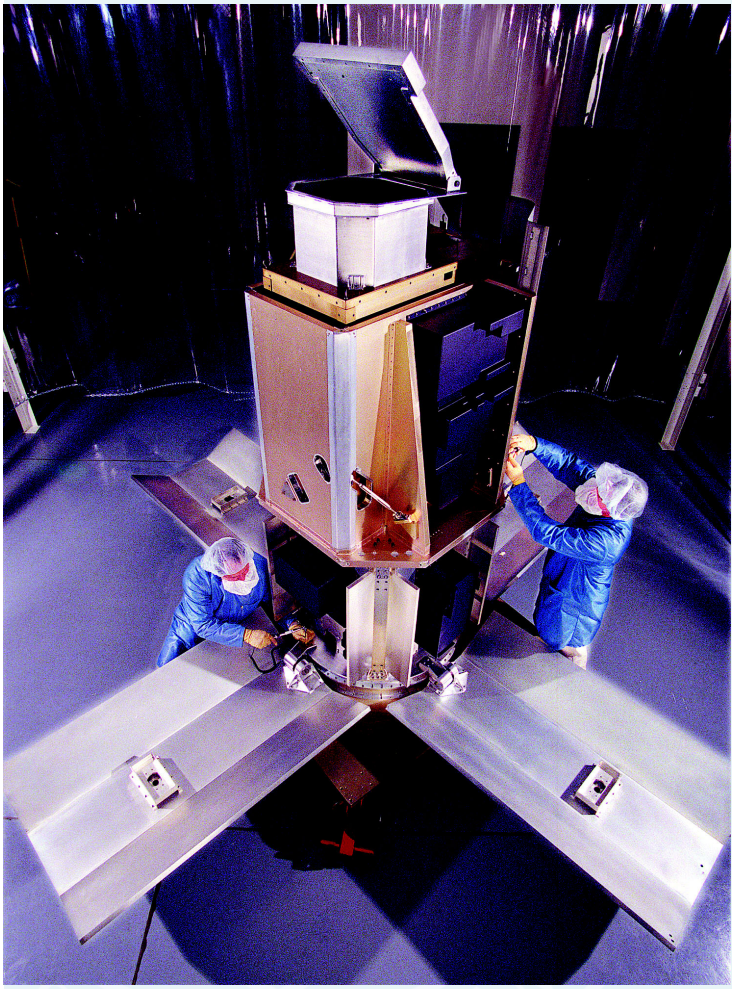
The following external factors could affect our ability to achieve this goal:

- **Close Cooperation with Russia**: Unprecedented levels of cooperation between the U.S. and Russia have made it possible to make great strides in eliminating and securing inventories of surplus materials. A close relationship is necessary for future progress.
- **International Atomic Energy Agency:** The IAEA is essential to the success of our efforts to control nuclear proliferation. It is vital that the IAEA receive the necessary funding and show the necessary leadership to member countries to accomplish its mission.
- **Technology**: Technological development is uncertain and unpredictable. Our efforts to develop detection technology may be more or less successful than predicted, which would have a corresponding positive or negative impact on our efforts.

Key Intermediate Objectives

- Security upgrades will have started on nearly all of the 600 estimated metric tons of weapons usable nuclear material in Russia by the end of fiscal year 2005.
- Security upgrades to 39 Russian Navy nuclear warhead sites containing hundreds of nuclear warheads are completed by 2006.
- Upgrades to Russian border security are completed by 2005.
- Last remaining nuclear reactors in Russia that produce weapons-grade plutonium are shut down by 2008 for the two reactors at Seversk and 2011 for the reactor in Zheleznogorsk.
- Operation of a mixed oxide fuel fabrication facility that will eliminate surplus Russian weapons material commences by 2008.
- Security upgrades at Russia's Ministry of Atomic Energy nuclear weapons complex are completed by 2008.

- Convert approximately 27 metric tons of Russian highly enriched uranium to low enriched uranium by 2010.
- All worldwide fissile nuclear materials are under controls acceptable to the U.S. by 2025.



The Multispectral Thermal Imager satellite is prepared for launch. This satellite employs technologies that could be used in future systems for detecting and characterizing facilities producing weapons of mass destruction.

Goal 3. NAVAL REACTORS: Provide the Navy with safe, militarily effective nuclear propulsion plants and ensure their continued safe and reliable operation.

The Department, through NNSA and the Naval Reactors Program, is responsible for providing the U.S. Navy with safe, militarily effective nuclear propulsion plants, beginning with technical development and continuing with reactor operation and ultimately reactor plant disposal. Naval nuclear propulsion plants currently power 40 percent of the Navy's combatants, and the Department will continue to fulfill this responsibility. The Department is embarking on a long-term effort to develop and deploy a new reactor core design to meet the demands of longer and more frequent deployments. The Naval Reactors Program has developed an envied reputation for process, skills, and technologies.

Strategies

Two strategies will be used to accomplish this goal. NNSA will:

1. Ensure the safety, performance, reliability, and service life of operating reactors.
2. Develop new technologies, methods, and materials to support reactor plant design for future generations of reactors for submarines and aircraft carriers.

External Factors

The Department does not believe there are major external factors with the potential to affect our ability to achieve this goal.

Key Intermediate Objectives

- Throughout the planning period, NNSA provides nuclear reactors that meet the U.S. Navy's operational requirements safely and reliably.
- Throughout the planning period, NNSA's new reactor plant technologies, methods, and materials meet performance, schedule, and budgetary requirements of new ships.
- Throughout the planning period, no personnel involved with U.S. military reactors exceed Federal limits for radiation exposure, and operations have no adverse effect on human health or the quality of the environment.

Investing In America's Energy Future

When the Bush Administration took office, our dependence on energy imports had risen to record levels. Oil imports accounted for 55 percent of total U.S. consumption, up from 42 percent in 1990. Oil in the Strategic Petroleum Reserve was being sold—for far less than the taxpayer paid to buy it in the first place—to raise cash to spend on other Government programs. Energy demand was projected to rise by about 32 percent by 2020, much faster than the projected increase in domestic energy production. The shortfall between energy demand and domestic production was projected to increase nearly 50 percent by 2020. That projected shortfall can be made up in only three ways: import more energy, improve energy conservation and efficiency, and increase domestic supply.

The Administration considered these options in its development of the National Energy Policy. It concluded that increased dependence on oil imports from volatile regions of the world would jeopardize our national and economic security. As imports rise, so does our vulnerability to price shocks, shortages, and disruptions. For that reason, the Administration resolved to take steps to improve energy conservation and efficiency and increase domestic energy production in order to avoid increased dependence on imports. That was the hallmark of the National Energy Policy issued in May 2001 and remains the heart of our national energy policy.

Energy Strategic Goal: To protect our National and economic security by promoting a diverse supply and delivery of reliable, affordable, and environmentally sound energy.

The Department's principal tool in its national energy policy is science and technology. The Department invests in high-risk, high-value energy research and development that the private sector alone would not or could not develop in a market-driven economy. The agency is developing new technologies for FutureGen, an emissions-free coal power plant of the future, which would enable us to tap the full potential of the Nation's plentiful domestic coal supplies. We are developing technologies to allow renewable energy to play a more important role in the future of our Nation. The Department is working with the private sector, academia, and other nations to develop advanced nuclear energy technologies that will enhance nuclear operations safety, reduce the threat of proliferation, cost less to build and operate, and minimize the generation of waste. We are also developing new exploration, development, and production processes that can keep U.S. oil fields producing well into the future. Every barrel of oil we produce at home is one less barrel that we have to import. The Department is investing in hydrogen technology that has the dramatic potential to free us from our current dependence on

> "Energy, of course, is a vital component of our work. We must promote and execute both practical and visionary policies that will secure the energy we need to guarantee our continued economic growth and prosperity today and in the years and decades ahead."
>
> *Spencer Abraham*
> *Secretary of Energy*
> *February 3, 2003*

imported oil. The Department develops technologies to strengthen our energy infrastructure in order to assure the reliability of energy delivery, such as superconducting materials for power transmission lines and distributed generation units.

The Department also relies on technology to reduce energy demand through improvement in energy efficiency and conservation. The Department is committed to reducing America's dependence on foreign oil and developing energy efficient technologies for buildings, homes, transportation, power systems, and industry. Every barrel of oil we conserve has the added benefit of reduced environmental impact resulting from avoiding its use. However, no matter how much cleaner and more efficient we make today's energy sources, the Nation will still need enough energy supply to meet the demands of a growing economy.

It is the role of the Federal Government to promote competitive energy markets, not to choose the energy sources for the country, now or in the future. The Department's aim is to assist the private sector where appropriate to develop technologies capable of providing a diverse supply of reliable, affordable energy, and environmentally sound energy, while protecting the environment. Market forces, influenced by these Federal investments and other policies such as tax incentives and environmental regulation, will determine the supply mix that consumers choose.

The Department's programs extend beyond research and development of energy technologies. The Department operates: (1) the Strategic Petroleum Reserve, which provides emergency oil supplies in the event of a serious supply disruption; (2) the Northeast Heating Oil Reserve, which helps ensure adequate heating oil supplies in the event of severe energy disruptions; and (3) four Federal power marketing administrations, which sell electricity from Federal hydropower dams and operate large transmission grids.

The long-term solution to our economic and environmental challenge is to make a fundamental change in our mix of energy options and, therefore, America's energy future. To aid this transformation, the Department will develop advanced technologies to reduce the cost and environmental impacts of nuclear energy; to produce, store, and use hydrogen as a sustainable and emissions-free energy carrier; and to develop fusion energy, the process that powers the sun.

Over the next 25 years, the Department will pursue advanced technologies to achieve the following general goal.

Goal 4. ENERGY SECURITY: Improve energy security by developing technologies that foster a diverse supply of reliable, affordable, and environmentally sound energy by providing for reliable delivery of energy, guarding against energy emergencies, exploring advanced technologies that make a fundamental improvement in our mix of energy options, and improving energy efficiency.

When the Bush Administration took office our dependence on energy imports had reached record levels. Our greatest vulnerability was in the area of petroleum imports, which accounted for 89 percent of total energy imports in 2000. Upon taking office, President Bush first halted any sales from our Strategic Petroleum Reserve and then directed that this invaluable tool for limiting vulnerability be filled to its maximum capacity of 700 million barrels. Since then, the Department has taken careful steps to minimize impacts on energy markets, deferring acceptance of oil for deposit in the Strategic Petroleum Reserve during periods of high prices. The development of new technologies is an additional way to make up energy shortfalls.

In addressing our vulnerability in the future, Secretary Abraham recently declared that the Department has "an ambitious, long-term vision of a zero-emission future, free of reliance on imported energy." As we look to the carbon-free generation of electricity and hydrogen, it is clear that we must call upon science, technology and the research talents in our national laboratories, universities, and industry to help us improve and move beyond today's energy choices.

The Department of Energy's technologies draw on all our available resources: oil, natural gas, coal, nuclear energy, hydropower, renewable energy, and reductions in demand through conservation and energy efficiency. The Administration believes it is not the role of the Federal Government to choose the energy sources for the country. Instead, the role of the Federal Government is to help the private sector develop technologies capable of providing a diverse supply of energy, and to allow the market to decide how much of each energy source is actually used. Diversity of energy sources can help provide stability and guard against price spikes.

To tackle our immediate need for oil and gas, the Department continues to develop and promote technologies that can lower the costs of oil and natural gas exploration and development and maximize the efficiency and stability of America's oil and gas production and supply.

The Department plans–together with our private sector partners–to develop coal technologies and processes that will allow us to continue to take full advantage of this affordable, plentiful, domestic energy resource, which supplies more than half of our electricity needs today. This emphasis on developing advanced technologies that will allow coal to serve as a valuable—

and ultimately an emissions-free—contributor to our energy mix for decades to come. President Bush and Secretary Abraham have announced the FutureGen program, a cost-shared $1 billion international initiative that will design, build, and operate a nearly emissions-free (including no greenhouse gases), coal-fueled generation plant that will co-produce hydrogen and electricity. President Bush's Clear Skies Initiative will reduce emissions of nitrogen oxide, sulfur oxide, and mercury by an average of 70 percent, while providing incentives for investment in new, cleaner, coal-based generation facilities in the decades ahead.

As part of the Administration's climate change initiative, the Department is focusing its efforts on carbon sequestration—the capture and permanent storage of carbon dioxide produced from combustion of fossil fuels. Carbon sequestration potentially offers the world a new option for managing the risks of climate change—an option that will enable the United States and other countries with extensive coal resources to take advantage of their abundant and low-cost energy resources.

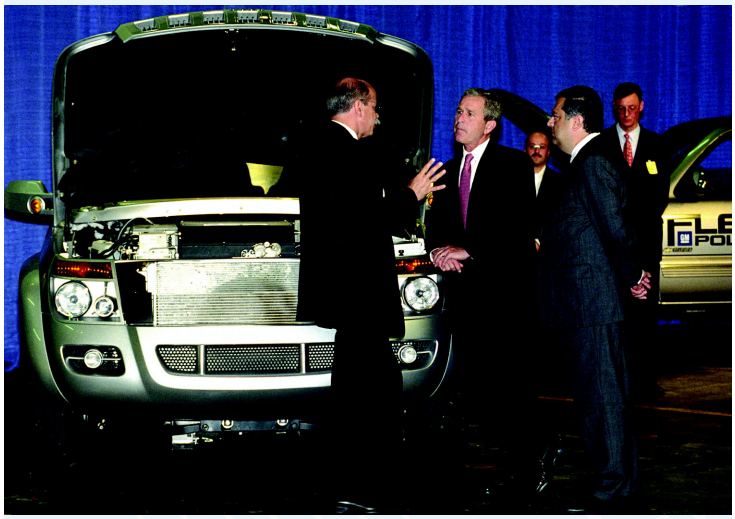
Another clean power technology, nuclear energy, holds great potential to make even larger contributions to greenhouse gas emissions reduction, while at the same time contributing to energy supply diversity in the areas of electricity and hydrogen production. Through the Nuclear Power 2010 and the Generation IV Nuclear Energy Systems programs, the Department is easing the path for the construction of future nuclear plants which will be in operation in the next decade and beyond. These programs will demonstrate the new siting and licensing regulatory processes and produce new certified reactor designs that will offer improvements in economics, safety, waste disposition, and proliferation resistance.

The Department is also taking steps to reduce our energy consumption and improve energy efficiency. These energy efficiency programs place a premium on vehicle technologies, designed to not only improve energy efficiency improvements to current vehicles but also encourage development of alternative fuel vehicles. The Department is also developing technologies to improve the energy efficiency of buildings, appliances, energy-intense industries and power plants. Departmental energy efficiency programs also extend beyond technology development. The Department operates a vital Weatherization Assistance Program, which delivers cost-effective, energy efficiency improvements in the housing of low-income families, such as adding insulation to water tanks and pipes, installing insulation in walls, foundations, and roofs, adding weather-stripping and caulking around windows and doors to reduce drafts, and repairing faulty furnaces. According to the National Research Council's 2001 *Energy Research at DOE, Was It Worth It?,* the Department's R&D efforts to improve the efficiency of our buildings, our industrial complex, and our cars and trucks has benefited the Nation by at least $30 billion in energy saved, pollution avoided and improved national security.

The Department will lead a national effort to modernize and expand the Nation's electricity transmission system to help ensure a more reliable and robust delivery of electricity and to help guard against energy emergencies, and ultimately help ensure economic and national security.

The long-term solution to meet our energy supply and environmental challenges is to transform our energy system to provide clean, reliable, and diverse energy supplies for a growing U. S. economy. For that reason, the President has launched two bold programs. The first is our focus on the limitless potential of hydrogen to power our economy with virtually no adverse environmental effects. The second is tackling a major hurdle on the long, tentative path aimed at ultimately releasing the potential of fusion to produce electricity—and hydrogen—in a safe, economical, and environmentally benign manner.

As projected by the Energy Information Administration, the consumption of petroleum products, primarily used in transportation, will remain the largest share of the consumption of fuels and the leading source of carbon dioxide emissions. The Department has programs to develop more energy efficient hybrid and clean diesel vehicles capable of reducing emissions of air pollutants and the Nation's dependence on foreign oil. The Administration's FreedomCAR and Hydrogen Fuel Initiative programs offer the potential to virtually eliminate the use of petroleum for transportation through development and deployment of a new hydrogen-based transportation infrastructure over the next several decades.



President George W. Bush and Secretary Spencer Abraham receive a briefing on fuel cells and alternative-fueled vehicles during a tour of exhibits featuring energy-efficient technologies.

Hydrogen holds the promise of an ultra-clean and secure energy option for America's future. Hydrogen can fuel ultra-clean fuel cell or internal combustion engines, which would reduce auto emissions to zero or near-zero. The President's Hydrogen Fuel Initiative and FreedomCAR partnership are focused on development of a hydrogen fuel cell and hydrogen production and infrastructure technologies for vehicles. Since most of our imported oil is used for transportation, these programs have the potential to substantially reduce, if not eliminate, our dependence on imported oil. Hydrogen can be produced from diverse domestic sources including coal, nuclear power, and renewable resources, (e.g., wind and solar).

Fusion, the physical process that powers the sun, is an energy source of the future that could transform the way we produce electricity. By reproducing the sun's process for transforming matter into energy, we can create a new energy source that would produce no air pollutants, greenhouse gases, or high-level nuclear waste, and would be extraordinarily safe to operate. Fusion's potential is too great to ignore, and for that reason the Administration has joined the ITER international fusion energy research and development project designed to take a significant step in fusion development. If fusion development is successful, it could provide the most cost-effective, long-term source of hydrogen, with almost no environmental impacts.

Strategies

The Department will reach this goal through the following 14 strategies**.** The Department will:

1. Partner with private sector, states and communities, national laboratories, colleges and universities, nongovernmental organizations, foreign allies, Congress and other Federal agencies to develop and bring to market technologies that advance energy efficiency.
2. Follow the directive of President Bush to fill the Strategic Petroleum Reserve to its full capacity of 700 million barrels, expanding the Reserve by 150 million barrels.
3. Develop new technologies to increase domestic oil and natural gas supplies.
4. Foster relationships with international suppliers to keep our supplies of oil abundant, affordable, and secure.
5. Make significantly cleaner the power systems fueled by coal and pursue carbon sequestration as a way to achieve near-zero greenhouse gas emissions.
6. Lead the international community in pursuit of advanced nuclear technology that will benefit the U.S. with enhanced safety, improved economics, and reduced production of waste.
7. Collaborate with the domestic industry to assure the availability of nuclear fuel to meet potential supply disruptions.
8. Research renewable energy technologies – wind, hydropower, biomass, solar and geothermal – and work with the private sector in developing these domestic resources.
9. Develop technologies to reduce the vulnerability and increase the reliability of the electricity supplies, focusing on superconducting materials and distributed generation including relatively small-scale and modular energy generation devices.
10. Through the Power Marketing Administrations, continue to distribute electricity generated primarily by Federal hydropower plants and improve the performance of their 33,000 miles of transmission lines by removing bottlenecks.
11. Promote the reduction of energy consumption in Federal facilities and other end use applications and provide energy efficiency assistance to low-income homes through the Weatherization Assistance Program.

12. Accelerate the shift toward the hydrogen economy by developing and improving technologies to produce hydrogen using renewable energy, nuclear energy, and fossil fuels.
13. Collaborate with industry to develop fuel-cell power technologies for multiple applications, especially transportation.
14. Advance plasma and fusion science, including burning plasma behavior, confinement theory, and experiments supporting the long-term commercial application of fusion power.

External Factors

The following external factors could affect our ability to achieve this goal:

- **Technology**: Technological development is inherently unpredictable. Our efforts to develop zero-emission fossil generation technology, hydrogen, renewable energy, advanced nuclear power and fusion may be more or less successful than predicted, with a correspondingly positive or negative impact on our efforts.
- **Market Forces**: Whether new technology is deployed depends to a large extent on whether that technology is competitive, considering relevant policies (e.g., tax incentives for the purchase of fuel-cell vehicles).
- **Consumer Choice**: Improved energy efficiency is largely the result of millions of decisions by individual consumers. The Department can help develop improved technology, but whether this technology is deployed depends on consumer decisions and relevant policies that may affect those decisions. In addition, the deployment of hydrogen and alternative fueled vehicles depends to a large extent on the decisions by individual consumers to purchase these vehicles.
- **Nonproliferation Policy**: Deployment of advanced fuel technologies will depend upon policy changes permitting fuel reprocessing.

Line Crewman checking equipment near Springfield, Missouri.

Key Intermediate Objectives

- Throughout the planning period, the Strategic Petroleum Reserve is ready to supply oil at a sustained rate of 4.4 million barrels per day for 90 days within 15 days notice by the President.
- By the end of fiscal year 2005, the Department's role in the International Thermonuclear Experimental Reactor is established.
- Between 2003 and 2008, the Department weatherizes approximately 771,000 homes of low-income households.
- By 2005, the nuclear industry has made a decision to build at least one new nuclear power plant in the U.S. (subject to supporting legislation currently under discussion).
- Between 2005 and 2010, the Department develops technologies and information management systems to monitor, track, predict, and improve transmission and distribution reliability and security and market efficiency, providing a 10 percent, or $20 billion cumulative savings.
- By 2008, the Department develops advanced power systems capable of achieving 50 percent thermal efficiency at a capital cost of $1000 per kilowatt or less for a coal-based plant.
- By 2008, the highly efficient production of hydrogen using nuclear technology is demonstrated on a pilot scale.
- By 2010, the cost of the hydrogen equivalent of a gallon of gas is brought down to $1.50.
- By 2010, FreedomCAR technical milestones established with industry partners are accomplished.
- By 2010, production capability of low cost solid-state fuel cells for less than $400 per kilowatt is validated.
- By 2010, the Department develops four types of high temperature superconducting electric power equipment prototypes with half the energy losses and half the size of the widely used, comparable conventional equipment (i.e., motors, generators, transformers and transmission/distribution cables).
- By 2012, the Department develops technologies that result in less than a 10 percent increase in the cost of new energy services to separate, capture, transport and sequester carbon using either direct or indirect systems.
- By 2012, new nuclear power plants are operational and support the President's Emission Intensity goal for an 18 percent reduction.
- By 2015, technologies are developed that allow a decision by industry to commercialize fuel-cell vehicles and hydrogen infrastructure and also facilitate an evaluation by the Federal Government of policy instruments that foster the delivery of commercial quantities of hydrogen.
- By 2015, technologies are developed that expand America's economically recoverable oil resource by 3.0 billion barrels and gas resource by 100 trillion cubic feet with minimal environmental impact.

- By 2016, a Next Generation Nuclear Plant prototype demonstrates efficient electricity and hydrogen production.
- By 2020, a power plant is on line demonstrating ultra-high efficient, pollution-free fossil energy power production.
- By 2020, technologies are developed to allow an industry decision to construct next-generation (Generation IV) nuclear power plants.
- By 2020, the Department provides advanced fuel cycle technologies ready to be deployed with light water and gas-cooled reactors that have the ability to achieve a significant reduction in the amount of high-level spent fuel requiring geologic disposal, to significantly reduce accumulated plutonium in civilian spent fuel, and to extract more useful energy from spent nuclear fuel components.
- By 2020, the technical feasibility of containing a burning plasma will have been demonstrated, contributing to reaching a "go/no-go" decision on proceeding with a demonstration power plant.
- By 2025, renewable energy sources (excluding hydropower) reach 12.0 quadrillion Btu (quads), nearly double the energy production in the year 2000, of 6.46 quads.
- By 2025, the Department develops and demonstrates technologies to bring systems that generate both heat and power within 90 percent efficiency.
- By 2025, solid-state lighting results in a reduction by one fifth in energy demand for lighting compared to those of 2000.

Operating since 1959, the Priest Rapids Dam is used for power production & recreation and is part of the Bonneville Power Administration supplying electricity to the Pacific Northwest.

Advancing Scientific Understanding

American science leads the world. Innovation, the willingness to take chances, the free and open exchange of ideas—these are some of the things that help propel American research. The Department will continue to serve a leadership role in advancing the Nation's science and technology

The Department takes its responsibilities toward science and technology seriously because it takes its responsibility towards national security seriously. The Department's research activities are closely coordinated with, and synergistic to, the activities of other federal agencies including the Defense Advanced Research Projects Agency (DARPA), Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), National Institutes of Health (NIH), National Security Agency (NSA), and National Science Foundation (NSF). The Department also promotes the transfer of the results of its basic research to a broad set of technologies such as advanced materials, national defense, medicine, space science and exploration, and industrial processes. The Department has taken a deliberate and integrated approach to its research and development portfolio, using the strengths of all our programs to address this central mission. Clearly, environmental security and economic security underpin national security, and each is sustained by science.

Science Strategic Goal: To protect our National and economic security by providing world-class scientific research capacity and advancing scientific knowledge.

To fulfill all of our responsibilities, we rely on the remarkable national network of science laboratories and the scientists, engineers, technicians, and administrators who produce the scientific breakthroughs and technological advances that propel work and contribute in dozens of ways to our economic growth and improved standards of living and health.

The common thread woven through all of the Department's activities is science. The Department's efforts to promote greater scientific understanding of energy and its related processes have strengthened the technological foundation underlying our national security, energy, and environmental clean-up activities. The Department operates a variety of unique scientific facilities that, together with the National defense laboratories, provide advanced research and development that is meeting emergent national requirements.

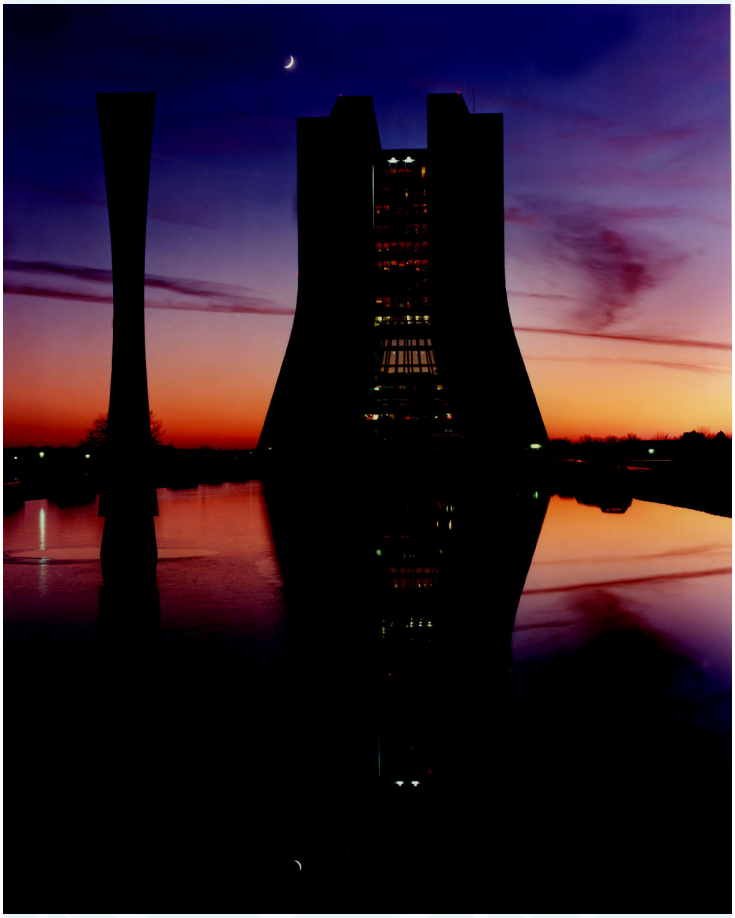
The Department will continue to aggressively pursue fundamental understanding of nature. Areas of investigation include the pursuit of the basic constituents of matter and the forces that control them, genomic research for energy and environmental applications, and the study of nanoscale science, scientific investigation of structures at the molecular level, which promises incredible breakthroughs previously limited to the realm of science fiction.

Another area of significant importance to the Nation's scientific strength is advanced computing. Tremendous supercomputing advancements for national security have provided the hardware capable of working with massive databases at incredible speeds. Much work remains, however, to harness dramatically increasing computing capabilities to solve complex scientific questions and stay competitive internationally in this arena. A clear trend is the increasing dependency on scientific simulation as a powerful tool for scientific discovery. Enabled by ever-faster computers and complex codes and algorithms, simulation will prove even more valuable in the future as mankind presses the limits of power, efficiency, and scale for earth-based experimental instruments.

Over the next 25 years, the Department will build upon its scientific and technological strengths to achieve the following general goal.

"In fact, we might well be called the Department of Energy and Science, given the importance of our role in American and indeed international science. And, the reason we are so deeply involved in science is simple. Our mission here at the Department of Energy … as I have stressed since becoming Secretary … is national security. And, in my view, a serious commitment to national security demands a serious commitment to science, especially basic research."

Spencer Abraham
Secretary of Energy
January 30, 2003



Night, in the form of a crescent moon, overtakes the fading light of day beyond Wilson Hall at Fermi National Accelerator Laboratory.

Goal 5. WORLD-CLASS SCIENTIFIC RESEARCH CAPACITY: Provide world-class scientific research capacity needed to: ensure the success of Department missions in national and energy security; advance the frontiers of knowledge in physical sciences and areas of biological, medical, environmental, and computational sciences; or provide world-class research facilities for the Nation's science enterprise.

> "American science leads the world. Innovation, the willingness to take chances, the free and open exchange of ideas—these are just some of the things that help propel American research. And I know—with certainty—that we will continue this leadership role. We will never accept second best in science."
>
> *Spencer Abraham*
> *Secretary of Energy*
> *January 30, 2003*

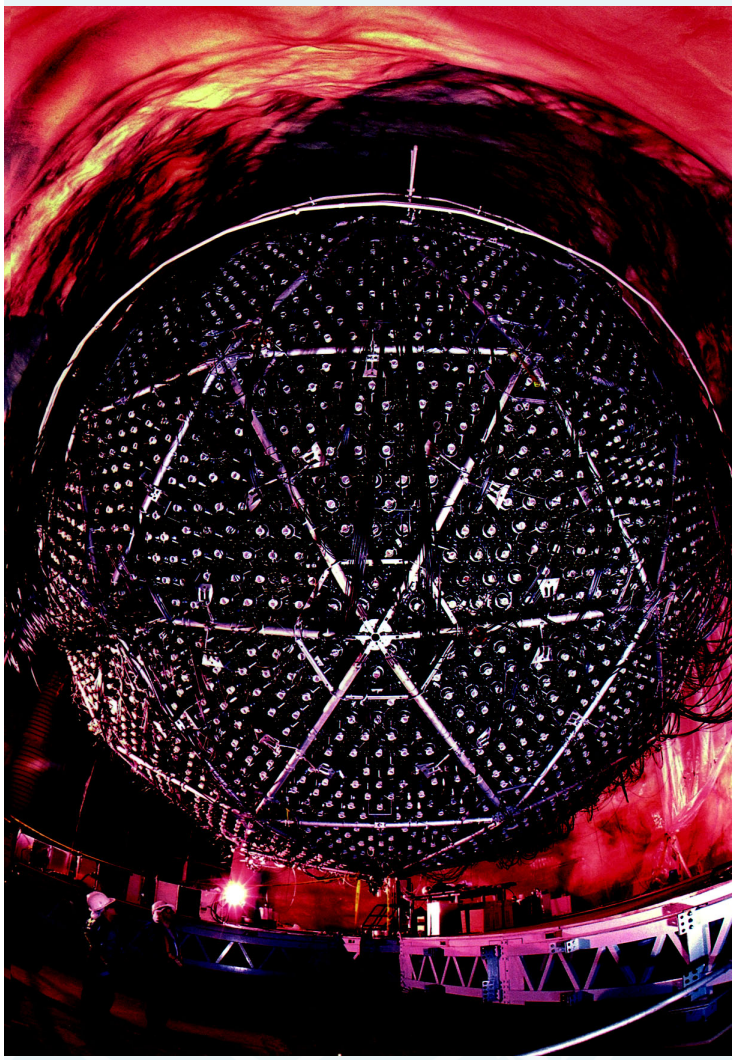
The Department is the primary Federal agency conducting basic research in the physical sciences. The Department operates the large national laboratories to drive the dramatic advances in energy-related sciences: high energy physics, nuclear science, plasma science, material and chemical sciences, and biological and environmental sciences. It also brings together the scientists, engineers, and technicians from a range of energy-related sciences that have unique capabilities to advance biological research supporting medical applications. For the public good, the Department also invests in large scientific facilities needed to support this basic research and the needs of the general science community.

Strategies

Over the next 20-25 years, the Department will implement the following eight strategies.

1. Advance the fields of high-energy and nuclear physics, including the understanding of dark energy and dark matter, the lack of symmetry in the universe, the basic constituents of matter, the structure of nuclear matter in its most extreme conditions, and the possible existence of other dimensions, collectively revealing key secrets of the universe.
2. Advance the theoretical and experimental understanding of plasma and fusion science, including a close collaboration with international partners in identifying and exploring plasma and fusion physics issues through specialized facilities.
3. Advance energy-related biological and environmental research built upon foundations in genomic science, climate modeling, contamination and transport modeling, and related interdisciplinary sciences.
4. Develop new diagnostic and therapeutic tools and technology for disease diagnosis and treatment, non-invasive medical imaging, and biomedical engineering.
5. Advance nanoscale science built around foundations in materials, chemistry, engineering, geoscience, and energy biosciences, leading to improved energy technologies and systems.

6. Significantly advance scientific simulation and computation, applying new approaches, algorithms, and software and hardware combinations to address the critical science challenges of the future.
7. Provide the Nation's science community access to world-class research facilities, including reactor and accelerator-based neutron sources, light sources, particle accelerators, plasma and fusion laboratories, and micro-characterization centers, that advance the physical sciences and enable the study of complex, interdisciplinary science questions.
8. Provide or support the Nation's science community access to world-class, scientific computation and networking facilities that support advancements in practically every field of science.



Built two kilometers under solid rock, the Sudbury Neutrino Observatory allows scientists from Lawrence Berkeley National Laboratory as well as from Canada and Great Britain to study the world's most elusive particle, the neutrino.

External Factors

The following external factors could affect our ability to achieve this goal:

- **Scientific and Technical Talent**: The prospect of insufficient scientific and technical talent, now and in the foreseeable future, threatens our ability to maintain world-class scientific capacity.
- **National Support for Science**: Eroding national support for investments in the physical sciences that provide the critical foundations to virtually all other fields of science, and the rapidly growing dependency between the biological and physical sciences.

Key Intermediate Objectives

- By the end of 2006, the Department develops a suite of specialized software tools for our scientific simulations to take much better advantage of terascale computers (computers capable of making ten to hundreds of trillions of operations per second or "teraflops"), while handling trillions of bytes of data or "terabytes," and high-speed networks.
- By the end of fiscal year 2006, construction of the Department's Spallation Neutron Source is completed.
- Through 2007, the Large Hadron Collider (LHC) and the ATLAS and CMS detectors, all international projects that include the Department, are kept on schedule, within budget, and become operational.
- By the end of 2008, the Department's five Nanoscience Research Centers are operational.
- By the end of 2008, experiments at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory will have established the basis characteristics of a fundamental new form of nuclear matter that exists at extremely high temperatures and densities.
- By the end of 2009, the Department completes studies on several next generation computer architectures that could be developed into high end supercomputers with 1,000 times the performance available in 2003.
- By 2010, experiments will begin to make it possible to determine which of the many proposed unified theories of the fundamental forces could actually describe nature at the smallest scale.
- By 2013, Department-sponsored research into viewing the makeup of genes in living cells, tissues, and organisms is used by clinicians as a new, sensitive tool for diagnosing disease and for monitoring the efficacy of disease therapies that target the products of specific genes.
- By 2015, the Department's understanding of nanoscale assemblies of materials (1,000 times smaller than a human hair) results in the capability to create materials, atom by atom, having predictable properties.
- By 2020, the Department will advance plasma science and computer modeling to obtain a comprehensive, and fully validated, plasma configuration simulation capability.

Resolving the Environmental Legacy

Environment Strategic Goal: To protect the environment by providing a responsible resolution to the environmental legacy of the Cold War and by providing for the permanent disposal of the Nation's high-level radioactive waste.

The Department has had environmental missions since its establishment in 1977. This mission expanded since the end of the Cold War, when the agency began to clean up sites contaminated by a half century of nuclear defense work. The Strategic Plan reflects a restructured environmental cleanup program developed from an intensive "Top-to-Bottom Review" that emphasized the need to reduce risk rather than manage it. Our aggressive new cleanup strategy emphasizes doing more real work, greater accountability, increased competition, innovative cleanup methods, and the use of performance-based incentives. This strategy will accelerate completion of the cleanup programs by 35 years, to 2035 rather than 2070, reduce risk to the public and the environment, and save taxpayers $50 billion in program costs. By the end of 2025, the Department will have cleaned up 108 of its 114 contaminated sites.

The Department is also developing a geologic repository to safely dispose of high-level radioactive waste and spend nuclear fuel at the Yucca Mountain site in Nevada. The repository is needed to support the environmental cleanup of the Cold War legacy as well as to enhance energy security by maintaining a viable nuclear option. Consolidation of nuclear waste from the many locations scattered across the country will promote our homeland security objectives.

Secretary of Energy Spencer Abraham visits Hanford Tank Farm and receives a briefing from J. Betts, Bechtel National's Deputy Project Manager.

Goal 6. ENVIRONMENTAL MANAGEMENT: Accelerate cleanup of nuclear weapons manufacturing and testing sites, completing cleanup of 108 contaminated sites by 2025.

The Environmental Management program was created in 1989 to safely manage the cleanup of the environmental legacy from 50 years of nuclear weapons production and nuclear energy research at 114 sites around the country. The scope of the program includes stabilization and disposition of some of the most hazardous materials known. The cleanup program resulting from over five decades of nuclear weapons production and energy research is the largest active cleanup program in the world, encompassing over 2 million acres at 114 sites in 31 states. As of September 2003, the cleanup of 77 sites has been completed. An additional 31 sites will be remediated by 2025 leaving six sites to be addressed after 2025.

In August 2001, the Secretary of Energy directed a "Top-to-Bottom Review" of the environmental cleanup program, which was completed in February 2002. The Review concluded that significant change was required in how the Department attacked risk reduction and cleanup. Two years ago, as costs continued to increase, the Department estimated that it could take over $300 billion and nearly 70 more years to complete the cleanup. The environmental cleanup program stood as one of the largest liabilities of the Federal Government.

The Top-to-Bottom Review concluded that the cleanup program was not focused on achieving the greatest reduction in risk to human health and the environment. Resources were diverted to lower risk activities, and process, not risk reduction, had become the driving force. Fundamental change was required in how the Department approached, managed, and performed the entire cleanup program. Last year the Department started to reform this massive program. The top priority for the program has been to reform and refocus the nuclear weapons cleanup program to deliver risk reduction safer and faster and to clean up more efficiently and cost effectively. The Department, working collaboratively with the regulator and stakeholder community, is developing strategies to focus cleanup activities on accelerated risk reduction and site closure.

The Department has defined risk reduction cleanup strategies on a site-by-site basis. The Department, in collaboration with its regulators and stakeholder communities, has developed plans which lay out the current site conditions, desired end state, strategic initiatives to get from the current state to the end state, and management processes to support the new approach for 18 of the most significant sites remaining to be addressed. The plans provide the site-specific strategies for the significant acceleration of risk reduction and cleanup completion including three of the Department's largest sites (the Hanford Site in Washington, the Idaho National Laboratory, and the Savannah River Site in South Carolina) as much as 35 years earlier than originally planned.

To reduce landlord costs, it is in the public interest for the Department to consolidate its facilities and reduce the size of its real estate holdings. Following completion of accelerated cleanup activities, the Department will close and transfer ownership of some sites to other entities. The Department will continue to maintain and control real estate at some sites following cleanup to continue mission related activities. Where required, long-term surveillance and maintenance activities will be conducted to assure that cleanup activities remain protective of human health and the environment.

Strategies

The Department will implement eight strategies to achieve this goal. These strategies will result in significant cost savings and a significant reduction in the time needed to complete cleanup—putting the taxpayers' dollars to more productive use. The Department will:

1. Eliminate significant environmental, health and safety risks as soon as possible.
2. Review the remaining risks in concert with regulators and stakeholders to determine the most appropriate remediation schedules and approaches.
3. Develop management systems that will force the establishment of clearly defined and demanding performance goals.
4. Improve its acquisition approach by clearly identifying the work to be done and the Department's expectations, establishing proper incentives for its contracts, and adequately rewarding performance.
5. Hold its cleanup contractors to high safety standards; yet empower them to pursue the most direct path to success.
6. Streamline surveillance and maintenance costs to further accelerate cleanup.
7. Ensure safe and secure management of nuclear materials and wastes.
8. Refocus the cleanup science and technology program to directly address the specific, applied technology needs for cleanup and closure for the next five to ten years.

Argonne National Laboratory's ongoing environmental cleanup program ensures the maintenance of a clean, healthy environment at DOE sites.

External Factors

The following external factors could affect our ability to achieve this goal:

- **Regulatory Requirements**: Compliance with environmental laws and regulations and agreements with States drive the Department's cleanup decisions. The laws and regulations are subject to change, and agreements with States may be renegotiated.
- **Cleanup Standards**: The end state for cleanup at many sites is not fully determined. The extent of cleanup greatly affects cost, schedule and scope of work.
- **Technology**: Technological development is inherently unpredictable. Suitable cleanup technologies do not always currently exist, and the development and deployment of innovative technologies could help reduce risk, lower cost, and accelerate cleanup.
- **Uncertain Work Scope**: Uncertainties are inherent in the environmental cleanup program due to the complexity and nature of the work. There are uncertainties in our knowledge of the types of contaminants, their extent, and concentrations.

Key Intermediate Objectives

- By the end of fiscal year 2005, the Department completes cleanup and transfers approximately half of the Hanford site to the U.S. Fish and Wildlife Service.
- By the end of fiscal year 2006, the Department completes cleanup of Fernald (Ohio) and Mound sites (Ohio) and transfers the Mound site to the Miamisburg Mound Community Improvement Corporation.
- By the end of fiscal year 2006, the Department completes the cleanup of Rocky Flats (Colorado) and transfers the Rocky Flats Wildlife Refuge to the U.S. Fish and Wildlife Service.
- By 2008, the Department completes cleanup of the East Tennessee Technology Park.
- By 2012, the Department completes cleanup of the Hanford River Corridor project.
- By 2013, the Department completes disposal of all legacy stored transuranic waste into the Waste Isolation Pilot Plant.
- By 2020, the Department completes cleanup and closure of the high-level waste tanks at the Savannah River Site.
- By 2025, the Department completes cleanup 108 of 114 sites, leaving six: Hanford, Idaho National Laboratory, the Nevada Test Site, Tonapah Test Range area, the Paducah site, and the Waste Isolation Pilot Plant.
- Throughout the planning period, the Department maintains long-term stewardship at the sites containing residual radioactive or hazardous material after cleanup has been completed until they are transferred.

Goal 7. NUCLEAR WASTE: License and construct a permanent repository for nuclear waste at Yucca Mountain and begin acceptance of waste by 2010.

Associated with the Nation's energy supply is the Federal responsibility for the ultimate disposal of spent nuclear fuel and high-level radioactive waste. This responsibility includes licensing, building, and operating a deep geologic repository at Yucca Mountain, Nevada, for the disposal of commercial and the Department's spent nuclear fuel and high-level radioactive waste. In 2002, the President and Congress designated the Yucca Mountain, Nevada, site as suitable for development as a permanent repository for high-level waste and spent nuclear fuel.

The President's budget for the Department's repository program supports the completion of work needed for the submission of a license application to the Nuclear Regulatory Commission (NRC) in 2004 and the development of a repository and associated transportation capabilities needed to initiate repository operations by 2010.

Strategies

The Department will pursue two strategies to accomplish this goal. The Department will:

1. Take the necessary steps to establish a permanent geologic repository for high-level waste and spent nuclear fuel at the Yucca Mountain, Nevada, site.
2. Lead an international long-term research program on advanced technology options to promote future waste-management alternatives, which could significantly reduce the amount of future spent nuclear fuel requiring disposal.

External Factors

The following external factors could affect our ability to achieve this goal:

- **Regulatory Requirements:** The NRC is responsible for approving a Department license application for Yucca Mountain. Any delay in issuing a license could delay the commencement of repository operations.
- **Litigation:** It is likely that any NRC decision to issue a license to construct and operate a repository at Yucca Mountain will be challenged in the courts.
- **Stakeholder Interface:** Successful coordination and collaboration with external stakeholder groups (state, local government, industry, and the public) is vital to successfully develop the Yucca Mountain repository and transportation infrastructure.

Key Intermediate Objectives

- By December 2004, the Department submits a license application to the NRC for a repository construction authorization, which would be issued by the NRC early in 2008.
- Between 2007 and 2010, the Secretary reports to the President and to Congress on the need for a second repository.
- In fiscal year 2008, the Department begins construction of the Yucca Mountain Repository.
- By 2010, the Department develops the National and Nevada transportation infrastructure to support the anticipated shipment of materials to Yucca Mountain.
- In 2010, the Department begins receiving spent nuclear fuel and high-level waste for disposal at the Yucca Mountain repository.
- By 2014, the Yucca Mountain repository reaches the maximum annual acceptance rate of 3,000 metric tons per year.

Yucca Mountain, on the southwest boundary of the Nevada Test Site, being evaluated for suitability as the nation's first repository for high level nuclear waste. Studies include surface based testing of rock, soil samples and water movement, subsurface rock testing at deep levels and laboratory analysis of sample.

Achieving These Goals

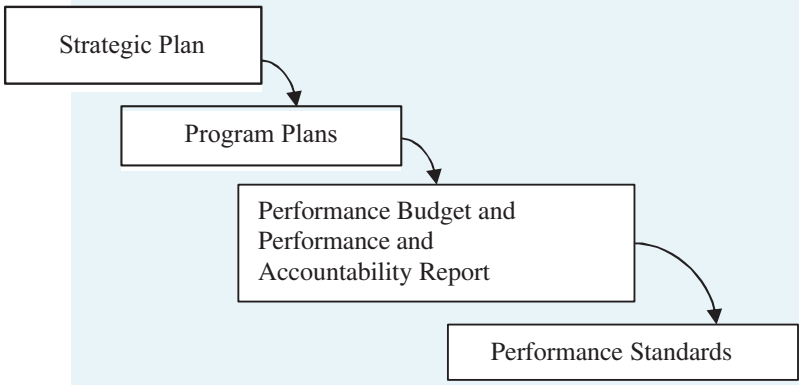
The Department's strategic and general goals will be accomplished not only through the efforts of the major program offices in the Department but with additional effort from staff offices that support the programs in carrying out the mission. The Department's staff offices perform critical functions necessary for successfully achieving the Department's goals. These functions include managing information technology, ensuring sound legal advice and fiscal stewardship, developing and implementing uniform program policy and procedures, maintaining and supporting the health and safety of our workforce, safeguarding our work spaces, and providing Congressional and public liaison.

The Department will only achieve its goals with adequate financial, human, facility, infrastructure, and technical resources. In developing this plan, the Department assumed budget appropriations generally consistent with the Administration's out-year budgets. In the area of human resources, the Department is implementing the President's Management Agenda on Human Capital. The Department will ensure that it has the necessary skills available to carry out its missions and rebuild a pipeline of skills for the future while recognizing the increasing retirement rate. The Department has also recently strengthened its project management efforts. In order to meet the Nation's needs for cutting-edge science, the Department must periodically replace or make major upgrades to aging or outdated major experimental facilities. These requirements will be weighed against the benefits from cost-effective modifications to existing facilities to ensure that the maximum national benefits are derived from existing infrastructure. Further advances in computation and communication will aid the continuing push toward a more seamless, connected establishment. Opportunities for collaboration, remote experimentation, and scientific simulation as a substitute for more costly experimentation, and sharing and access to vast quantities of data and information will continue to place demands on computation and communication of the Department's organizations.

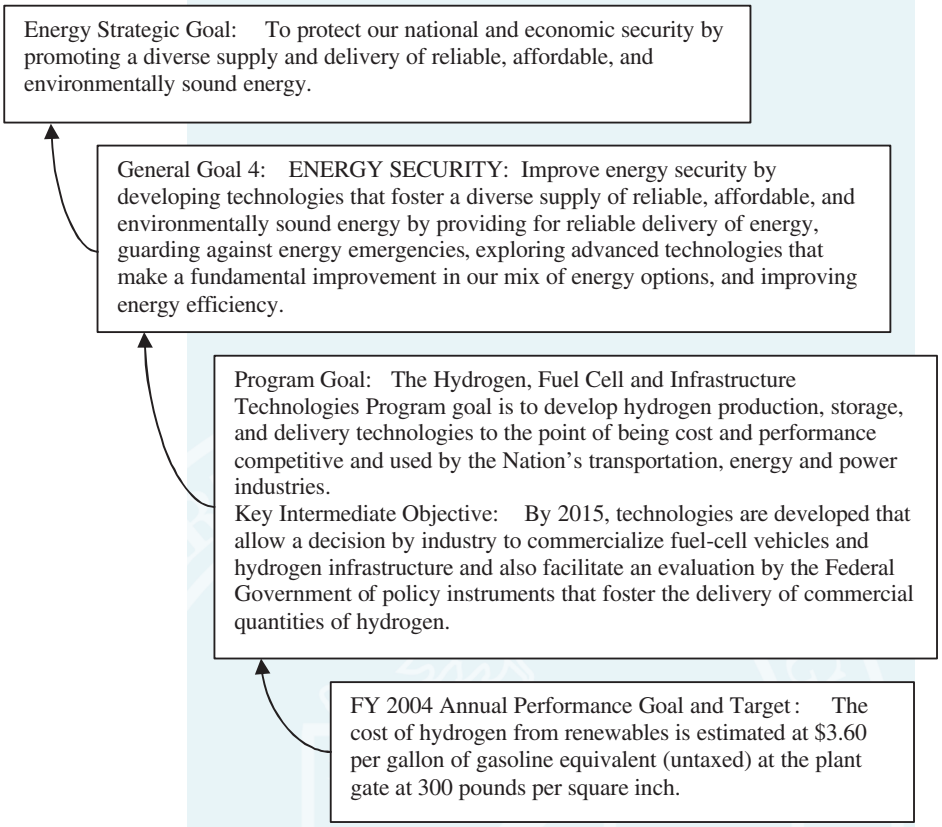
The Department is committed to improving its management and is taking steps, for example, implementing the President's Management Agenda, to ensure that program management helps achieve program goals.

Although the planning period for these strategic and general goals stretches to 2025, the discussion of each general goal includes strategies and key intermediate objectives between now and 2025. These strategies relate to the Department's programs and will be included in a cascade of documents, shown below, with annual performance targets included in the justifications for the appropriate budget years.

More specifically, the Department's annual budget justification is based on projected performance for the requested funding. Beginning with the budget for fiscal year 2005, the Department will incorporate its annual performance plan into the budget presentation and justification of its programs.



The linking of strategic goals, general goals, program goals, key intermediate objectives, and annual performance goals and targets is shown in the following example:



The Department reports actual performance against these targets annually in the Performance and Accountability Report. This report provides the basis for evaluating the Department's progress toward the strategic goals. Each year, the Department will adjust the strategies, as necessary, based on actual performance, the current resources available, and updated national, energy, and economic outlook. This will ensure that the Department is continuously fulfilling its mission to protect national, economic, energy security with advanced science and technology.

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