# ANS MISSION IN WASHINGTON
# 1999

1.) ANS STRATEGIC PLANNING

2.) KYOTO CONFERENCE

3.) DOE BUDGET CYCLE

4.) NATIONAL ENERGY STRATEGY

5.) SENATOR PETE DOMENICI PROPOSAL

6.) ANS - NRC INTERFACE

# Goals

A. ANS shall be the recognized Leader for the advancement of nuclear science and technology.

B. ANS will be members' primary resource for professional development and knowledge exchange.

# Goals

C. ANS will be publicly recognized as a credible source of nuclear science and technology information.

D. ANS will be an active contributor to and participant in nuclear science and technology public policy issues.

# REDUCING GLOBAL CARBON DIOXIDE EMISSIONS

A statement by the International Nuclear Societies Council

**The International Nuclear Societies Council believes that the world's capacity for generating electricity from nuclear power must be increased substantially, if we are to meet the ambitious targets for reducing global emissions of carbon dioxide.**

A central tenet of the Third Conference of the Parties (COP3), to be held in Kyoto in December 1997, is that carbon dioxide from the combustion of fossil fuels may cause changes in the earth's climate. An objective of the Conference will be to set limits on the emissions of carbon dioxide.

Little progress has been made in meeting the target of the Rio Accord of 1992 to reduce carbon dioxide emissions to 1990 levels. The trends over the last 30 years show that, while there have been increases in emissions from the US and other OECD countries, most of the increase has occurred in the developing world, as those countries strive to develop market economies and raise their standards of living (Table 1). Over the period 1990 - 1995, this large increase was offset by a reduction in emissions from the Former Soviet Union (FSU) and the Eastern European countries, because their economies slowed dramatically as they began to adapt to market-driven economies. With this phase ending, it is to be expected that there will be no further decreases in their emissions, and there may well be increases, as their economies start to grow again. Today, about one quarter of the carbon dioxide emissions comes from the US, one quarter from the rest of the OECD, and half from the rest of the world.

It is now generally accepted that the global energy demand will increase by two to three times by the middle of the next century. Energy demand in the developing countries is growing by over 4% per year and already accounts for over 30% of the global total. Its growth is likely to continue at a much higher rate than in the OECD countries.

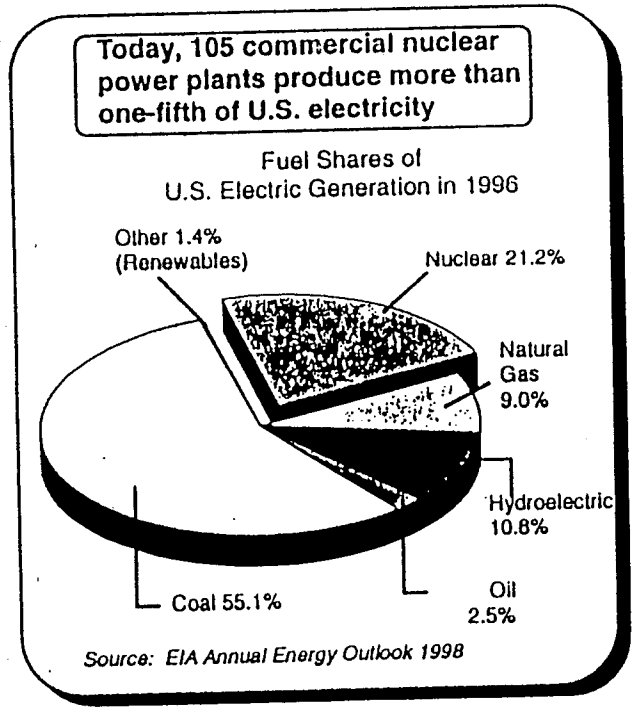
With these patterns of growth, reductions of 20% in emissions from the OECD countries will not achieve a global reduction in carbon dioxide emissions. For example, if the OECD countries were to reduce emissions by 20%, and if the developing countries were to maintain their economic development with emissions following the trends of recent years, then the resulting global emissions in 2015 would be 30% higher than in 1995.

Thus energy conservation programs in the OECD countries, while highly desirable, are by no means sufficient. Furthermore, the major gains in energy efficiency during the 1970s and 1980s have already attacked the easy targets; further gains will be more difficult and costly. To have any real impact on global carbon dioxide emissions, the principal emphasis must be on energy sources other than fossil fuels.

Renewable energy sources can contribute to the solution. The only commercial large scale renewable energy in use is hydroelectric power, which today contributes about 3% of the global energy supply. It could be expanded to replace about 3% of the additional energy demand, if all potential rivers were developed. However, this does not seem likely, given concern in many countries over the environmental impact of new hydroelectric development. In any event, the additional energy provided would have little influence on the total energy picture. No other renewable energies have yet demonstrated commercially economic and reliable energy production

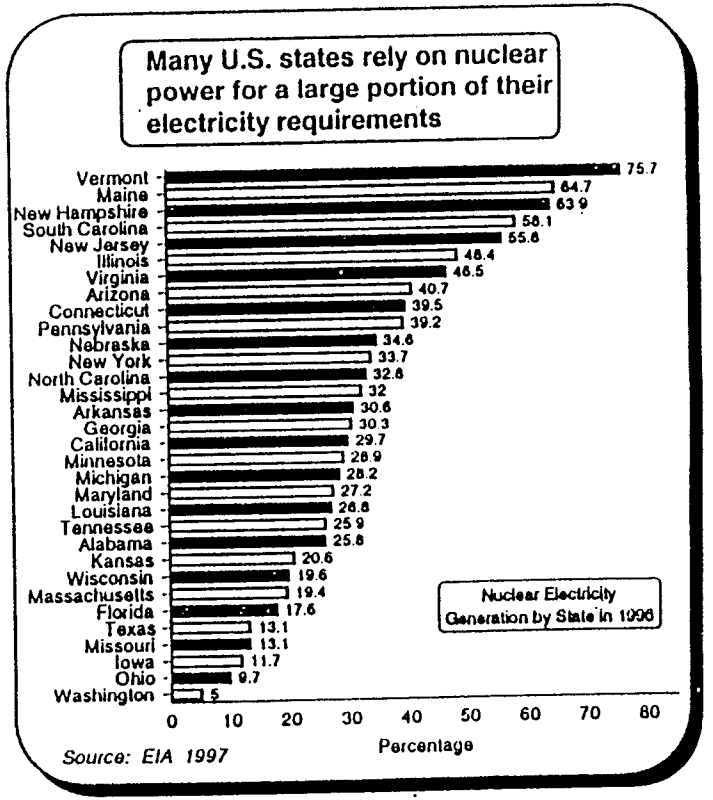
# Nuclear Energy In The United States

## *Nuclear Energy Is A Vital Component Of U.S. Energy Mix*




- Nuclear energy provides reliable baseload electricity in all weather conditions
- Most U.S. nuclear power plants have low production costs and can be competitive sources of electricity

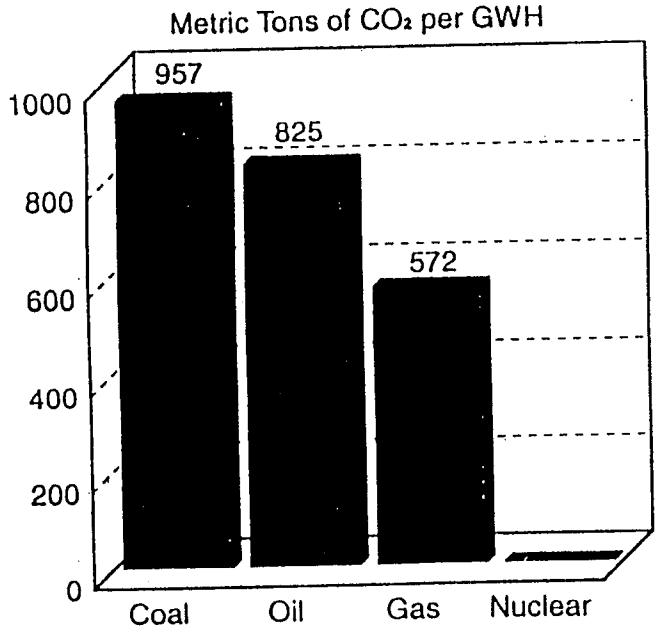
- U.S. nuclear plants generate over 100 gigawatts of electricity annually
- Large baseload electricity source -- second only to coal



# What Are The Benefits?

## *Nuclear Energy Mitigates Global Climate Change*

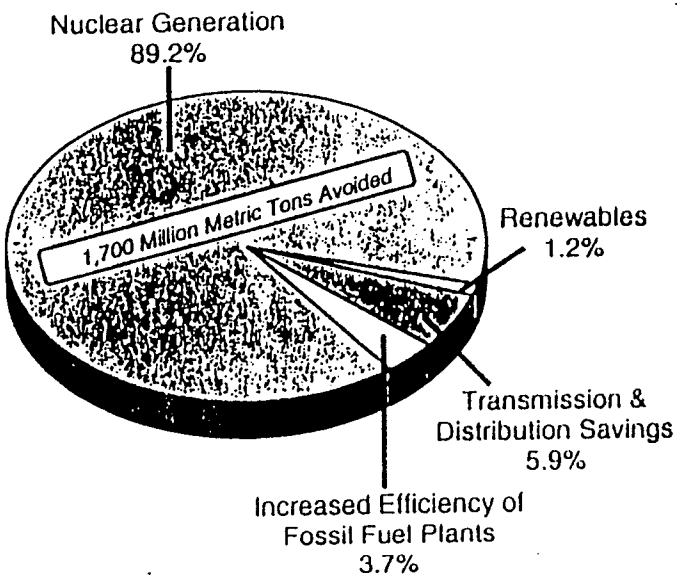
***Nuclear power produces essentially zero carbon, $SO_2$, or NOX gas emissions***




*Source: EIA 1997 Annual Energy Outlook*

***Nuclear power contribution to U.S. carbon emission reductions****

***(Carbon emissions avoided 1973-1994)***

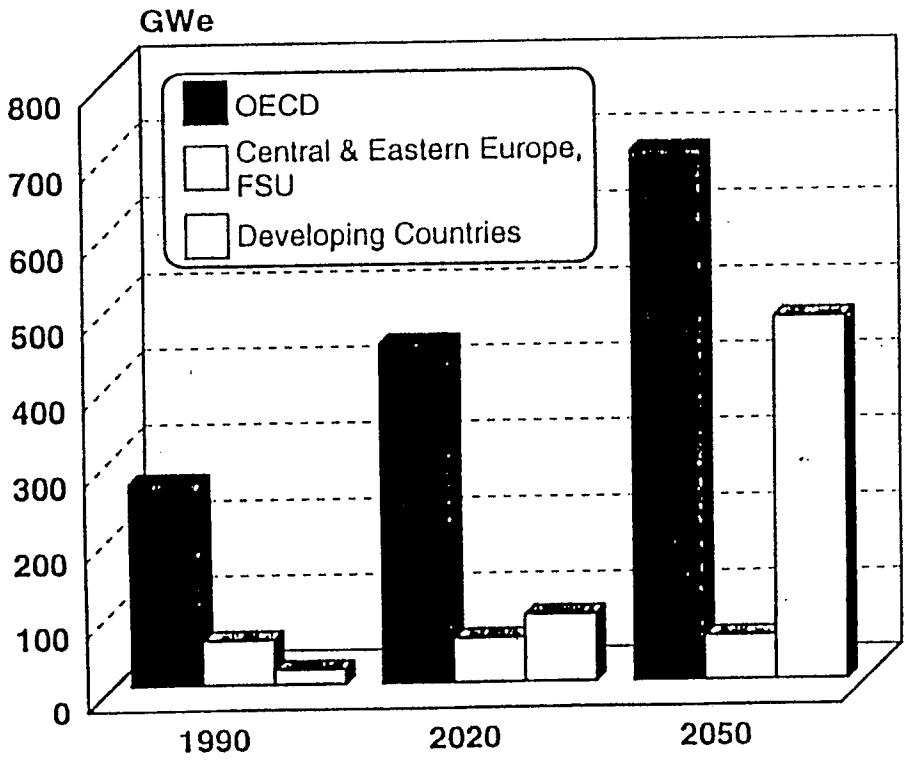



**Displacements are in million metric tons of carbon (C) weight*

If 75 percent of U.S. nuclear plants renew their license, an additional 2.8 billion metric tons of carbon emissions will be avoided by 2035

# What Role Will Nuclear Energy Play In The Future?

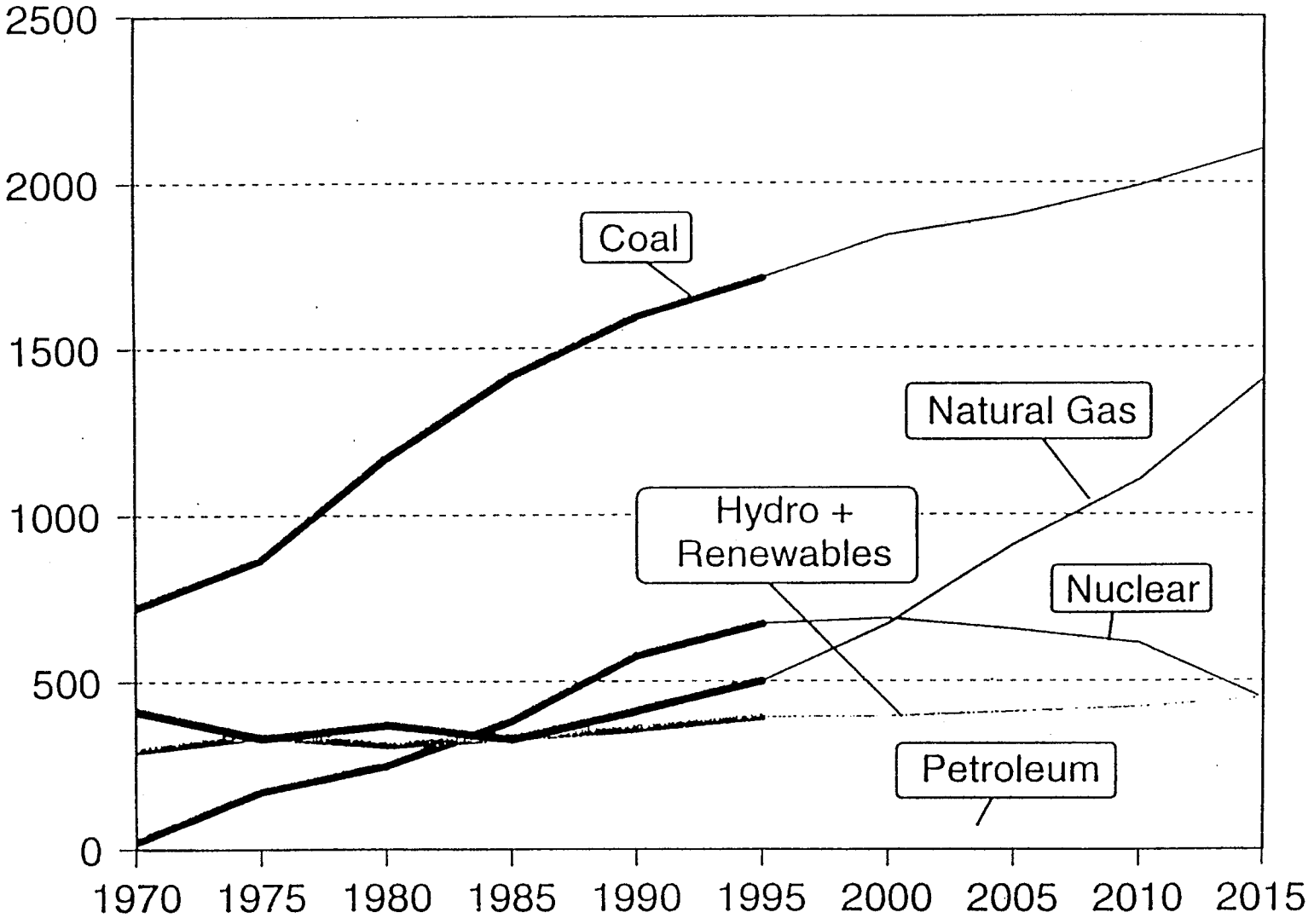
*Use Of Nuclear Power Is Expanding In Many Countries*




## Reasons For Expansion

- Energy security
- Desire by some countries to be seen as technologically advanced
- Lack of extensive fuel resources and transportation systems to support coal or natural gas plants
- Concerns over air pollution associated with economic growth

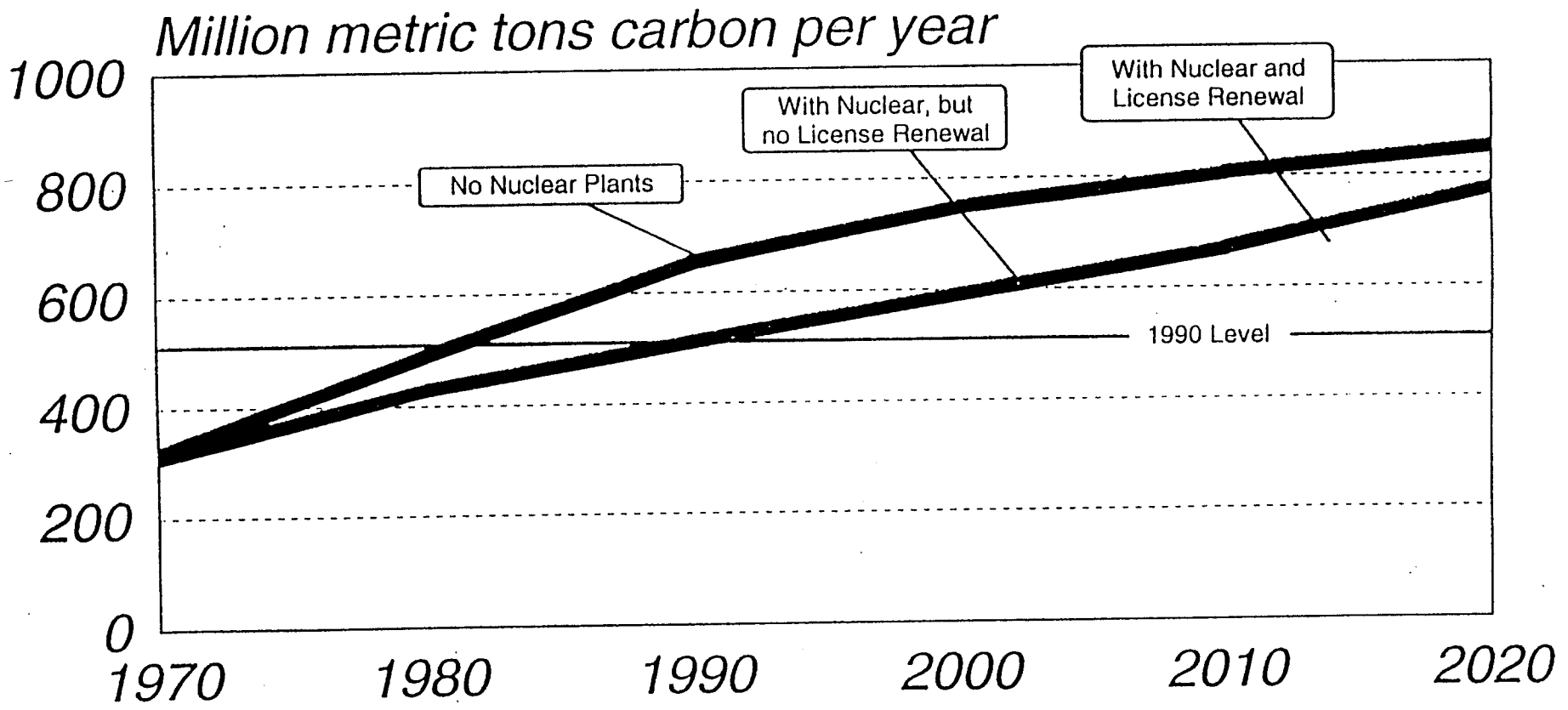
# Projected U.S. Electricity Generation By Fuel




Source: EIA Annual Energy Outlook 1997

# Impact Of License Renewal On Electric Generation Carbon Emissions In The United States

*(1970 to 2020)*




Source: Energy Resources International

# Federal Energy R&D Report

## *President's Committee of Advisors on Science and Technology*

NE: Focus on Energy Resources

**Support Innovative Nuclear R&D**

- January 14, 1997: President tasked PCAST to review the National Energy R&D Portfolio by October 1, 1997
- March 20, 1997: John P. Holdren's Panel on Energy R&D initiated work
- November 5, 1997: PCAST Report of the Energy Research and Development Panel issued
- PCAST nuclear energy observations
  - Potential benefits of expanded contribution from fission in helping address $CO_2$ challenge warrant modest research initiative
  - "To write off fission now as some have suggested, ... would be imprudent in energy terms and would risk losing much U.S. influence over the safety and proliferation resistance of energy activities in other countries"
  - "Fission belongs in the R&D portfolio"

# What Is The United States Doing In Nuclear Energy Research?

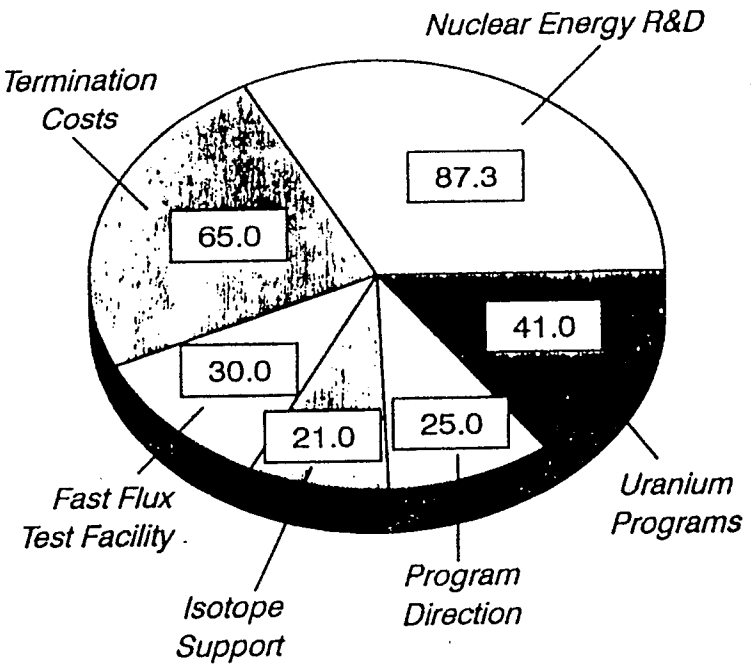
- Nuclear Energy Plant Optimization Program
- Nuclear Energy Research Initiative
- Growing Funding Support for University Nuclear Energy Research
- Nuclear Energy Research Advisory Committee
- Nuclear Science and Technology Facilities Roadmap

# FY 1999 and FY 2000 Budget[1/]

## *($ in Thousands)*

| | *FY 1999* | *FY 2000* |
|---|---|---|
| Nuclear Energy R&D | | |
| Adv. Radioisotope | $ 37,000 | $ 37,000 |
| University Research Support | 11,000 | 11,345 |
| TRA Landlord | 6,766 | 9,000 |
| Nuclear Energy Plant Optimization | 0 | 5,000 |
| Nuclear Energy Research Initiative | 19,000 | 24,000 |
| *Total, Nuclear Energy R&D* | *73,766* | *87,345* |
| Termination Costs | 85,000 | 65,000 |
| Fast Flux Test Facility | 30,000[2/] | 30,000 |
| Isotope Support | 21,500 | 21,000 |
| Program Direction | 24,700 | 24,960 |
| Uranium Programs | 49,000 | 41,000 |
| *Total Nuclear Energy* | *$ 283,966* | *$ 269,305* |
| Adjustments: | | |
| General Reduction | -3,546 | 0 |
| *TOTAL, NUCLEAR ENERGY* | *$ 280,420* | *$ 269,305* |

*FY 2000*




1/ *Excludes Naval Reactors.*

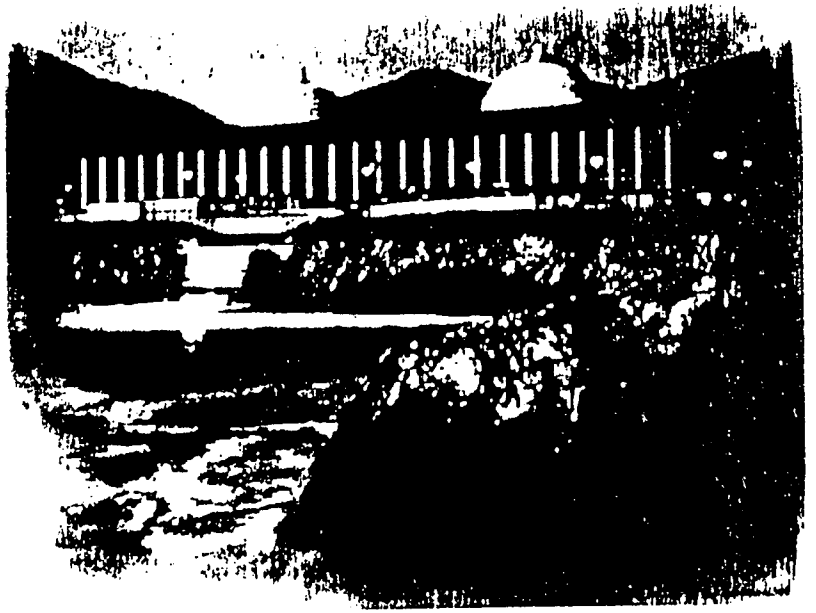
2/ *Excludes $9.2 million of prior year balances reprogrammed into this account in FY 1998.*

# Nuclear Energy Research Initiative (NERI)

## Mission Statement

*To address the key issues affecting the future use of nuclear energy and to preserve the nation's nuclear science and technology leadership.*

- Responsive to PCAST recommendations
- Investigator initiated R&D proposals
- Competitive, peer-reviewed selection of research proposals from national laboratories, universities, and industry
- Close R&D coordination with other DOE offices (SC, RW) and other agencies (NRC)
- R&D collaborative partnerships encouraged among national laboratories, universities, industry and international R&D organizations
- Nuclear Energy Research Advisory Committee to guide the research strategic focus



***DOE's NERI initiative will help preserve U. S. nuclear science and technology leadership.***

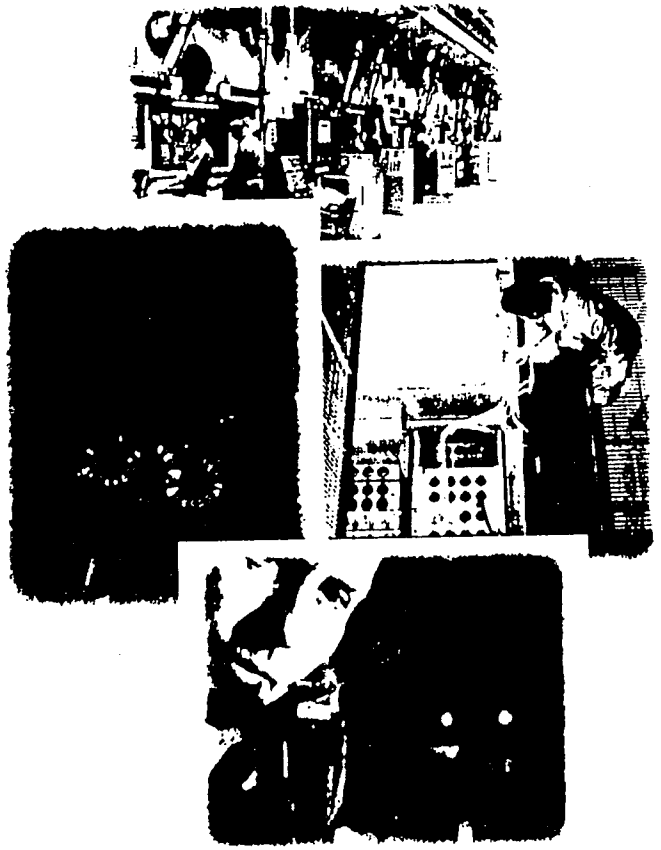
# Nuclear Energy Research Initiative (NERI)

## *Areas of Research*

- Proliferation resistant reactors and fuel technologies
- Advanced reactor designs and applications, including low-power for special applications
- Advanced nuclear fuel
- New techniques for management of nuclear waste
- Fundamental scientific research -- cross cutting including radiation effects on reactor materials

# Nuclear Energy Research Initiative (NERI)

## *FY 1999 Planned Accomplishments*



### Significant Research Community Response to the NERI Solicitation

- Over 300 R&D applications received from universities, laboratories, industry, and collaborative partnerships.

### Peer Review NERI Investigator Initiated Proposals

- Select and award grants for the best and most relevant research.

### International Collaboration

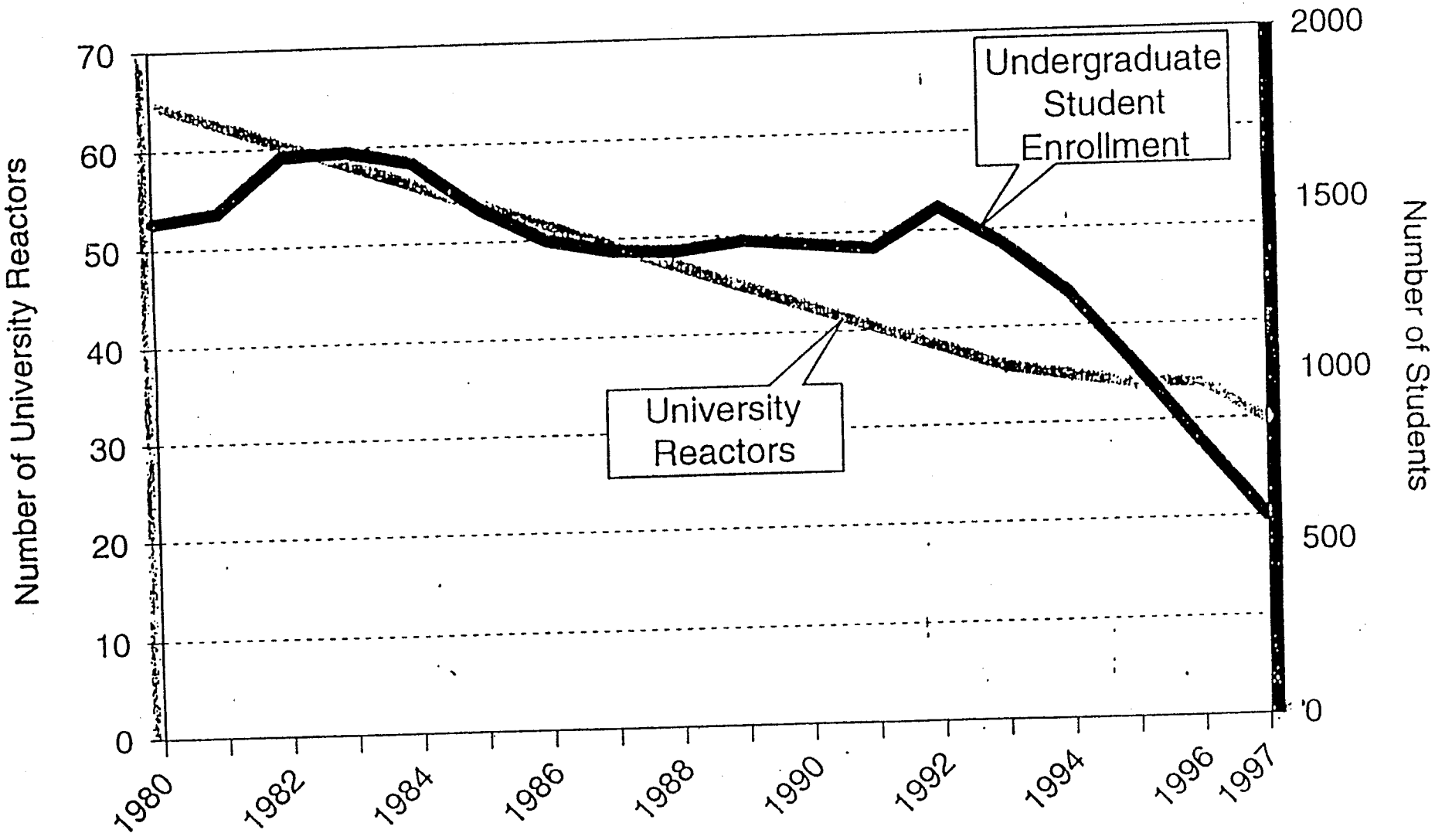
- Establish international R&D partnerships to leverage funds awarded to universities, laboratories, and industry.

# Nuclear Energy Research Advisory Committee

*Assuring Resource Stewardship*

- **This Advisory Committee was chartered in October 1998 to:**
  - Provide expert, independent advice on long-range plans, priorities, and strategies of the Office of Nuclear Energy, Science and Technology programs
- **NERAC subcommittee activities:**
  - Long-Term Strategic Plan for Nuclear Energy Research
  - Long-Term Isotope Research and Production Plan
  - Nuclear Science and Technology Infrastructure Roadmap
  - Operating Nuclear Power Plant Research Coordination and Planning

# Negative Trends In University Nuclear Engineering



# University Reactor Fuel Assistance and Support

## Budget Summary

| Program Element | FY 1999 | FY 2000 |
|---|---|---|
| University Reactor Fuel Assistance and Support | $ 11.0 | $ 11.3 |
| TOTAL | $ 11.0 | $ 11.3 |

| *Detail* | *FY 1999* | *FY 2000* |
|---|---|---|
| Reactor Sharing | 700 | 600 |
| Utility Matching Grants | 1,000 | 800 |
| Fuel Shipments - Refueling | 2,300 | 2,800 |
| Reactor Modernization Upgrades | 800 | 845 |
| Fellowships | 1,400 | 1,300 |
| Nuc. Engin. Recruitment | 0 | 200 |
| Radiochemistry | 300 | 300 |
| Nuclear Engineering Research Grants | 4,500 | 4,500 |
| | *$ 11,000* | *$ 11,345* |

## FY 2000 — Planned Accomplishments

- Support U.S. universities' nuclear energy research and education capabilities by:
  - Providing fresh fuel to all university reactors requiring this service.
  - Funding universities with research reactors for reactor upgrades and improvements (at least 20 in FY 1999 and FY 2000).
  - Partnering with private companies to fund DOE/Industry Matching Grants Program for universities (19 or more in FY 1999; and 17 or more in FY 2000).
  - Increasing the funding for Reactor Sharing in FY 1999 by 40 percent over FY 1998, and in FY 2000 by 20 percent over FY 1998, enabling each of the 26 schools involved in the program to improve the use of their reactors for teaching, training, and education within the surrounding community.
- Attract outstanding U.S. students to pursue nuclear engineering degrees by:
  - Increasing the number of Fellowships (from 14 in FY 1998 to 22 in FY 1999 and 18 in FY 2000).
  - Increasing the number of Nuclear Engineering Education Research Grants (in FY 1999 existing and new grants will total 43; and in FY 2000 existing and new grants will total approximately 45).
  - Providing summer on-the-job training to junior and senior nuclear engineering scholarship recipients (29 in FY 1999, 25 in FY 2000) .

# Nuclear Energy Plant Optimization (NEPO)

## Mission Statement

*The goal of the NEPO program is to ensure that current nuclear plants can continue to deliver adequate and affordable energy supplies up to and beyond their initial license period by resolving critical issues related to long-term plant aging, and by applying advanced technologies to improve plant reliability, available, and economics.*

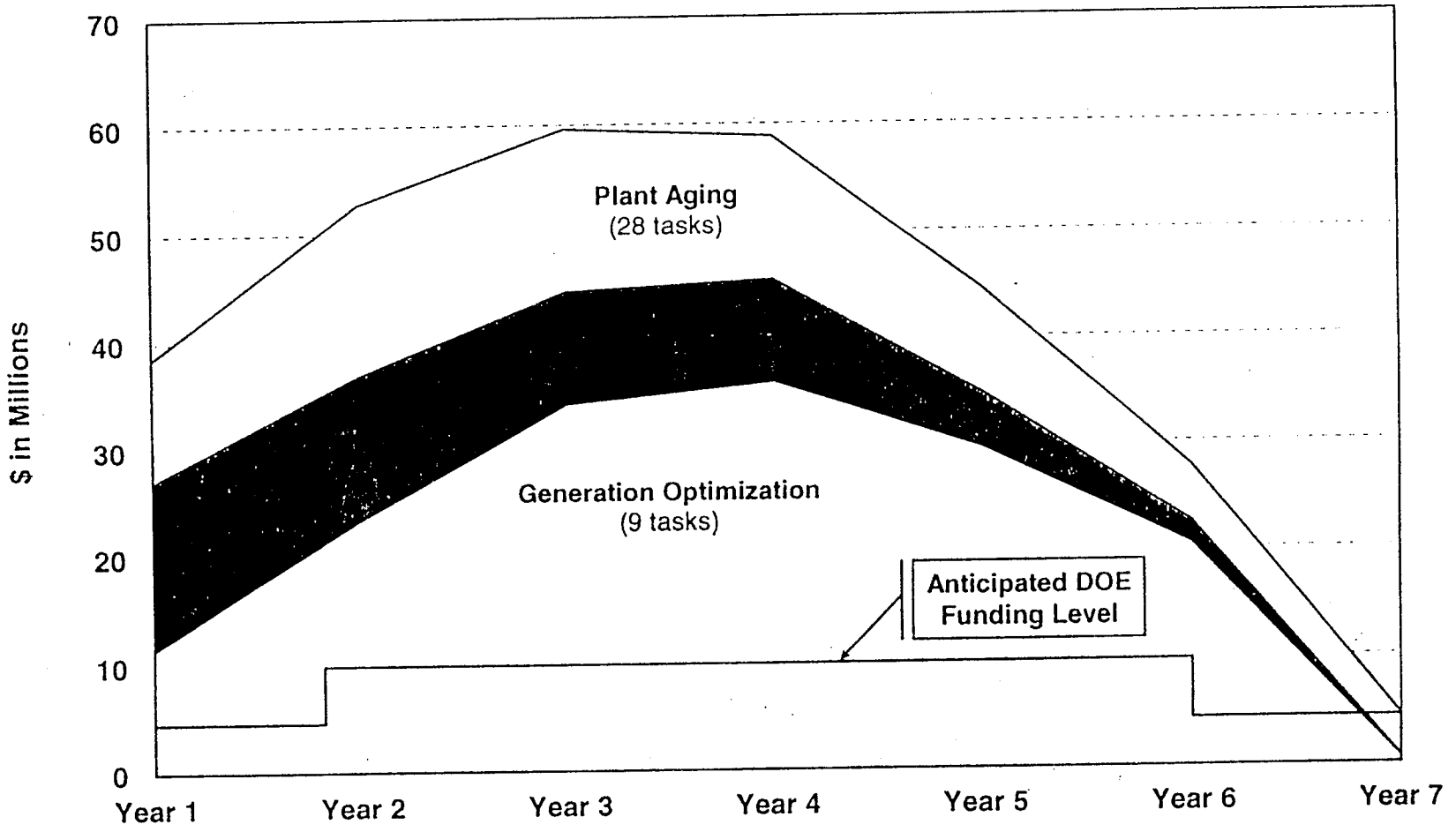
- Drivers
  - Deregulation
  - Premature Plant closures
  - License expirations
  - Clean Air Act
  - Climate change Initiative
- Recommended by PCAST to help preserve current plants
- Based on Joint DOE/EPRI Strategic R&D Plan
- Supported by Memoranda of Understanding with EPRI and NRC to be established in FY 1999
- Guided by NERAC Subcommittee on Operating Nuclear Power Plant Research, Coordination, and Planning
- Cost-shared R&D program with competitively-selected performers; industry provides a minimum of 50 percent of the cost

# Nuclear Energy Plant Optimization (NEPO)

## *Proposed Research Areas*

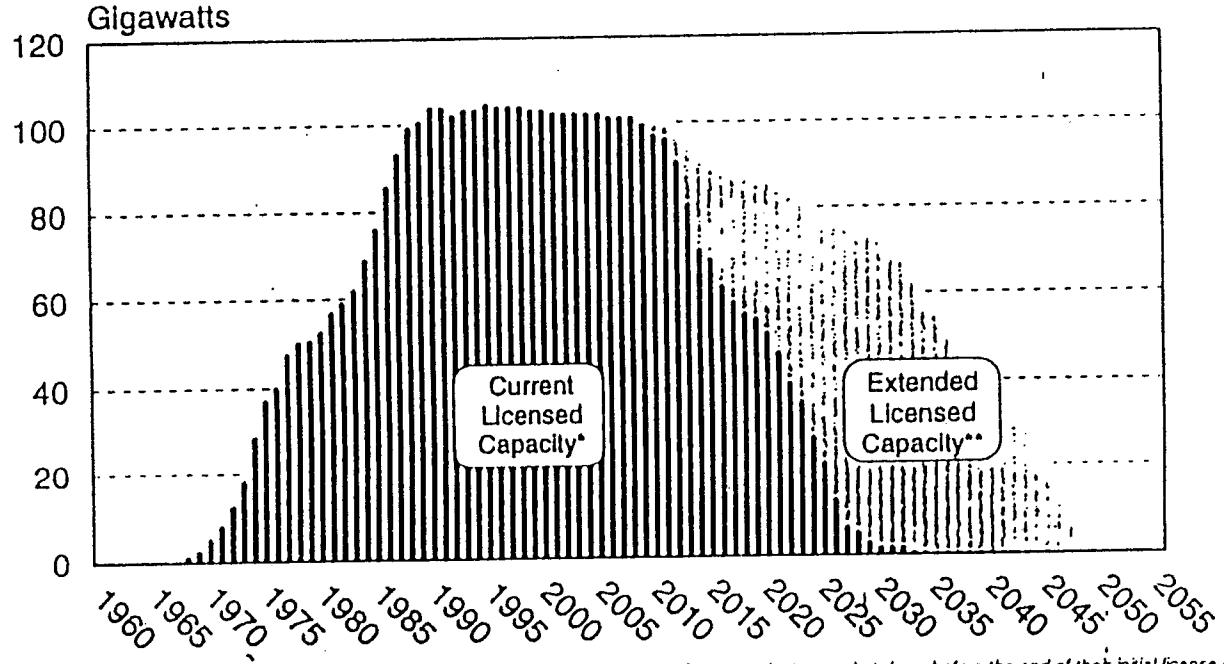
- **Manage long-term effects of nuclear plant component aging**
  - Steam generators
  - Key reactor components
  - Piping, pumps, valves
  - Cables
- **Optimize nuclear power plant generation capacity**
  - Digital and I&C replacements
  - Advanced sensor technologies
  - Advanced monitoring, diagnostics, and control systems

# High Priority Projects In the Joint DOE-EPRI Strategic R&D Plan



# Nuclear Plant License Renewal

- Success of current plants and prospects for future U.S. plants depend upon accomplishing license renewal for a significant portion of U.S. fleet




Source: DOE Analysis

*Assumes 5 percent of current plants are shut down before the end of their initial license period
**Assumes 75 percent of plants receive license renewal for 20 years

- Plan includes research to address generic issues, dissemination of information through the industry, and active participation of DOE in resolving issues with NRC

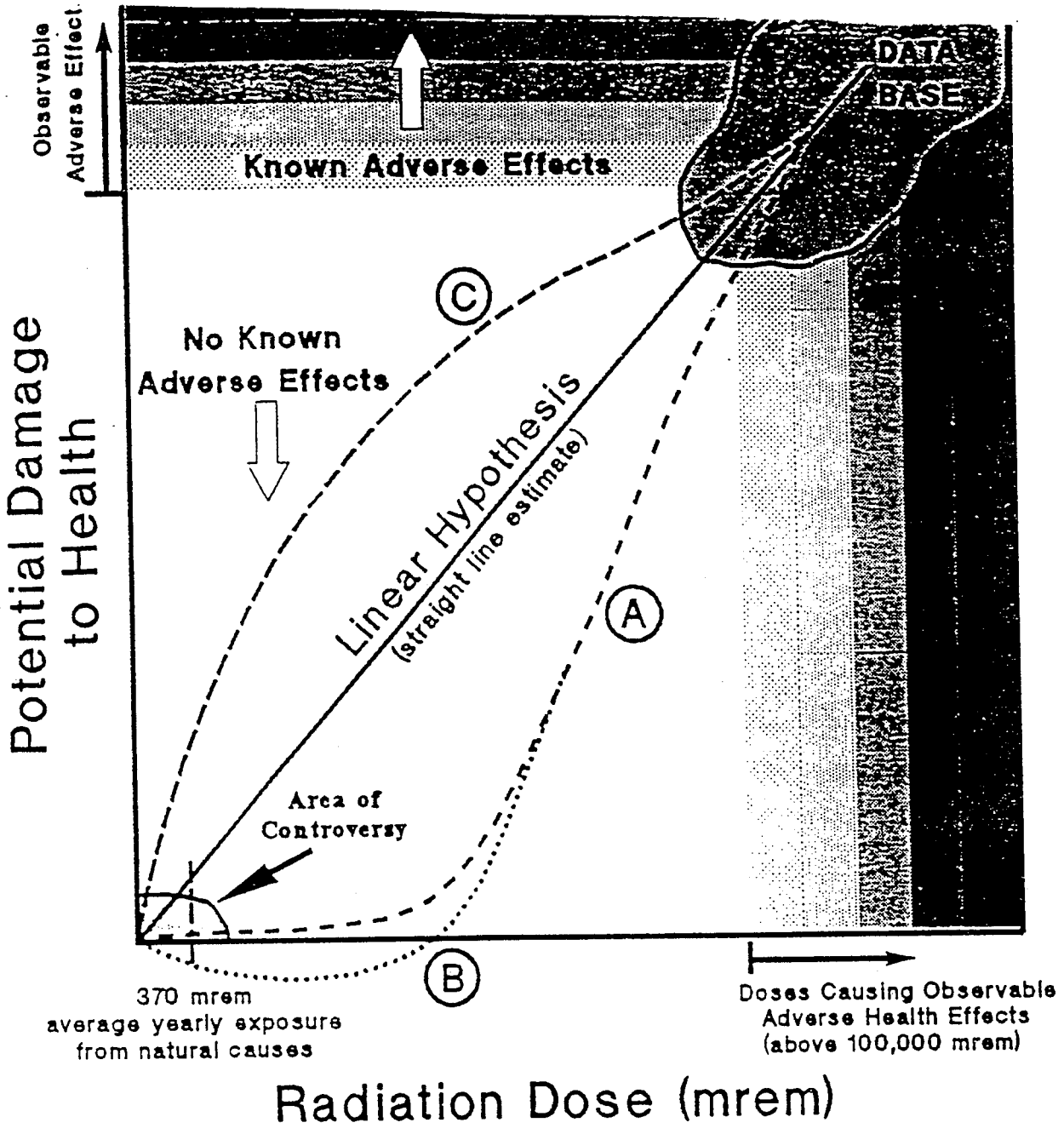



*Figure 18. Models for Determining the Health Effects of Radiation Dose*

Scientific opinion overwhelmingly favors Curve A. For a detailed and easily understood treatment of the basis for this position, an excellent reference is Bernard Cohen's masterful book *Before It's Too Late.*[3] Dr. Cohen, a professor of physics at the University of Pittsburgh, has devoted most of his distinguished career to the study of radiation and its associated risks. With a publication record of more than 200 articles in scientific journals, he is highly regarded by international health physics professionals. Another excellent source of information is Merrill Eisenbud's *Environmental Radioactivity from Natural, Industrial, and*

# The Future . . . ?

*What are the Long-Term Priorities of the Nuclear Energy Program?*

- ***Expand NERI and NEPO*** -- approach levels recommended by PCAST and fully fund Federal share of Joint DOE-EPRI Plan
- ***Launch the Advanced Nuclear Medicine Initiative*** -- to support expanded use of medical isotopes
- ***Determine and address the Nation's research facility requirements***
- ***Increase support for Universities*** -- to strengthen Nuclear Engineering Programs and University Research Reactors
- ***Support potential future NASA-manned mission to Mars*** -- nuclear technology will be essential for this goal to be met