ＢＢＬセミナー

# 『米国のエネルギー政策と日本へのインプリケーション』

# “U.S. Energy Policy and its implication to Japan”

エネルギー政策研究所長

神田　啓治

独立行政法人　経済産業研究所

２００３年１２月９日（火）

# 第５回サンタフェ会議　日米原子力ワークショップ

## "Partnership for a New Nuclear Era"

November 23-25, 2003
Loews l'Enfant Plaza Hotel
Washington, DC

**１１月２３日（日）**

歓迎レセプション

・Robert Card（エネルギー省次官）

**１１月２４日（月）**

基調講演

座長 Eric Knox（エネルギー省 Card 次官室首席）

・ 藤　洋作（電事連会長、関西電力社長）
「日本におけるエネルギー需給の基本計画」

・ Nils J. Diaz（原子力規制委員会委員長）
「変貌する世界における原子力規制の役割」

・ William Magwood（エネルギー省原子力局長）
「米国のエネルギー政策」

原子力における国民の信頼の強化

・ 勝俣恒久（東京電力社長）
「日本における原子力プラント運転の問題点」

・ Joe F. Colvin（Nuclear Energy Institute 理事長）
「米国における原子力についての国民の信頼」

・ 早瀬佑一（東京電力常務）
「地域共同体との新しい関係構築」（コメント）

昼食会

・ 藤家洋一（原子力委員会）
「科学史にみるエネルギー（過去・現在・未来）」

日米原子力研究開発の見通し（パネル）（１）

座長 William F. Martin（前出）

・ 藤家洋一（原子力委員長）
「宇宙の創成とエネルギー源」

・ Ernest J. Moniz（マサチューセッツ工科大学教授）
「原子力の将来（ＭＩＴレポート）」

・ 神田啓治（エネルギー政策研究所所長）
「２２世紀における原子力の重要性」

・ Robert J. Eagan（サンディア国立研究所副所長）
「２１世紀の原子力：行動計画」

日米原子力研究開発の見通し（パネル）（２）

・ 渡辺　格（文科省研究開発局原子力課長）
「二法人（原研とサイクル機構）の統合」

・ 斎藤伸三（日本原子力研究所理事長）
「原子力研究所における創造的原子力システムと放射線応用の研究活動」

・ 相澤清人（核燃料サイクル開発機構特別技術参与）
「高速炉サイクルの商業化に向けての日本の研究開発」

・ Edward Arthur（ロスアラモス／アルゴンヌ国立研究所、核燃料サイクル顧問）
「核燃料サイクル技術、研究開発・実証」

昼食会

・ Dale Klein（国防総省ＮＣＢ防衛担当長官補佐）
「国家安全保障と核戦略－イラク、北朝鮮、イラン」

要約

・ Giulia Bisconti（エネルギー省エネルギー・科学・環境担当次官補佐）

・ Nicole Nelson-Jean（在日米大使館エネルギー担当参事官）

・ 兒島伊佐美（電事連副会長）

・ William F. Martin（前出）

原子力エネルギー拡大への挑戦

・ 川口文夫（中部電力社長）
「新原子力時代の展望と設備利用率向上の努力」
・ Peter Lyons（上院エネルギー資源委員会スタッフ）
「当面の米国の原子力政策」
・ 宮崎慶次（近畿職業能力開発大学校校長）
「日本の原子力産業の方向性と期待される原子力安全規制」
・ Margaret Chu（エネルギー省民生放射性廃棄物管理局長）
「核廃棄物処分への挑戦」

自由化の現状と原子力の展望

司会 William F. Martin（エネルギー省原子力研究委員会委員長、Washington Policy Analysis 会長）

・ 兒島伊佐美（電事連副会長）
「電力自由化と原子力の展望」
・ Guy Caruso（エネルギー省エネルギー情報局長）
「２０２５年までの環境制約下での原子力の成長」

プルトニウム利用と核不拡散（パネル）

座長 Harold Bengelsdorf（Bengelsdorf, McGoldrick & Associates 代表）

・ 武藤　栄（電事連原子力部長）
「日本のプルトニウム利用」
・ Richard Stratford（国務省原子力局長）
「原子力発電の拡大と核拡散防止」
・ 佐々木正（日本原燃社長）
「六ヶ所再処理プラントの現状」

１１月２５日（火）

原子力発電所運転の経済性改善戦略

司会 Neil J. Numark（Numark Associates Inc.社長）

・ 鷲見禎彦（日本原子力発電社長）
「日本における原子力発電所の維持」
・ Michael Wadley（Nuclear Management Company 副社長）
「電力自由化下における原子力発電所の管理費」

2003.12.5

# MIT レポートについて

神田　啓治

| | |
|---|---|
| 標　題 | The Future of Nuclear Power<br>(An Interdisciplinary MIT Study) |
| 発表者 | Prof. Dr. Ernest Moniz（共同議長）<br>Director of Energy Studies<br>Laboratory for Energy and Environment<br>Massachusetts Institute of Technology<br>クリントン政権当時（1997.10～2001.1）、エネルギー省エネルギー・科学・環境担当次官を務めた。その前は大統領府の科学技術政策担当次長であった。 |
| 発表日 | レポート　2003.7.29<br>GLOBAL2003　11.18（２時間の特別セッション）<br>サンタフェ会議　11.25（このとき神田と隣席のパネル） |
| 主な内容 | １．地球温暖化防止のための手段<br>・発電及び使用効率の向上<br>・再生可能エネルギーの拡大<br>・炭素の固定<br>・原子力利用の拡大<br>２．原子力を推進する上での問題点<br>・経済性、安全性、核不拡散性、放射性廃棄物<br>３．原子力を推進するときの主なシナリオ<br>・発電所建設費の縮小（－25%）と建設期間の短縮（４年）<br>・炭素税（50～200 ドル／tC）の導入を考慮<br>・当面はワンススルー |

主な内容
（続き）

発電コストの比較　（単位：cents/kWe-hr）

| | | |
|---|---|---|
| 原子力（軽水炉） | | 6.7 |
| | 建設費用 25%減 | 5.5 |
| | 建設期間短縮（5→4年） | 5.3 |
| | 運転管理費 13mills/kWe-hr | 5.1 |
| | 資本費をガス／石炭並みに縮小 | 4.2 |
| 粉　炭 | | 4.2 |
| 複合ガス（ガス代 安 3.77 ドル/MCF） | | 3.8 |
| 〃　（ガス代 中 4.42 ドル/MCF） | | 4.1 |
| 〃　（ガス代 高 6.72 ドル/MCF） | | 5.6 |

炭素税が導入された場合の発電コスト　（単位：cents/kWe-hr）

| | 50 ドル/tC | 100 ドル/tC | 200 ドル/tC |
|---|---|---|---|
| 粉 炭 | 5.4 | 6.6 | 9.0 |
| 複合ガス（ガス代安） | 4.3 | 4.8 | 5.9 |
| 〃　（ガス代中） | 4.7 | 5.2 | 6.2 |
| 〃　（ガス代高） | 6.1 | 6.7 | 7.7 |

その他

1．Moniz 教授に「どうしてこんなレポートを出す気になったのか」と尋ねたところ、「米国にはどうしても原子力発電所が必要であるが、長年建設の経験がないので技術力が劣ってきている。一刻も早く建設を始めるための動機付けが必要だと考えたからである。」

2．Moniz 教授に「この程度の論文は京都大学大学院では修士論文としか見なされない」と言ったところ、苦笑しながら「原子力について技術力の落ちている米国ではこのレポートが必要なのだから、冷やかさないで理解して貰いたい」と。

3．同じ MIT の A. Kadak 教授（原子力工学）に同様の質問をしたところ、「①Moniz 教授は原子力の専門家ではなく物理学者だ。これは、むしろ政治家的発想をする学者たちが作成した、②このレポートに MIT という名が付いているのは MIT の恥だ。」

4．GLOBAL2003 では、フランス原子力庁ブシャール局長が、ワンススルーを前提とした同レポートを痛烈に批判していた。

# Partnership for a New Nuclear Era

## Nov. 23-25, 2003 Washington, DC

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## Importance of Nuclear Energy in the 22nd Century

Keiji Kanda
Director, Japan Energy Policy Institute

The importance of nuclear energy will increase in the second half of the 21st century and the 22nd century. Because

(1)an effective alternative energy source may be difficult to be found,

(2)the environmental restrictions will become more severe.

The amount of uranium resource is limited, therefore,

(1) The spent fuels must be considered to be an energy resource.
(2) Fast breeder reactors in any form must be developed.
(3) Thorium-$^{233}$U cycle has to be reconsidered.
(4) Small reactors are of a possible option, especially for developing countries.

- Nuclear hydrogen program will also be important.
- Public opinion against nuclear energy will be changed.
- If once peaceful nuclear materials (Pu or $^{233}$U) are to be used as nuclear bomb in any type in a real war, all the scenarios above will be changed.

Recently in Japan,

1. The national election of House of Representatives was performed on Nov. 9, 2003.

as of Nov. 18, 2003

| | House of Representatives (Lower House) | | House of Councilors (Upper House) | |
|---|---|---|---|---|
| | After | Before | | |
| Liberal Democratic Party | 244 | 247 | 115 | Ruling Party (278) |
| New Komeito | 34 | 31 | 23 | |
| New Conservative Party | -------- | 9 | -------- | |
| Democratic Party | 178 | 137 | 69 | Opposition Party (202) |
| Japanese Communist Party | 9 | 20 | 20 | |
| Social Democratic Party | 6 | 18 | 6 | |
| Others | 9 | 13 | 12 | |
| Total | 480 | 475 | 245 | (480) |

2. "The Fundamental Energy Program" was decided by the cabinet on Oct. 7, 2003.

   (1) Nuclear energy is the basic electricity source,
   (2) As to the backend of the nuclear fuel cycle, the government of Japan is positively involved.

3. The Nagoya High Court reversed a lower court decision on Jan. 27 and nullified the national government's 1983 go-ahead for construction of the Monju. The ruling supported the claim of the plaintiffs, who blamed a leak of sodium coolant at the plant in 1995. The government did action to the Supreme Court in the end of March 2003. The research and examinations of national options are going on now in the Supreme Court. The ruling by the Supreme Court will be done early next year.

# Revitalization of Nuclear Research in the U.S.

## FY 2004 Nuclear Energy, Science and Technology Budget Request

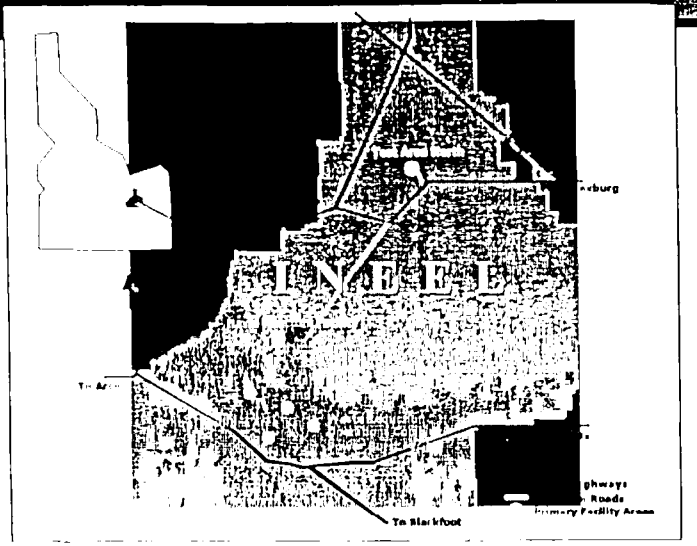
William D. Magwood, IV, Director
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy

February 3, 2003

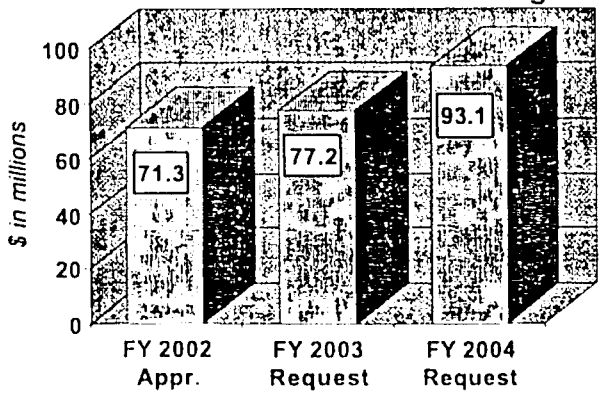
# Revitalization of Idaho National Engineering Laboratory

In Cooperation with

EM U.S. Department of Energy Office of Environmental Management




Nuclear R&D, Safeguards & Security, and Infrastructure Funding

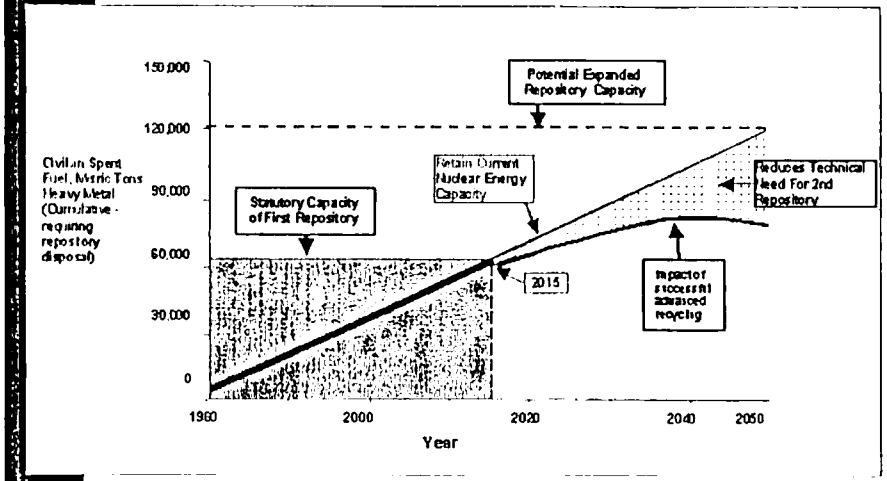


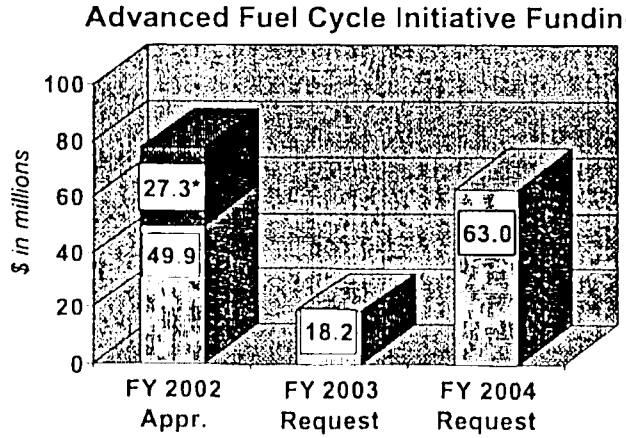

- ? On July 15, 2002, Secretary Abraham announced a major mission realignment for INEEL
- ? INEEL will become a world-class nuclear laboratory focusing on R&D such as:
  - Generation IV nuclear energy systems and advanced fuel cycles
  - Advanced space nuclear power and propulsion systems
- ? Success in environmental cleanup will be essential to the growth in the nuclear program at Idaho

# Advanced Fuel Cycle Initiative: *Optimizing Spent Nuclear Fuel Disposition*

In Cooperation With

YUCCA MOUNTAIN PROJECT
OCRWM




? Built on international cooperation and collaboration (*e.g.*, France and Russia) and integrated with Generation IV

? *Report to Congress on Advanced Fuel Cycle Initiative: The Future Path of Spent Fuel Treatment and Transmutation Research* issued (January 2003)

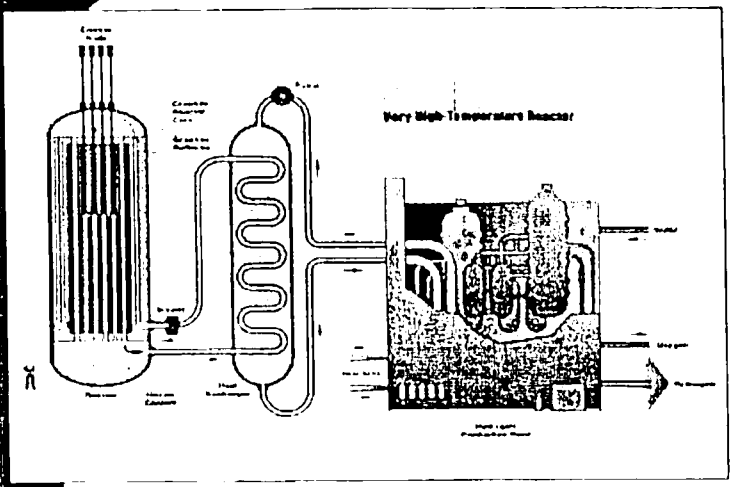
Planned Accomplishments -- FY 2004

? Conduct research on proliferation-resistant fuel treatment technologies

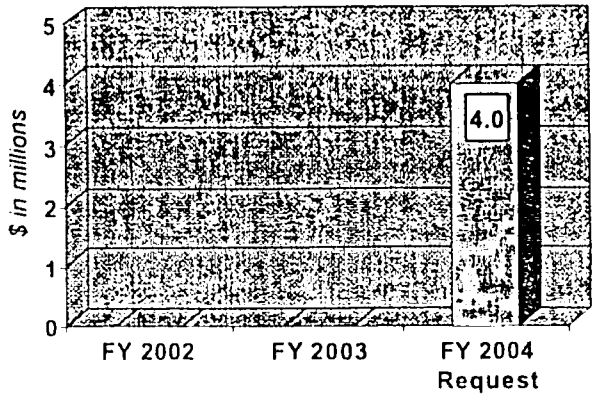
? Develop technologies to reduce toxicity and heat load of fuel sent to a geologic repository

? Award additional 10 to 12 transmutation science fellowships to U.S. universities

# Nuclear Hydrogen Initiative: Developing Nuclear Energy Systems for Clean and Abundant Hydrogen Production



Nuclear Hydrogen Initiative Funding




? Nuclear energy systems offer opportunity for economical, clean, and abundant source of hydrogen

## Planned Accomplishments in FY 2004

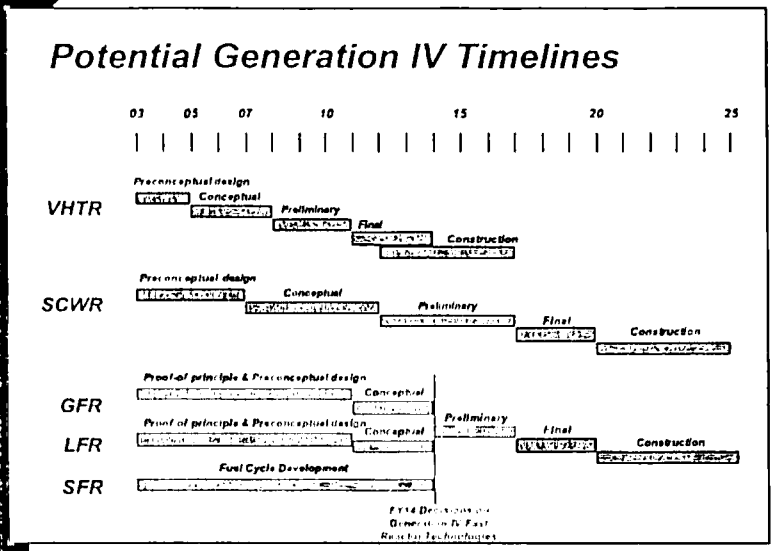
? Complete a Nuclear Hydrogen Technology Roadmap

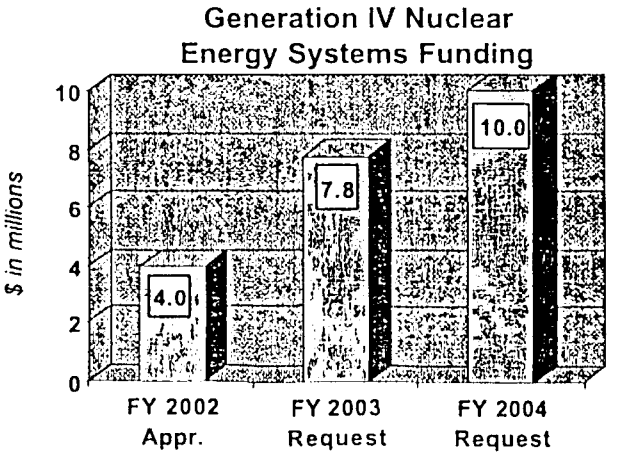
- Built on National Hydrogen Energy Roadmap and inter-office cooperation
- Define R&D required to develop an integrated nuclear hydrogen production plant

? Develop concept for an integrated nuclear hydrogen production system

? Initiate R&D on high temperature and corrosion resistant materials for thermo-chemical process

# Generation IV Nuclear Energy Systems
## *Nuclear Power for a New Century*




In Cooperation With

GENERATION IV International Forum

? Developing advanced nuclear energy systems for deployment after 2010 and before 2030

? In September 2002, the 10-Nation Generation IV International Forum agreed on 6 advanced technologies, including:

- Very High Temperature Reactor (VHTR)
- Supercritical Water Cooled Reactor (SCWR)
- Gas Cooled Fast Reactor (GFR)
- Lead Cooled Fast Reactor (LFR)

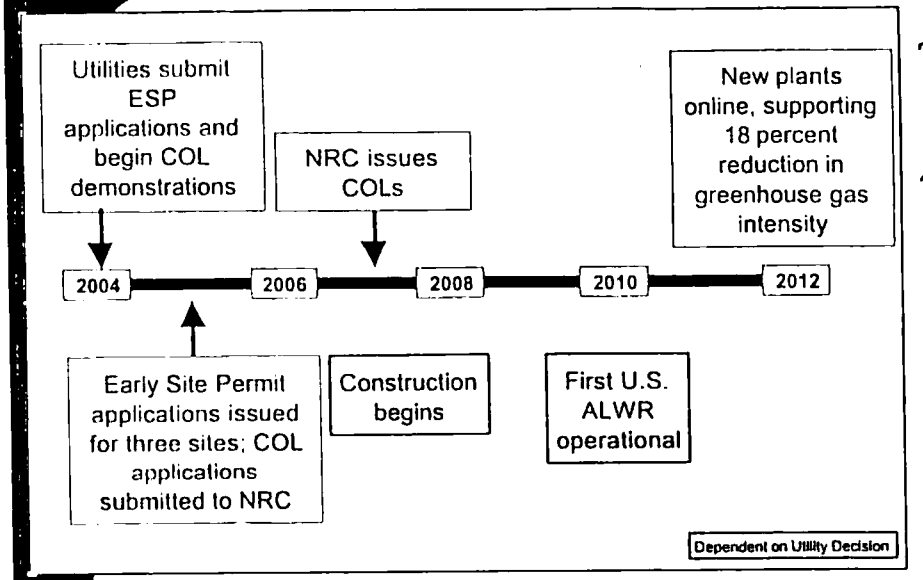
### Planned Accomplishments -- FY 2004

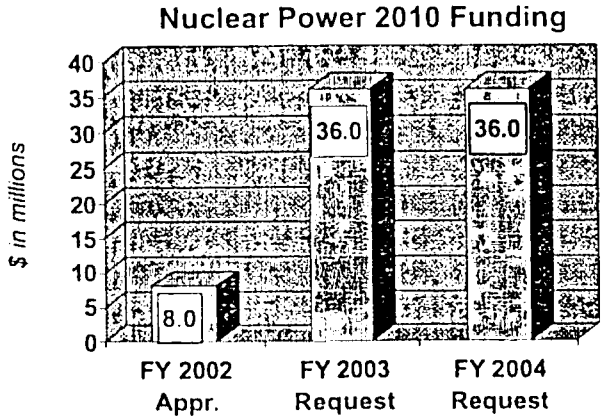
? Conduct major VHTR trade studies

? Complete feasibility study on GFR fuels studies

? Initiate mechanical and irradiation tests on advanced materials

# Nuclear Power 2010:
## *Paving the Way for New Nuclear Power Plants*




? U.S. utilities are examining the business cases for new nuclear plants in the U.S.

? Cost-shared regulatory demonstrations and R&D on advanced technologies underway aimed at deploying new plants by 2010

Planned Accomplishments -- FY 2004

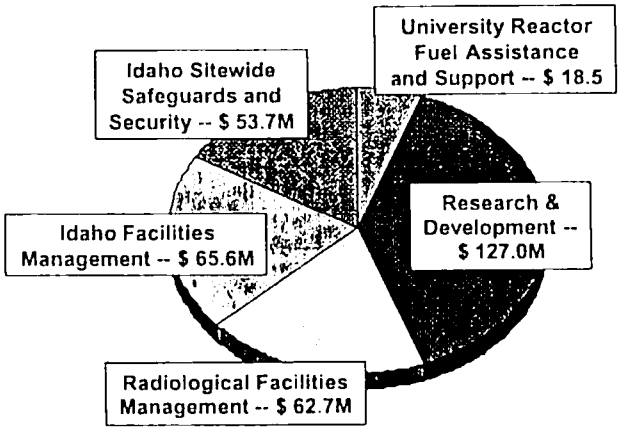
? In FY 2003 and FY 2004, DOE will select industry partners for demonstration of Combined and Operating License (COL) processes

? Advanced gas cooled reactor fuel development program continues in FY 2004

# FY 2004 Nuclear Energy, Science and Technology Budget Request

(dollars in thousands)

| | FY 2002 Comparable Approp. | FY 2003 Comparable Request | FY 2004 Request to Congress | FY 2004 vs. FY 2003 | |
|---|---|---|---|---|---|
| University Reactor Fuel Assistance and Support | 17,500 | 17,500 | 18,500 | +1,000 | +6% |
| **Research and Development** | | | | | |
| Nuclear energy plant optimization | 6,293 | — | — | — | — |
| Nuclear energy research initiative | 31,081 | 25,000 | 12,000 | -13,000 | -52% |
| Nuclear energy technologies | 11,867 | 46,500 | 48,000 | +1,500 | +3% |
| Advanced fuel cycle initiative | 77,219 | 18,221 | 63,025 | +44,804 | +246% |
| Nuclear hydrogen initiative | — | — | 4,000 | +4,000 | — |
| **Infrastructure** | | | | | |
| Radiological facilities management | 58,933 | 54,180 | 62,655 | +8,475 | +16% |
| Idaho facilities management | 63,289 | 68,425 | 65,560 | -2,865 | -4% |
| Idaho sitewide safeguards and security | 40,295 | 40,215 | 53,651 | +13,436 | +33% |
| Program direction | 57,237 | 56,834 | 60,207 | +3,373 | +6% |
| Use of PY balances | -818 | — | — | — | — |
| Total | 362,896 | 326,875 | 387,598 | +60,723 | +19% |



# The Department of Energy

# Strategic Plan

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



Draft: August 6, 2003

# The Department of Energy Strategic Plan

The Department of Energy contributes to the future of the Nation by ensuring energy security, maintaining the safety and reliability of the nuclear 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

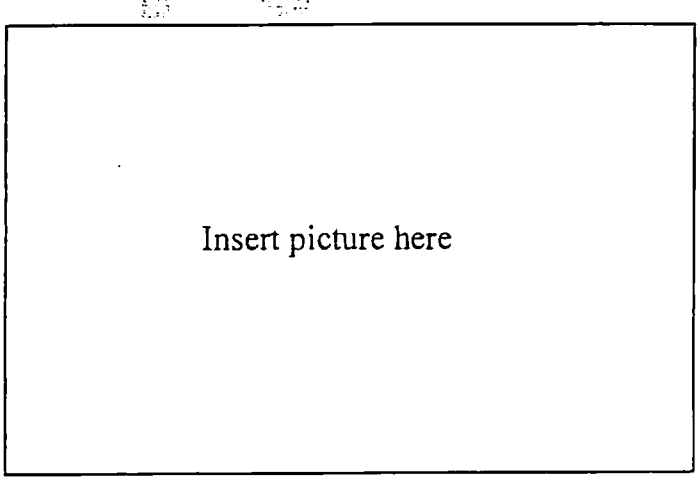
Administration, the Energy Research and Development Administration, and parts and programs from several other agencies.

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 conservation, 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, 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 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 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 below.



This document charts the course for the next 25 years—focusing on the Department's technical capabilities to meet 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 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.

| 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 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. |
| **Energy Strategic Goal:** To protect our national and economic security by promoting a diverse supply of reliable, affordable, and environmentally sound energy. | Goal 4. ENERGY SECURITY: Enhance energy security by developing technologies that foster a diverse supply of affordable and environmentally sound energy, improving energy efficiency, providing for reliable delivery of energy, exploring advanced technologies that make a fundamental change in our mix of energy options, and guarding against energy emergencies. |
| **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, to advance the frontiers of knowledge in physical sciences and areas of biological, medical, environmental, and computational sciences, and to 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. |