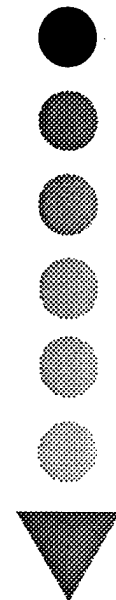


REDUCING

The Nuclear Danger



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Inventory of U.S. Department of Energy
Nonproliferation and Nuclear Threat Reduction Initiatives

October 1995

19980309 411

U6027

Accession Number: 6027

Publication Date: Oct 01, 1995

Title: Reducing the Nuclear Danger

Corporate Author Or Publisher: US Department of Energy, Washington, DC

Descriptors, Keywords: Department Energy Nuclear Danger Nonproliferation Threat Reduction Initiative

Pages: 00036

Cataloged Date: Mar 12, 1996

Document Type: HC

Number of Copies In Library: 000001

Record ID: 40644

Message From the Secretary



The Department of Energy is pleased to present *Reducing the Nuclear Danger*, which provides an overview of the wide array of our activities in support of United States arms control, nonproliferation and nuclear threat reduction policies. Although the Cold War has ended, significant threats to our national security still remain. The Department is reordering its priorities to meet these new challenges.

We have demonstrated to the world community the Administration's commitment to nonproliferation and nuclear threat reduction through leadership by example. Over the past twelve months, the Department counts many successes, most notably: the achievement of an indefinite extension of the Nuclear Nonproliferation Treaty; the removal of more than 20 bombs worth of weapons grade highly

enriched uranium from Kazakhstan - no longer available for illicit trafficking; dramatic Russian - American progress in improving nuclear materials protection, control and accounting at a rapidly increasing number of facilities that contain weapons-usable nuclear materials; and the adoption of a science-based stockpile stewardship and management program that allows the Department to cease all nuclear testing.

This report portrays the Department's activities for fiscal years 1995 and planned for 1996 across ten broad categories which crosscut all program areas of nonproliferation and nuclear threat reduction, as well as work we do for other government agencies. These Administration-wide initiatives most accurately characterize our post Cold War activities and provide a baseline from which future activities will be measured. As an added benefit, the inventory will provide a powerful management tool by which we can measure our effectiveness in meeting the Administration's goal of reducing the global nuclear danger.

We are at the crossroads of an unprecedented opportunity to direct the course of U.S. nonproliferation efforts into the next century and beyond, using the preeminent scientific and technological expertise of our National Laboratories. This report will assist the Department in critically assessing existing programs and activities to monitor and adjust our priorities for the future.

A handwritten signature in dark ink, reading "Hazel R. O'Leary". The signature is fluid and cursive, with the first name "Hazel" and last name "O'Leary" clearly distinguishable.

Hazel R. O'Leary
Secretary of Energy

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EXECUTIVE SUMMARY

REDUCING THE NUCLEAR DANGER

Inventory of Departmental Nonproliferation and Nuclear Threat Reduction Activities

The proliferation of weapons of mass destruction represents a major challenge to our national security. Reducing the nuclear danger is one of the primary goals of the United States national security strategy and it is a cornerstone of the Department's vision of the future.

To meet this challenge, our Nation draws upon the same foundation of scientific and technological skills that helped bring a successful end to the Cold War. The Department, drawing upon many of the Nation's best and most innovative scientists, provides essential support for the changing global political climate that has guided the Department's adaptation to the new era.

Reducing the global nuclear danger, responding with programs that build upon and enhance the strengths of the Department's complex and the National Laboratories, and emphasizing commitments to environment, safety, and health, are the essence of the Department's national security strategy.

The nuclear danger is now defined differently than it was just five years ago. Initiatives to prevent nuclear weapons proliferation, improve nuclear reactor safety, safeguard and dispose of nuclear materials and maintain confidence in our nuclear weapons deterrent without nuclear testing have surged to the forefront.

Proliferation Challenges in the 1990s

Significant nuclear proliferation challenges face the United States in the 1990s. The breakup of the former Soviet Union (FSU) has presented the dilemma of how to deal with the legacy of enormous amounts of nuclear weapons-usable material resulting from the Cold War buildup. Under "Project Sapphire," for example, the U.S. purchased 581 kilograms of weapons-grade highly enriched uranium (HEU) suitable for use as reactor fuel. The then "secret" operation included an eight week repackaging operation performed by Department of Energy experts in Kazakhstan to prepare the uranium for international shipment and storage. The HEU was shipped to Oak Ridge National Laboratory where it was held in storage until July, 1995, when the Department began shipping it to a commercial

vendor where it will be put under International Atomic Energy Agency (IAEA) safeguards, prior to being downblended for use as power reactor fuel.

In addition, transformation of U.S.-Soviet nuclear competition has weakened traditional spheres of influence and can lead some nations to seek security through nuclear weapons while others renounce them.

The full array of our prevention efforts presented in this report helps buy time for political and diplomatic solutions to be effective. Emerging regional challenges pose an increasingly serious threat to international stability and security. Asia is a major problem area highlighted by U.S. concerns over the nuclear programs of North Korea, China, India and Pakistan. The Middle East and Africa continue to cause concern, although the elimination of South Africa's nuclear weapons program was a major success story.

The continuing explosion of technology also increases the nuclear danger. Despite our best efforts, export controls can only slow the spread of technology useful in nuclear weapons programs. Scientific knowledge cannot be contained and even if controlled can be replicated in other countries. Lessons learned in the Gulf War have illustrated that clandestine nuclear programs can be well hidden, as in Iraq. Better international efforts are essential to monitor peaceful nuclear programs. The IAEA, with U.S. assistance, is taking steps to improve its monitoring capability.

Existing Nonproliferation Regimes

The Administration's priority commitment to obtain the indefinite extension of the Nuclear Non-Proliferation Treaty (NPT) has been fully achieved. DOE was a major player in these successful efforts which resulted in an international consensus to indefinitely extend the treaty. Future Departmental efforts will continue to focus on nuclear cooperation and technical assistance, as well as safeguards. The NPT remains the cornerstone of the nuclear nonproliferation regime. It forbids nations to develop nuclear weapons and in return provides for assistance in the peaceful uses of nuclear energy. The IAEA monitors compliance of nations that have signed the NPT and provides technical assistance on peaceful uses of nuclear energy.

Export controls, an important component of the non-proliferation regime, are designed to keep nuclear weapons-usable technologies, equipment and materials out of the hands of other potential proliferant nations. The Department, through

the interagency process, has endeavored to enhance the ability of the U.S. system of nuclear export controls to be more responsive and efficient while seeking to prevent exports that would be detrimental to U.S. nonproliferation objectives. The Department has actively provided leadership in multilateral supplier regimes to increase their effectiveness and to achieve wider participation. Examples include the Nuclear Suppliers Group (NSG) and the NPT Exporters Committee.

The purpose of various regional initiatives is to increase greater awareness of nonproliferation principles and objectives while working to diminish real or perceived regional security threats in order to decrease the desire for nuclear weapons. Examples include the proposals to end the production of fissile materials for weapons purposes and the Latin America Nuclear Free Zone. Similar nuclear free zones are under discussion for the Middle East and Africa.

Finally, complementary agreements concerning other weapons of mass destruction including missiles, chemical and biological weapons, are important to the nuclear nonproliferation regime, although not aimed directly at the nuclear danger. Examples include the Missile Technology Control Regime, the Chemical Weapons Convention (not yet ratified) and the Biological Weapons Convention.

The national security of our Nation cannot afford false economy at this critical juncture. Change for the sake of change is neither in the public interest nor in the long- or short-term interest of our national security.

President Clinton has made nuclear nonproliferation a top U.S. security priority. The President's July 1994 National Security Strategy calls for

"developing integrated approaches for dealing with threats arising from the development of nuclear and other weapons of mass destruction by other nations..."

As a direct result of President Clinton's nuclear nonproliferation strategy, the Department identified the following programmatic priorities for nonproliferation and arms control: Secure Former Soviet Union Nuclear Materials and Expertise, Limit Weapons-Usable Fissile Materials, Establish Transparent and Irreversible Nuclear Reductions, Strengthen the Nuclear Nonproliferation Regime and Control Nuclear Exports.

We have inventoried the Department's activities in these critical areas. To address closely related nuclear threat reduction programs of the Department, we have included the following categories: Nonproliferation Verification Research and Development, Intelligence/Law Enforcement Support,

Nuclear Safety and Emergency Response, Departmental Safeguards and Security Activities/Requirements, and Stockpile Stewardship.

These broad headings, and the examples of activities that fall under them, help capture and organize the full range of the Department's activities in nonproliferation and nuclear threat reduction. **Reducing the Nuclear Danger -- An Overview of U.S. Department of Energy Activities** (Chart A) appears on the next page.

Reducing the Nuclear Danger An Overview of U.S. Department of Energy Activities

- | | |
|--|---|
| <p>I. Secure Nuclear Materials and Expertise in the Former Soviet Union</p> <ul style="list-style-type: none"> • Implement effective Material Protection Control and Accounting (MPC&A) in Russia and other newly independent states • Prevent "brain drain" from the FSU • Prevent nuclear smuggling • Increase Industrial Partnering Programs <p>II. Limit Weapons-Usable Fissile Materials</p> <ul style="list-style-type: none"> • Shut down production reactors • Negotiate a plutonium fissile material cut-off convention • Eliminate the civil use of HEU (includes RERTR) • Reduce stockpiles of civil HEU and plutonium • Promote alternatives to the civil use of plutonium • Initiate regional fissile material control activities • Storage and disposition of weapons-usable materials <p>III. Establish Transparent and Irreversible Nuclear Reductions</p> <ul style="list-style-type: none"> • Achieve agreement for exchange of classified information with Russia • Exchange and confirm data on inventories • Confirm dismantlement of excess weapons • Purchase 500 tonnes of HEU from dismantled warheads • Expand weapons reductions <p>IV. Strengthen the Nuclear Nonproliferation Regime</p> <ul style="list-style-type: none"> • Promote adherence to the Nuclear NPT • Negotiate a Comprehensive Nuclear Test Ban Treaty (CTBT) • Facilitate IAEA inspections of excess fissile materials • Promote regional safeguards and nonproliferation measures • Increase effectiveness and efficiency of the IAEA • Negotiate bilateral Agreements • Counter Proliferation <p>V. Control Nuclear Exports</p> <ul style="list-style-type: none"> • Assist FSU states in effectively controlling exports • Reform statutory licensing requirements • Strengthen multilateral supplier initiatives • Promote expanded information sharing and analysis | <p>VI. Nonproliferation Verification R&D</p> <ul style="list-style-type: none"> • Design and fabricate remote sensing systems for worldwide treaty monitoring and verification • Develop technologies for detecting proliferant activities • Conduct research to improve capability to monitor/verify current and future treaties • Develop and demonstrate technologies to control special nuclear materials • Maintain technology base to ensure future nonproliferation system capabilities <p>VII. Intelligence/Law Enforcement Support</p> <ul style="list-style-type: none"> • Conduct intelligence analysis of foreign nuclear programs • Conduct nuclear proliferation assessments • Develop and apply proliferation detection technology • Conduct threat assessment/data sample analysis • Oversee the Department's Communicated Nuclear Threat Program • Provide nuclear support to the law enforcement community • Monitor transparency of nuclear treaties • Provide support to international nuclear organizations <p>VIII. Nuclear Safety, Accident Prevention and Emergency Response</p> <ul style="list-style-type: none"> • Strengthen nuclear safety • Promote emergency planning/preparedness/response • Maintain radiological emergency response assets • Maintain on-scene technical/analytical expertise • Provide support to other government agencies <p>IX. DOE Safeguards and Security Activities/Requirements</p> <ul style="list-style-type: none"> • Develop MPC&A policy/R&D complex-wide • Support for declassification and new openness initiatives • Conduct standards development and technical analysis • Design basic threat policy • Develop and assure international comparability for measurements of nuclear materials <p>X. Stockpile Stewardship and Management</p> <ul style="list-style-type: none"> • Maintain stockpile confidence • Conduct no nuclear testing • Dismantle weapons • Provide research and technology base |
|--|---|

Category Descriptions

Category I - Secure Nuclear Materials and Expertise in the Former Soviet Union. Among the Department's and U.S. Government's top priorities are efforts to secure nuclear materials and expertise in the FSU. Activities included in this category are cooperation with FSU nations on protection,

The essential limiting factor in the ability to manufacture a nuclear weapon is fissile material. The breakup and breakdown of the governmental and security structure in the Former Soviet Union has increased the likelihood that weapons-usable fissile materials or nuclear weapons scientists could migrate to nations desiring nuclear weapons.

control and accounting of weapons-usable nuclear material. Activities to prevent nuclear smuggling, prevent "brain drain" and increase industrial partnering programs are also consolidated here.

Category II - Limit Weapons-Usable Fissile Materials. The cessation of the use of weapons grade plutonium from production reactors, elimination of the civil use of HEU and promotion of alternatives to the civil use of plutonium, reduction of stockpiles of HEU and plutonium, and efforts to initiate regional fissile material

Ending the production and limiting the stockpiling and use of fissile materials decreases the chances and opportunities for diversion and use for non-peaceful purposes.

control activities and disposition of weapons-usable materials are included under this broader category.

Category III - Establish Transparent and Irreversible Nuclear Reductions. President Clinton has pursued initiatives in the nuclear arms reduction arena that expand previous goals of simply reducing numbers of weapons to ensuring that warheads subject to the START I and II agreements are dismantled and that fissile materials no longer required for nuclear weapons purposes are not reused in new nuclear weapons. Activities incorporated in this category include efforts to expand negotiated weapons reductions and to implement the purchase of 500 tonnes of HEU from dismantled Russian warheads, together with activities that support the Secretary's Openness Initiative,

Transparency--the need for nations to confirm dismantlement and non-reuse of warheads and materials. Irreversibility--means of ensuring that materials declared excess to security needs are not reused in nuclear weapons.

such as progress toward an agreement for the exchange of classified information with Russia and cooperation to exchange and confirm data on nuclear-related inventories.

Category IV - Strengthen the Nuclear Nonproliferation

Regime. This category combines those activities that relate to treaties and agreements, such as compliance with the NPT,

The Nuclear Non-Proliferation Treaty was indefinitely extended this year. It can now serve as the foundation for future efforts to strengthen barriers to proliferation.

negotiations for the Comprehensive Nuclear Test Ban Treaty (CTBT), support for IAEA inspections and

effectiveness, and the promotion of regional safeguards and nonproliferation measures. Support by the National Laboratories for counterproliferation measures are also included in this category.

Category V - Control Nuclear Exports.

Programs to control nuclear exports, including assistance to states of the FSU, reform of

Access to specialized technologies, equipment and materials are the building blocks of a nuclear weapons program. Controlling access to these is the first line of defense in preventing the development of a nuclear weapons infrastructure.

statutory licensing requirements, strengthening of multilateral supplier initiatives and the promotion of expanded information sharing and analysis are considered here as a single category.

Category VI - Nonproliferation Verification R&D.

A wide range of programs in research and development directly support U.S. Government efforts to meet nonproliferation and nuclear security objectives. Included under this category are programs to design and fabricate for the actual deployment of sensor systems needed for treaty verification, proliferation detection, warhead dismantlement (including transparency) and material protection control and accounting (MPC&A).

Category VII - Intelligence/Law Enforcement Support.

This category is one of the broadest. Most of these efforts are further divided into activities that support nuclear nonproliferation analysis and detection, and provide threat assessment, including the technical support to law enforcement agencies on nuclear smuggling, such as the Black Market/Illicit Trafficking Assessment Program

Category VIII - Nuclear Safety, Accident Prevention and Emergency Response.

This category includes activities reported by the National Laboratories as well as from throughout the Department, including the Offices of Nuclear Energy, Science and Technology; Civilian Radioactive Waste Management; Defense Programs and the Office of Nonproliferation and National Security. These programs provide safe and workable technology for radioactive waste management and disposal, and all aspects of emergency preparedness, including radiological and nonradiological

assessment, operations, on-scene technical/analytical expertise, technical support/assistance to other government agencies and technology development.



Entry Control - Kurchatov Institute

Category IX - DOE Safeguards and Security Activities / Requirements.

This category crosscuts all DOE and laboratory facilities. These activities ensure the protection of DOE nuclear weapons, nuclear materials, classified information and facilities against theft, sabotage, espionage and terrorist activity; identify classified and unclassified sensitive information critical to the national security and declassify all other information; and clear appropriate personnel for access to classified or special nuclear material.

Category X - Stockpile Stewardship and Management.

President Clinton's commitment to maintain confidence in the U.S. nuclear stockpile while continuing the moratorium on nuclear testing is reflected in the Administration's stockpile stewardship and stockpile management program. Activities in this area have a nonproliferation nexus, including arms control, the dismantlement of nuclear weapons and the storage and disposition of excess nuclear components and materials.

The Department of Energy Strategic Plan, (April 1994) recognized the need for an approach to "most effectively utilize and integrate" the Department's unique assets to achieve national goals. National Security activities support reducing the global nuclear danger.

In general terms this involves:

- detecting and preventing proliferation of nuclear weapons, materials and technologies;
- verifying and sustaining deterrence of nuclear weapons against the United States or its allies;
- improving safety or reducing danger posed by unsafe or unsecured weapons, processes, materials or facilities;
- ensuring safe and secure dismantlement, transparency;
- providing excess materials storage and disposition; and
- ensuring nuclear incident avoidance and response.

In this period of change, we seek to adapt, integrate and apply our unique assets to emerging security challenges and so contribute to the overall coordination and direction of nuclear nonproliferation and related nuclear threat reduction activities.

In the graphical representation of the results of this inventory, we refer to the National Laboratories and DOE Program Offices by the following acronyms:

DOE Laboratories

ANL *Argonne National Laboratory, Idaho & Illinois*
BNL *Brookhaven National Laboratory, New York*
EML *Environmental Measurements Laboratory, New York*
INEL *Idaho National Engineering Laboratory, Idaho*
LANL *Los Alamos National Laboratory, New Mexico*
LBL *Lawrence Berkeley Laboratory, California*
LLNL *Lawrence Livermore National Laboratory, California*
NBL *New Brunswick Laboratory, Illinois*
ORNL *Oak Ridge National Laboratory, Tennessee*
PNL *Pacific Northwest Laboratory, Washington*
RSL *Remote Sensing Laboratory, Nevada*
SNL *Sandia National Laboratory, New Mexico & California*
SRS *Savannah River Site, South Carolina*
STL *Special Technologies Laboratory, California*

DOE Program Offices

DP *Defense Programs*
EH *Environmental, Safety and Health*
EM *Environmental Management*
ER *Energy Research*
MD *Fissile Materials Disposition*
NE *Nuclear Energy, Science and Technology*
NN *Nonproliferation and National Security*
PO *Policy*
RW *Civilian Radioactive Waste Management*

Varied Roles of the Laboratories

Nonproliferation and nuclear threat reduction activities at the DOE National Laboratories cover the spectrum from nonproliferation to nuclear accident prevention and response. The Laboratories work independently and in collaboration on these critical national security issues. Chart B, the **Snapshot by Laboratory** illustrates that reducing the nuclear danger is accomplished through a network of activities at all of the Laboratories.

Reducing the Nuclear Danger Snapshot by Laboratory - FY 95														
Category	ANL	BNL	EMIL	INEL	LBL	LLNL	LANL	NBL	ORNL	ENL	RSL	SNL	SRS	STL
I.	•	•		•	•	•	•	•	•	•		•		
II.	•	•		•		•	•	•	•	•		•	•	
III.		•				•	•		•	•		•		
IV.	•	•				•	•	•	•	•		•	•	
V.	•					•	•		•	•		•		
VI.	•	•	•	•	•	•	•		•	•	•	•	•	•
VII.				•		•	•		•	•	•	•	•	•
VIII.	•	•		•		•	•		•	•		•		•
IX.		•				•	•	•		•		•		
X.		•				•	•		•			•		

Chart B

Examples of successful collaboration include:

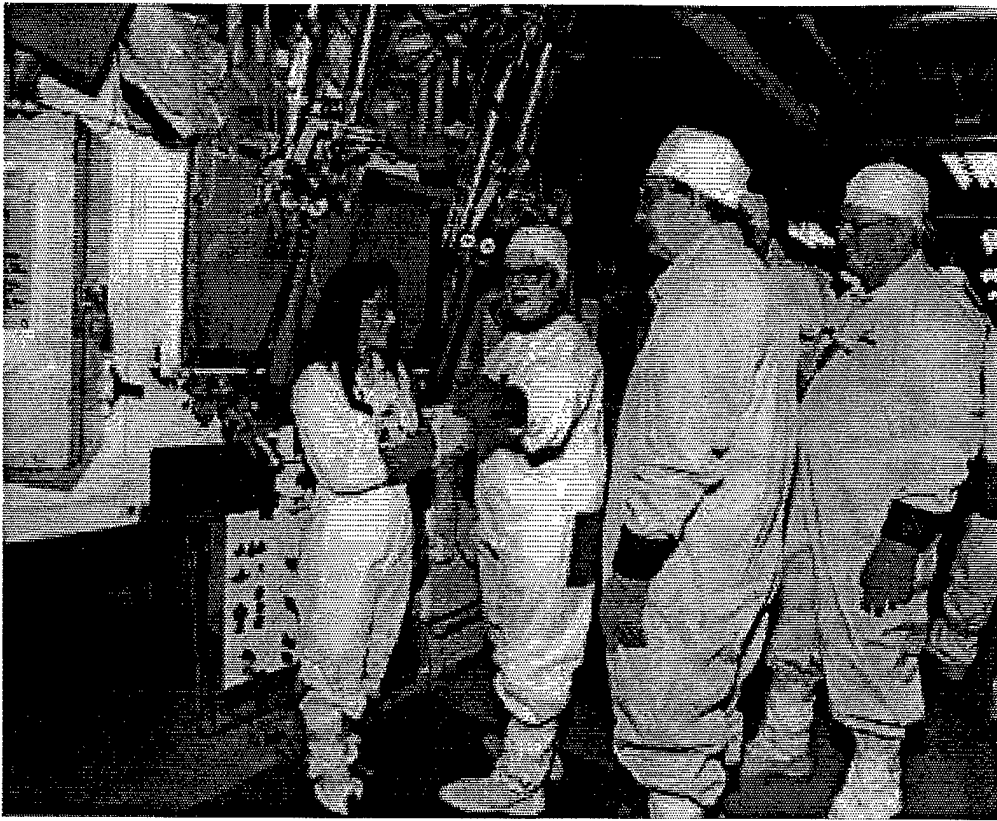
- Los Alamos is leading a team of six DOE labs in a major program to improve the protection, control and accounting of nuclear materials in Russia through a program of cooperation between the DOE labs and counterpart Russian labs. The goal is the rapid transfer of technology and knowledge gained in the United States for the protection of nuclear materials against

a wide range of threats, including insiders and armed terrorist groups, in a manner that encourages indigenous Russian efforts.

- Pacific Northwest Laboratories (PNL) chaired a multi-laboratory effort to support the development of safeguards information management systems, including the primary system used by the IAEA Iraq Action Team, to analyze the vast and diverse data being collected since the imposition of U.N. Security Council Resolutions on Iraq.

Many success stories reflect the complexity of the assets and capabilities at the National Laboratories. Several examples of the diverse range of projects include:

- Argonne National Laboratory (ANL) is the lead National Laboratory for developing the accident sequences, associated frequencies, and chemical and radiological accident source terms for the treatment, storage and disposal facilities included in the DOE Draft Waste Management Programmatic Environmental Impact Statement.
- As the U.S. Government's Nuclear Materials Standards Laboratory, the New Brunswick Laboratory participates in the Argentine/Brazil nuclear material certification program, an interlaboratory comparison program designed to qualify Argentine/Brazil laboratories, and supports U.S. laboratory cooperation to develop quality assurance/control programs for Argentine and Brazilian labs and so support the continued nuclear cooperation of these countries.
- Lawrence Berkeley Laboratory conducts precision analyses, including detection of proliferation-related products to extraordinarily low levels using the Advanced Light Source.
- Lawrence Livermore, Los Alamos and Sandia National Laboratories play key roles in the science-based Stockpile Stewardship Program to provide the scientific and engineering capabilities required to retain adequate confidence in the stockpile without nuclear testing.
- The Special Technologies Laboratory is developing a field portable radar instrument for use by IAEA inspectors to verify that nuclear storage canisters are physically constructed as designed.



Conference on Disarmament - Ambassadors tour the Hanford Site (October 1994) - Pacific Northwest

- Ensuring effective international nuclear safeguards has been a key activity supported by Oak Ridge, with special emphasis on uranium and other isotope separation facilities in safeguarded States. Oak Ridge, responding to Presidential policy, implemented the first international inspection at a U.S. weapons facility to encourage other weapons states to declare as excess significant quantities of nuclear weapons materials and to undertake a commitment not to use these materials for weapons.
- The largest single project in the nonproliferation area at Brookhaven National Laboratory (BNL) is the development of a standoff Raman Light Intensity Distance and Ranging (LIDAR) system, including a laboratory system to obtain the Raman spectra of proliferation-related effluents and a mobile system to remotely detect and identify effluents or environmental releases from suspect sites.
- The Department, through the National Laboratories, manages the Nuclear Emergency Search Team (NEST), a worldwide capability to respond to various types of nuclear incidents, including malevolent threats involving nuclear materials.

-
- Sandia's Cooperative Monitoring Center supports the reduction of the nuclear threat by fostering cooperative technology informational exchanges between countries in areas such as the Middle East, South Asia and the North Pacific and reinforce the efforts of those nations that have voluntarily elected to relinquish the nuclear option.
 - In the area of Nuclear Safety / Accident Prevention, PNL supports the "Accident Investigation" project for DOE through the review of the Operating Contractors' safety reports, trend determination, root causes of incidents and recommendations for improvement. For serious accidents, PNL conducts on-site investigations to identify and document the cause and disseminate the lessons learned to avoid future similar incidents.
 - Lawrence Livermore National Laboratory operates the Atmospheric Release Advisory Capability (ARAC), which provides a real-time, worldwide predictive capability to many DOE and military facilities on the transport and impact of hazardous materials released into the atmosphere.
 - ANL participates in the International Nuclear Safety Program to improve safety of operating Soviet-designed nuclear power plants in the former Soviet Union and Central and Eastern Europe and to improve the safety infrastructure in these countries.
 - ANL supports the Department's Reduced Enrichment for Research and Test Reactor (RERTR) Program by providing the technical means to reduce the uranium enrichment of research and test reactor fuels and irradiation targets to significantly less than the 90-93 percent enrichment currently used, and thereby, reduces the nuclear weapons proliferation potential of such fuels and targets, most of which are overseas.

Accomplishments

The Department, drawing upon and coordinating the types of interdependent expertise characterized immediately above, has made significant accomplishments in all of the category areas; some of the most recent include:

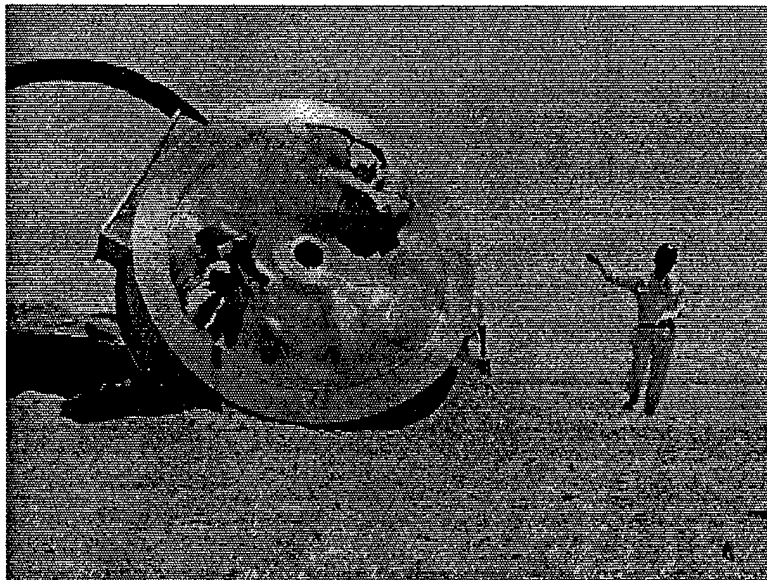
- Agreements for cooperative programs to improve the protection, control and accounting of Russian nuclear materials.



Loading Kazakhstan materials onto U.S. Air Force Cargo aircraft - Project Sapphire

- Removal of approximately 600 kilograms of weapons grade HEU from Kazakhstan for safe, secure storage at the Y-12 Plant in Oak Ridge, TN. Subsequent efforts have resulted in commercial contracts for the blending down of HEU to low enriched uranium (LEU) for peaceful use as commercial reactor fuel.
- Management of the Presidentially-directed Research and Development program dedicated to meeting the monitoring requirements of a CTBT by seismic, hydroacoustic and satellite instrumentation capabilities.
- Initiation of Project CALIOPE, which is intended to provide a capability for the remote detection of chemical effluents associated with the production of nuclear weapons.
- Extension of the Nuclear Testing Moratorium.
- Submission of excess U.S. plutonium and HEU to IAEA safeguards.
- Agreement providing for the shutdown of Russian plutonium production reactors at Tomsk and Krasnoyarsk.

-
- Stockpile Stewardship without testing.
 - Dismantlement of 1,420 nuclear weapons.
 - The objective of the Newly Independent States Industrial Partnering Program (NIS-IPP) is to redirect the expertise of scientists and engineers of the FSU from weapons-related activities to nonmilitary applications of commercial value and of mutual benefit to the United States and the Newly Independent States of the FSU. More than 170 projects approved by the DOE in consultation with the Department of State are in the process of being implemented. These projects provide support for over 1,900 scientists and engineers at 60 institutes in Russia, Ukraine, Kazakhstan and Belarus.
 - The United States and Russia have agreed to pursue a joint RERTR Program designed to convert Soviet designed research and test reactors from HEU fuel to LEU fuel.
 - The Department has established a comprehensive program with the countries of the FSU to improve the safety of Soviet-designed nuclear power plants by strengthening the operation and upgrading the physical condition of plants, promoting a safety culture, and facilitating development of a safety infrastructure in countries operating Soviet-designed reactors and assisting in the shutdown of the Chernobyl reactors and the provision of replacement power.



DOE personnel inspecting destroyed uranium enrichment equipment used in Iraq's nuclear weapons program.

- Inspections in Iraq.
- Numerous visits of U.S. experts to Pyongyang have occurred under the Democratic Peoples Republic of Korea (DPRK) Agreed Framework of October 12, 1994. The Department is stabilizing the fuel basin and will can the 8,000 fuel rods to aid in their inspection and ultimate transport out of North Korea. This will avoid reprocessing of the rods by North Korea that would result in production of weapons grade plutonium.

-
- Improved physical security, implemented a material accounting system for two critical assemblies and demonstrated remote monitoring (a promising technique that allows continuous monitoring at low cost) at the Kurchatov Institute in Moscow - the first improvements at a Russian facility attributable to U.S. assistance.
 - Access to and coordination with other sites is expanding at a rapid pace.

Future Challenges

By maintaining priority objectives focused on assisting in the implementation of Presidentially directed initiatives and agreements on arms control, nonproliferation and related nuclear threat reduction issues, the Department underscores the President's commitment of the United States to reduce the nuclear threat. DOE will continue to employ all means at its disposal, including the unparalleled talents of our National Laboratories to advance these objectives.

The continued maintenance of a safe and reliable U.S. nuclear deterrent remains a cornerstone of U.S. national security policy because of the ever-present ominous global nuclear threat. Thus DOE's responsibilities for ensuring the safety, security and reliability of the U.S. nuclear weapons stockpile will also continue for the foreseeable future.

Meeting these stockpile stewardship and management responsibilities will be more challenging now than ever before, given the termination of new weapons development in 1992, the closure of production facilities and the moratorium on nuclear testing in connection with ongoing negotiations for a Comprehensive Test Ban Treaty. Accordingly, the Department, in concert with relevant federal agencies has developed new programs to ensure confidence in the U.S. stockpile. This approach relies on scientific understanding and expert judgment, *not* on nuclear testing and the development of new weapons, to predict, identify and correct any problems affecting the safety and reliability of the stockpile while sustaining essential, vital scientific expertise. Looking to the longer term, such an approach is essential to maintain the safety and reliability of a stockpile of decreasing size in a manner consistent with our national security interests upheld through U.S. nonproliferation policies.

Funding Profiles

The Department has undertaken a systematic effort to catalog at the project level all activities across the laboratory complex in the area of nonproliferation and nuclear threat reduction. Program Offices, Operations Offices and National Laboratories were queried for activities funded during FY 95 and planned for FY 96 in the categories shown on page 5.

Funding profiles by category for FY 95 and FY 96 are shown on Chart C (page 18). The integration of the Department's National Laboratory network is evident in the representation of the "Top 6 Players." (Individual Laboratory profiles appear following the Executive Summary.)

Reducing the Nuclear Danger

DOE Laboratory Funding Profile

Categories	FY 95 \$ Mil	FY 96* \$ Mil	Chg. %	Top 6 Labs for FY 95
I. Secure Nuclear Material & Expertise in the Former Soviet Union	41.6	67.0	61	SNL, LANL, LLNL, ANL, ORNL, BNL
II. Limit Weapons-Usable Fissile Material	114.7	115.3	1	ANL, LLNL, ORNL, SNL, LANL, PNL
III. Establish Transparent and Irreversible Nuclear Reductions	33.7	35.3	5	ORNL, LANL, SNL, LLNL, PNL, BNL
IV. Strengthen the Nuclear Nonproliferation Regime	15.7	16.9	8	PNL, SNL, LANL, LLNL, ORNL, SRS
V. Control Nuclear Exports	13.4	13.2	-1	LANL, ORNL, LLNL, ANL, PNL, SNL
VI. Nonproliferation Verification R&D	182.4	181.7	<1	SNL, LANL, LLNL, PNL, ORNL, INEL
VII. Intelligence/Law Enforcement Support	19.1	16.3	-15	LLNL, PNL, RSL, LANL, SNL, ORNL
VIII. Nuclear Safety, Accident Prevention and Emergency Response	42.6	140.3	229	LLNL, LANL, PNL, ANL, SNL, ORNL
IX. DOE Safeguards and Security Activities/Requirements	33.1	32.0	-3	LLNL, SNL, LANL, NBL, PNL, BNL
X. Stockpile Stewardship and Management	1213.0	1291.1	6	SNL, LLNL, LANL, ORNL, BNL, INEL
TOTALS	1709.2	1909.3	12	* Estimated

U.S. Department of Energy

Excludes Work for Others

Chart C

An inventory was conducted of (1) all National Laboratory nonproliferation and related nuclear threat reduction activities, (2) those activities conducted by other prime (non-laboratory) contractors funded by the Department and (3) Work for Others performed by the National Laboratories.

The information in this report is based on over 800 individual project detail sheets obtained as a result of this inventory for nonproliferation and related nuclear threat reduction activities. These project detail sheets provide the Project Name, a brief Project Description, Project Period (actual initiation and estimated completion dates), Laboratory/Contractor Project Manager, Headquarters Project Manager, Inventory Activity Category (I-X), Funding Profiles for FY 95 and estimated for FY 96, and Accomplishments to Date. (Examples of three actual Project Detail Sheets are shown on the next page.)

Oak Ridge National Laboratory

Project Name: Nonproliferation Policy Technical Support

Project description: Project provides for expert technical support to NN-42 in Oak Ridge core technologies (enrichment, reprocessing, reactor design, nuclear weapon fabrication) for regional, bilateral and multilateral nonproliferation policy initiatives.

Accomplishments:

- Supported North Korean safeguards compliance issues and policy initiatives
- Provided technical briefings/assistance to IAEA on North Korean program monitoring and safeguards implementation
- Supported India/Pakistan regional policy initiatives

National Lab

Pacific Northwest Laboratories

Project Name: Excess Fissile Material Offer

Project description: Manage, coordinate and provide technical support to the offer of excess fissile materials at Hanford for placement under IAEA safeguards. Additionally, develop tutorials on the IAEA Safeguards Offer and Lessons Learned at Hanford to brief various audiences at different locations.

Los Alamos National Laboratory

Project Name: US/Russian Laboratory-to-Laboratory Program for Nuclear Material Protection, Control & Accounting

Project description: The project works to strengthen nuclear material MPC&A within Russia through technical collaboration with Russian institutes and implementation of safeguards technology at Russian nuclear facilities. Funding is provided to support Russian and U.S. MPC&A experts, and to provide U.S. equipment to Russian facilities.

Accomplishments:

- Initiated collaborative tasks at seven Russian facilities
- Implemented computerized material accounting system for two critical assemblies at the Kurchatov Institute in Moscow
- Established a safeguards technology test bed facility at Arzamas-16 which is being used to demonstrate thirty-nine equipment systems to Russian facility operators within the framework of an integrated MPC&A system

National Lab

Other prime (non-laboratory) contracts also support the ten categories (Chart D). An example of an actual "other prime contract" is also shown.

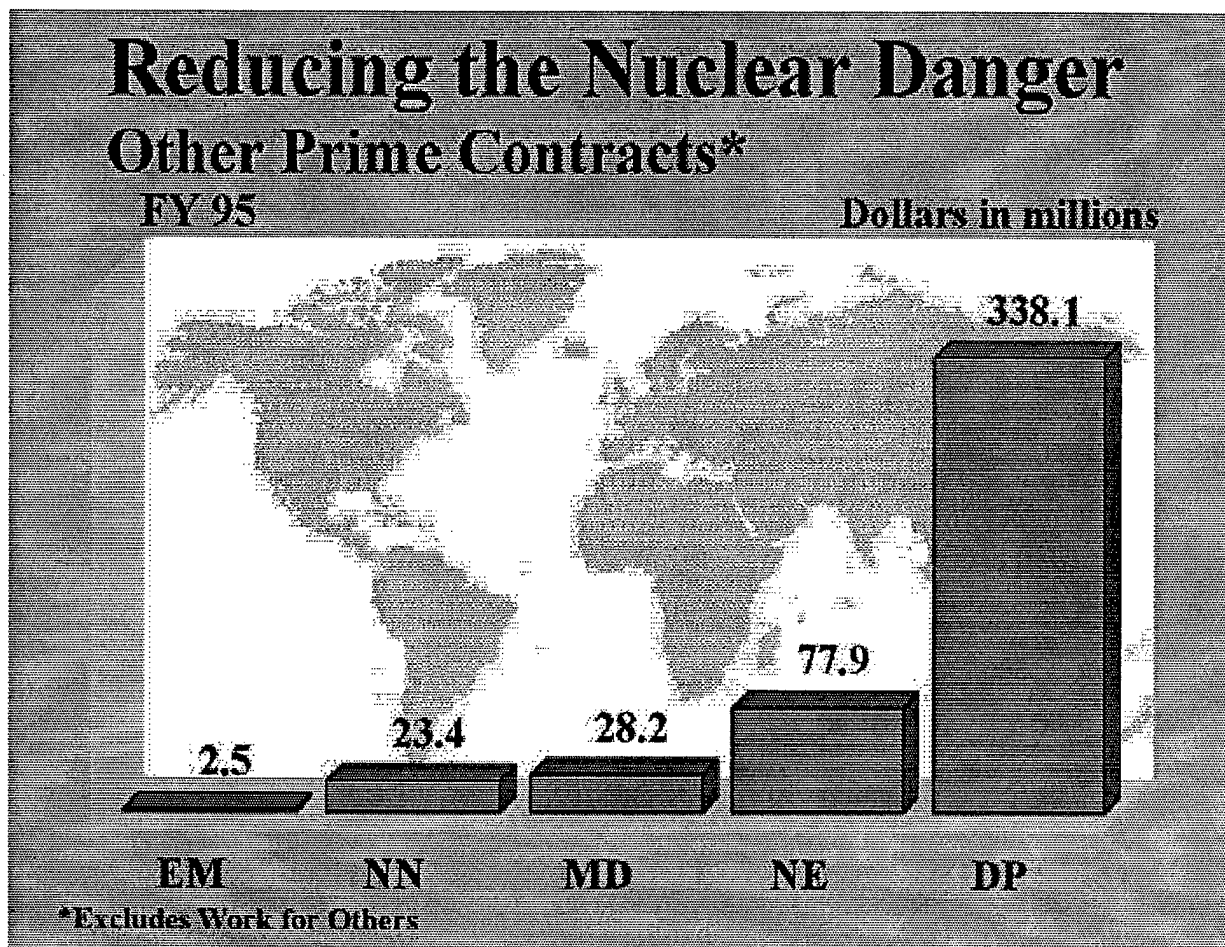


Chart D

Oakland Operations Office	
Project Name: Nyongbyon, North Korea, Spent Fuel Basin, Water Treatment and Related Services	
Project Description: Provide a water treatment instrumentation package for the stabilization of the spent fuel basin in order to support the safe storage and disposition (canning) of spent fuel.	
Prime Contractor: CENTEC	
Accomplishments: <ul style="list-style-type: none"> • Characterization of Spent Fuel Basin water • Preliminary design of Water Treatment System • Video inspection of Spent Fuel and Storage Baskets 	
Prime	

Program Drivers

Program requirements for DOE nonproliferation and nuclear threat reduction projects are driven by:

- 1. Statutory Requirements**
- 2. Presidential mandates; Presidential Decision Directives (PDDs), Office of Management and Budget (OMB) Requirements, National Security Decision Directives (NSDDs), Executive Orders (EOs)**
- 3. International Treaties and Agreements; Government-to-Government binding obligations**
- 4. Requests from Congress: Conference Reports; other legislative history**

All of the activities described are driven by programmatic requirements. The Department has been directed to spend these funds for nonproliferation and related nuclear threat reduction activities. Therefore, no savings to Congress would accrue if these functions were transferred to other agencies.

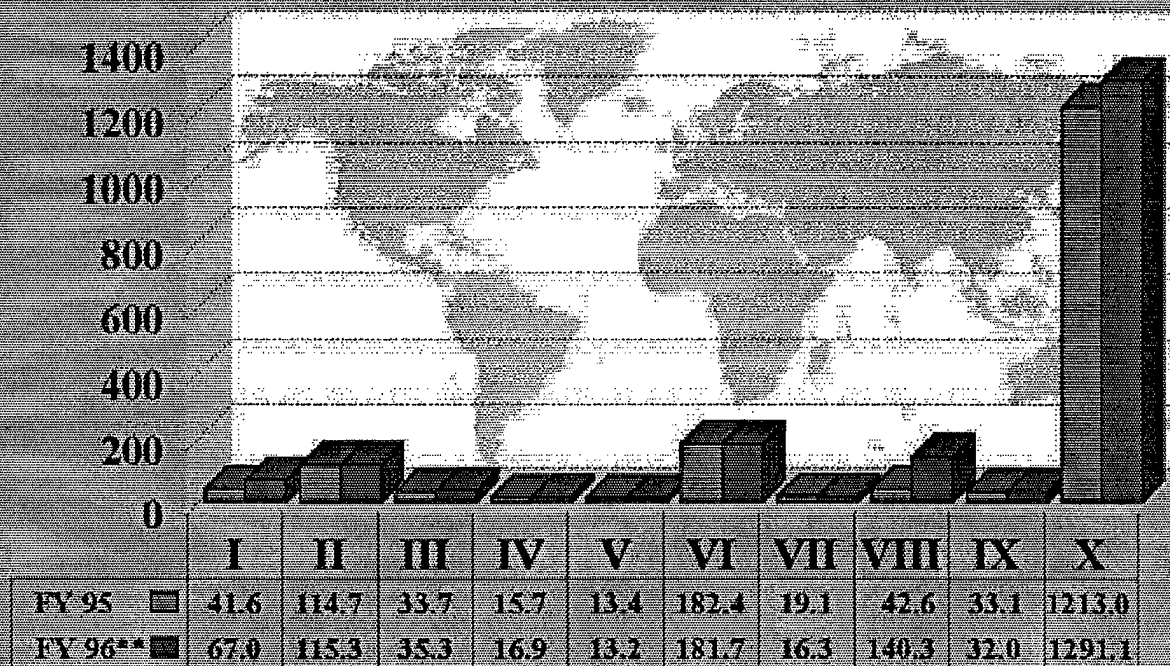
The following are examples of mandatory requirements:

- Government-to-Government activities are mandated by Cooperative Threat Reduction (CTR) authorization and appropriation bills that require certain activities to be conducted in the FSU.**
- Creation within the Department of an Office of Fissile Materials Disposition, mandated by the National Defense Authorization Act for Fiscal Year 1995 (P.L. 103-335), amending the DOE Organization Act. The Office directs the Department's technical and management efforts aimed at providing for the safe, secure, environmentally sound long-term storage of all weapons-usable fissile materials and the disposition of weapons-usable fissile materials declared surplus to our national defense needs.**

Reducing the Nuclear Danger

Total Expenditures by Category*

Dollars in millions



*Excludes Work for Others

**Estimated

Chart E

In addition to the activities directly funded by the Department, approximately \$232M in FY 95 monies was identified during this inventory as currently being appropriated by Congress to other agencies for work being performed by DOE Laboratories under the auspices of the Work for Others Program. (Chart F appears on the following page.) While many of these projects are classified, an unclassified example is also shown.

Reducing the Nuclear Danger Work for Others

FY 95

Dollars in millions

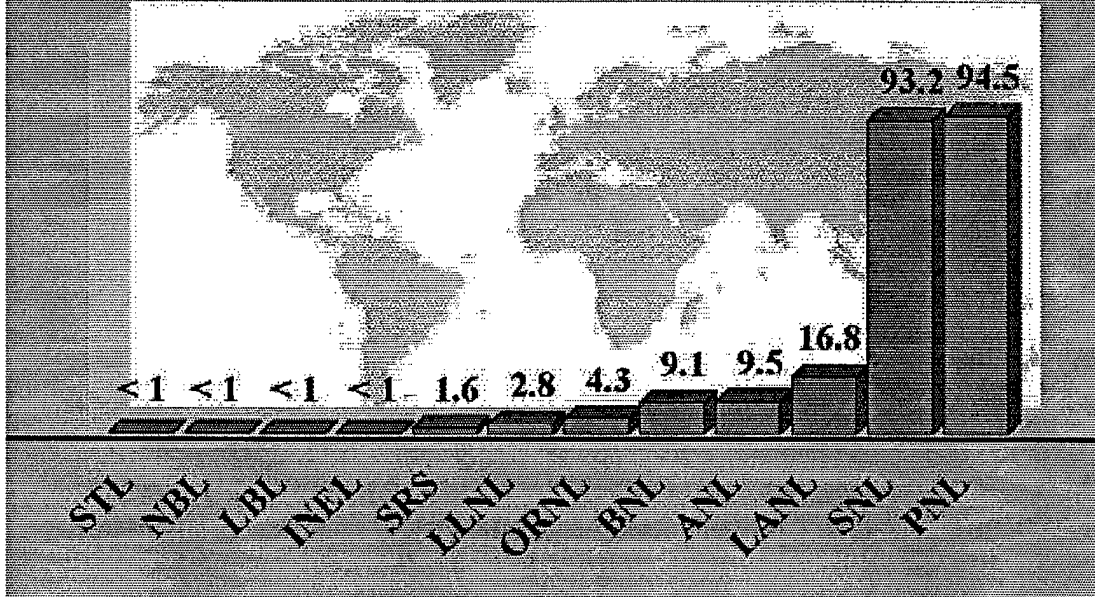


Chart F

Argonne National Laboratory

Project Name: Assessment of Entrepreneurial Workshops Aimed at Defense Conversion of MINATOM

Project Description: Assessment of arms control and nonproliferation effects of the entrepreneurial workshops conducted under the auspices of U.S. Arms Control and Disarmament Agency (ACDA) for the two Russian weapons laboratories, Arzamas-16 and Chelyabinsk-70. The intention is to utilize the results of the assessment for enhancing U.S. assistance to RF MINATOM defense conversion and nonproliferation activities.

Accomplishments:

Questionnaires for the U.S. and RF participants have been developed, interviews and analytical assessment of the results are being conducted.

National Lab

Summary

Today's partnership between DOE and its various National Laboratories reflects the unique relationship among government, academia and industry that had its genesis with the Manhattan Engineer District of the War Department and was expressly authorized by the Atomic Energy Act of 1946. These World War II-era arrangements with industrial and academic organizations for construction and operation of the manufacturing, research and community facilities for the atomic energy program were later transferred to the Atomic Energy Commission (AEC).

In response to Congressional and public concerns over the stewardship of the atomic energy programs, Congress passed the Atomic Energy Act of 1946 to address many of these military, political and administrative questions that were integral to the future of atomic energy at the end of World War II. The Act established the AEC and provided for the transfer of Government-owned atomic energy production and research facilities to this civilian agency.

The Commission was empowered to conduct research and development activities relating to nuclear energy, to distribute fissionable material, to distribute other radioactive (by-product) materials created while producing or using the fissionable material, and to continue the operation of the Government-owned communities at Oak Ridge, Los Alamos and Richland.

A philosophy of partnership for operation of the National Laboratories and other research centers among DOE predecessor agencies, industry and the academic community formed the cornerstone for the enduring successful relationship that exists today.

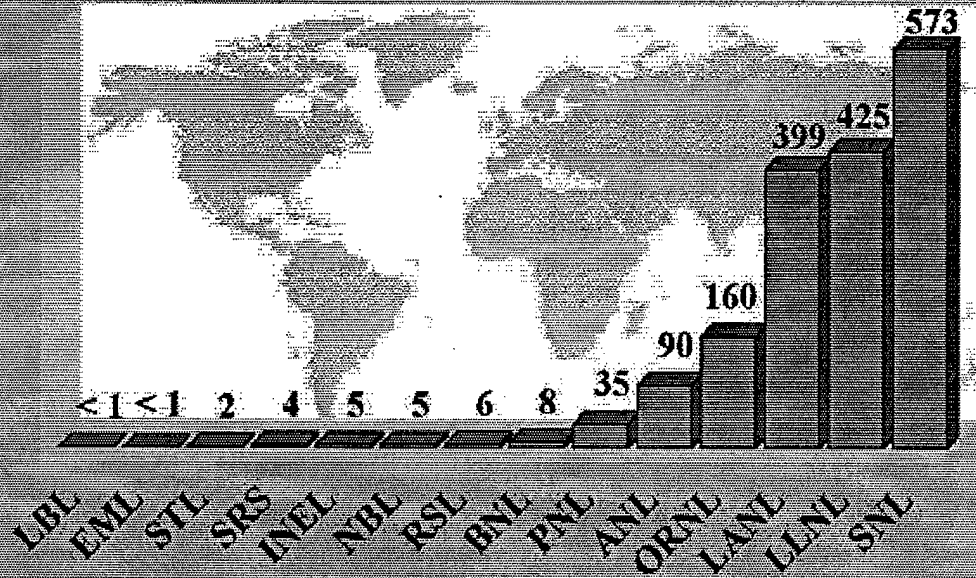
Priorities have changed, but the logic behind decisions to hold nuclear research under civilian control has stood the test of time. Sustaining the viability of laboratories -- based in no small part upon the premise of civilian stewardship -- is essential to maintaining the vitality of research and activity essential to the broad array of nuclear threat reduction missions captured in this report.

Reducing the Nuclear Danger

Total Laboratory Expenditures*

FY 95

Dollars in millions



*Rounded. Excludes Work for Others

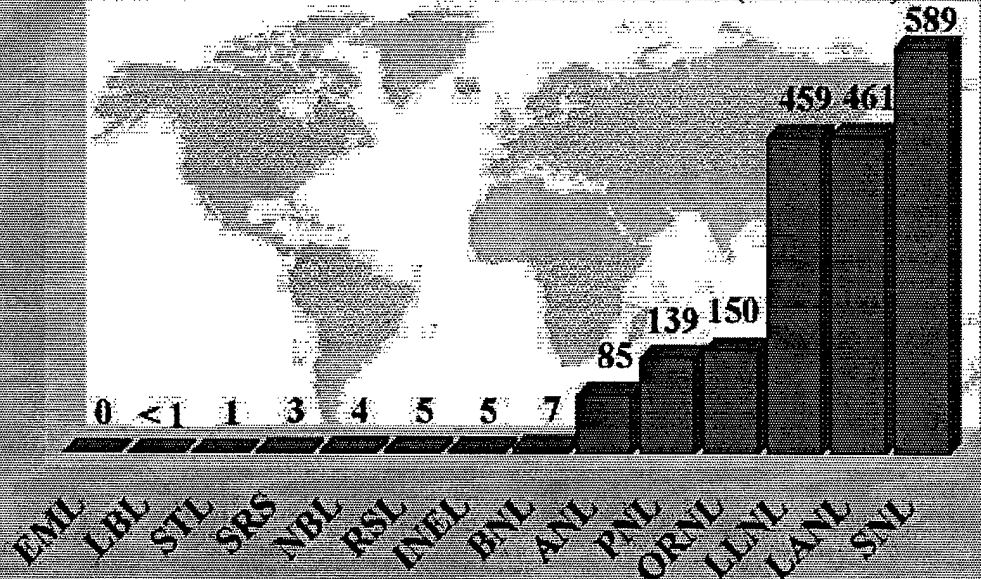
Chart G. Total DOE Laboratory Expenditures FY 95

Reducing the Nuclear Danger

Total Laboratory Expenditures*

FY 96

Dollars in millions (estimated)



*Rounded. Excludes Work for Others

Chart H. Total DOE Laboratory Expenditures FY 96

The Path Before Us

The United States is at a critical juncture in the post-Cold War era. The decisions made in support of nonproliferation and arms control are as vital to our national security interests today as those made at the end of World War II.

The challenge now confronting American policy makers is how to ensure an irreversible reduction of weapons of mass destruction while maintaining a high degree of reliability of the stockpile without nuclear testing.

Reducing the nuclear danger will remain a primary goal of the Administration and the Department. Providing adequate protection for domestic, as well as international, nuclear materials is the principal means to achieve it.

The Department's unique capabilities in the areas of nonproliferation and proliferation prevention are evidenced by the wide array of initiatives underway. To assure the national security interests of the United States, the Department will continue to provide policy and operational support complex-wide, to other Executive and international agencies, and to the intergovernmental community.

For example, on March 1, 1995, President Clinton announced that 200 tons of fissile material determined to be excess to U.S. national security needs will never again be used in nuclear weapons. DOE is actively engaged in efforts to implement this announcement.

In the arena of treaties and agreements, significant achievements have been made regarding the CTBT and the NPT. The United States made indefinite extension of the NPT a top foreign policy priority and underscored that commitment by having Vice President Gore lead the U.S. delegation. In May 1995, the United States achieved this goal when the Conference extended the Treaty indefinitely.

A first but important step has been made regarding the Fissile Material Cutoff Treaty to end the worldwide production of fissile materials for weapons. Recently, the multilateral Conference on Disarmament in Geneva, agreed to a negotiating mandate. Negotiations can now begin.

The last Clinton-Yeltsin Summit offered an additional opportunity to discuss the Russia-Iran controversy and to further U.S. nonproliferation objectives. These included initiatives to be concluded by December 31, 1995, completion of an agreement that will allow both nations to exchange

classified information to further mutual nonproliferation goals, agreement on a timetable for the exchange of data on nuclear weapons and materials, and to further negotiations on a transparent and irreversible regime for the dismantlement of nuclear weapons.

This collaboration between the United States and Russia has reaped significant rewards. The Department has played and will continue to play a pivotal role in the following areas:

- Working with Russia to secure and dispose of tons of material each year over the next seven years as was done successfully with Kazakhstan through Project Sapphire.
- Securing three bombs' worth of nuclear material at the Kurchatov Institute.
- Demonstrating remote monitoring technology that provides computer-assisted surveillance of HEU safeguarded material at the Y-12 Plant and a similar facility at the Kurchatov Institute.
- Developing with Arzamas-16 (a former "secret" nuclear city) a technology that will fingerprint nuclear material and follow it for a lifetime to ensure that it is not used in future nuclear weapons programs.
- Reducing incentives for nuclear scientists to emigrate to countries of proliferation concern through the Department's Industrial Partnering Program (IPP).

Epilogue

We are at the crossroads of an unprecedented opportunity to direct the course of U.S. nonproliferation efforts into the next century and beyond, using the preeminent scientific and technological expertise of our National Laboratories. This report will assist the Department in critically assessing existing programs and activities to monitor and adjust our priorities for the future.

Individual Laboratory Profiles

Charts 1 - 14

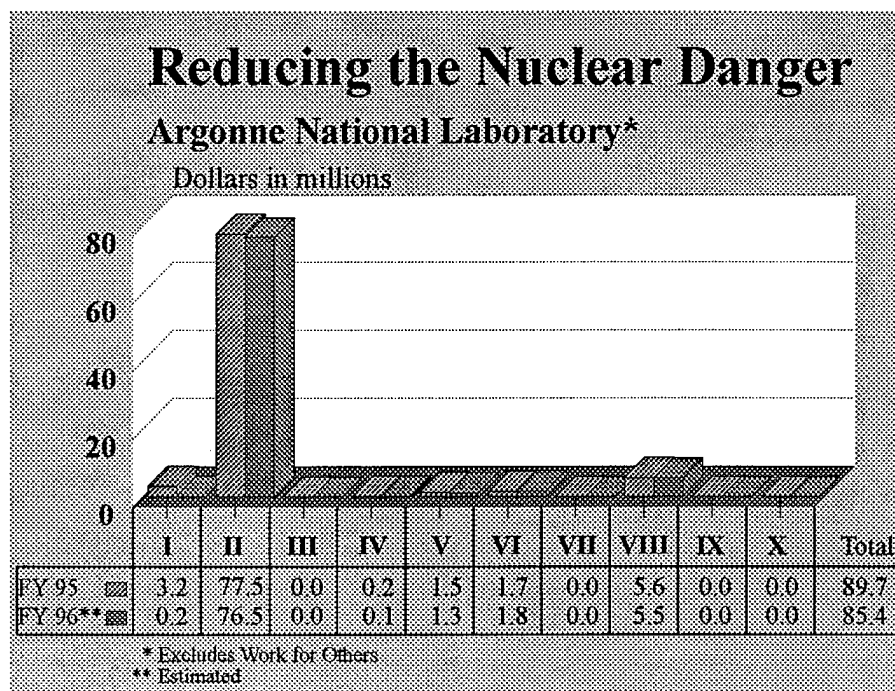


Chart 1. Argonne National Laboratory

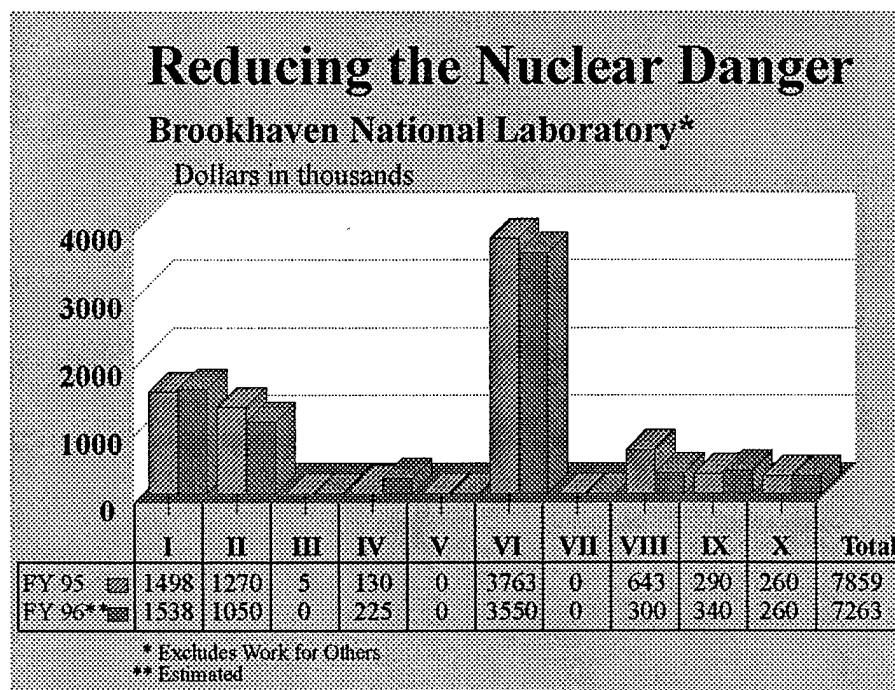


Chart 2. Brookhaven National Laboratory

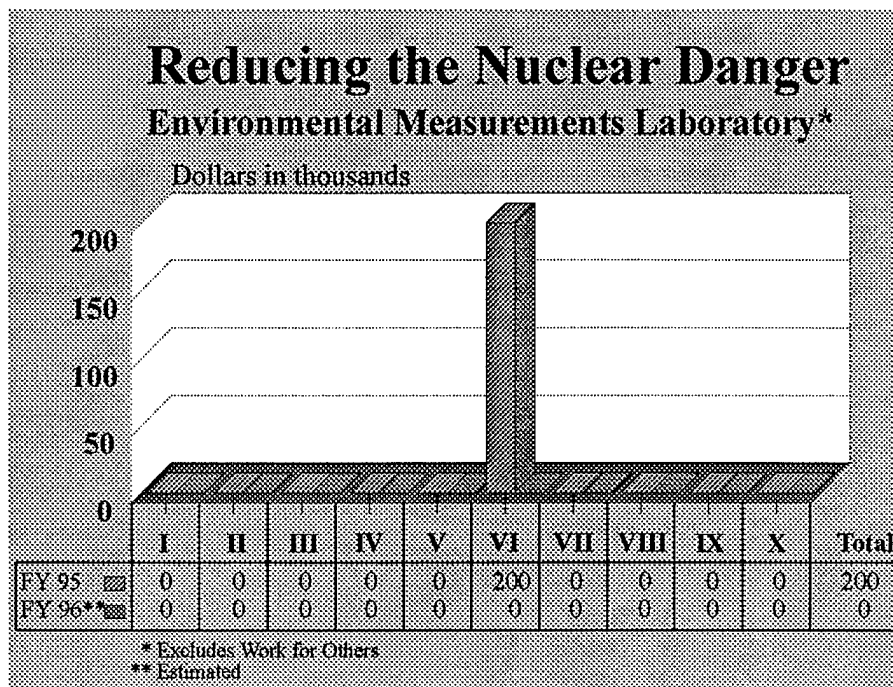


Chart 3. Environmental Measurements Laboratory

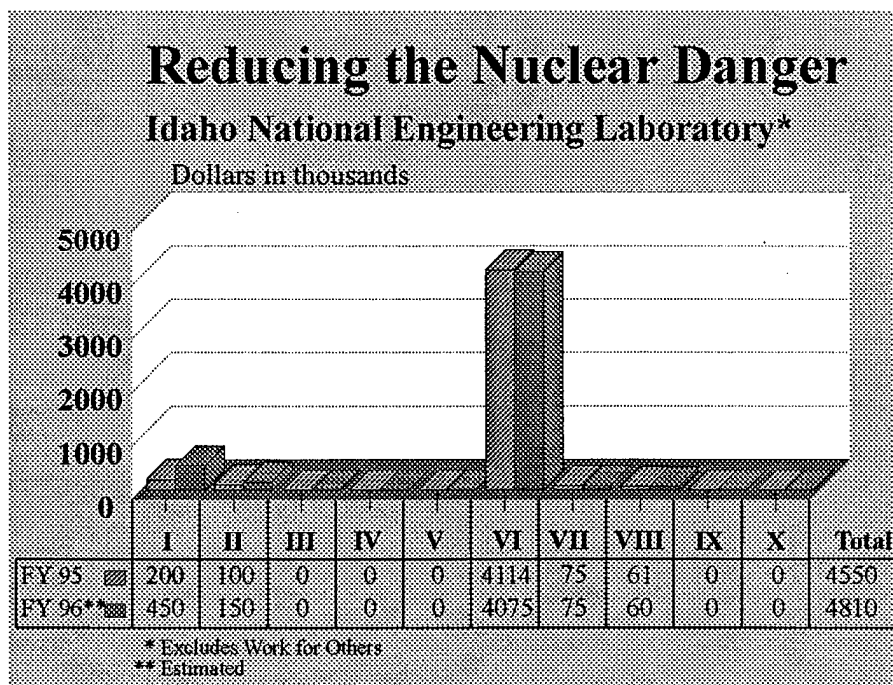


Chart 4. Idaho National Engineering Laboratory

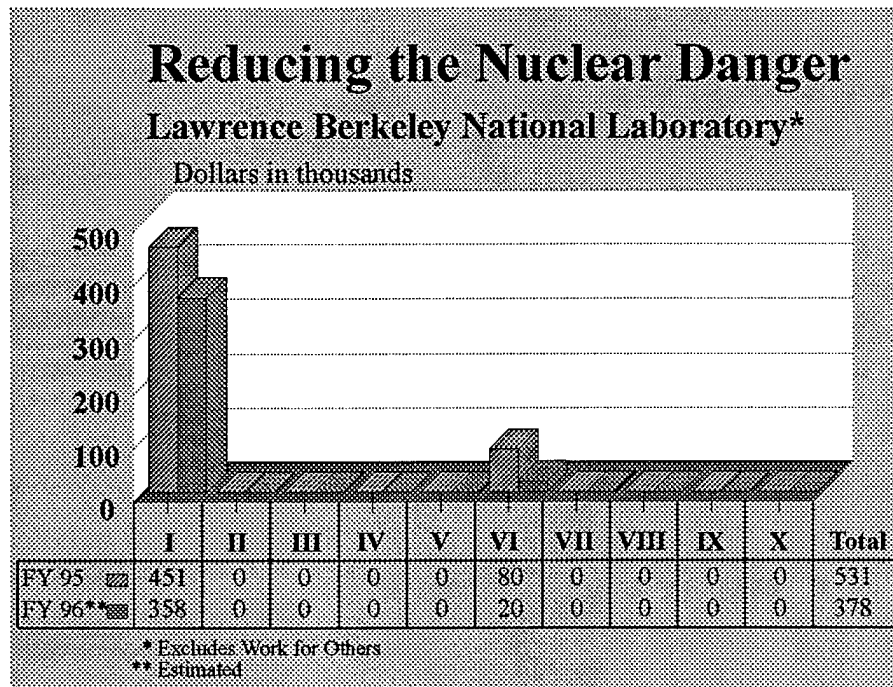


Chart 5. Lawrence Berkeley National Laboratory

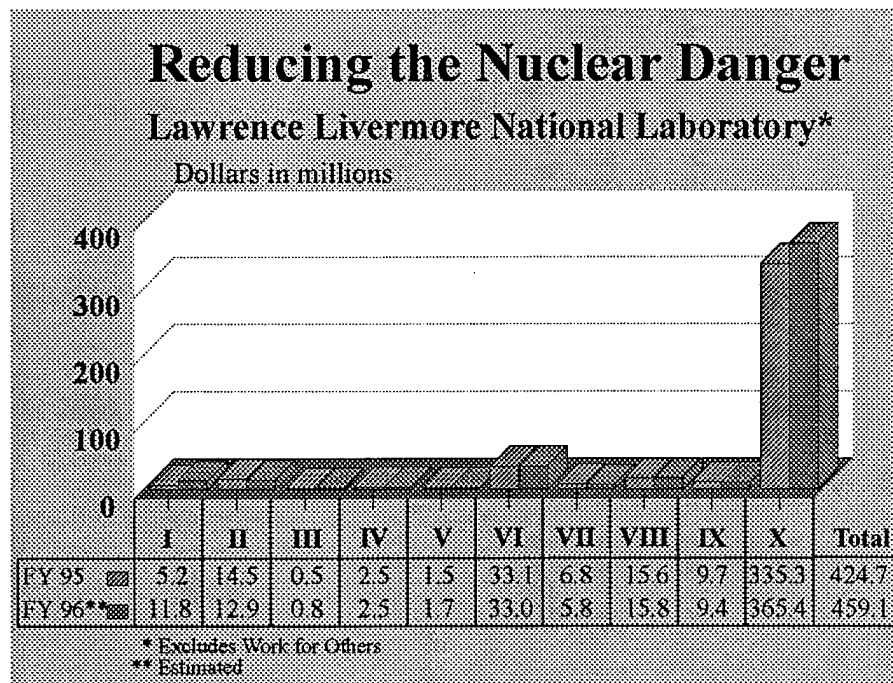


Chart 6. Lawrence Livermore National Laboratory

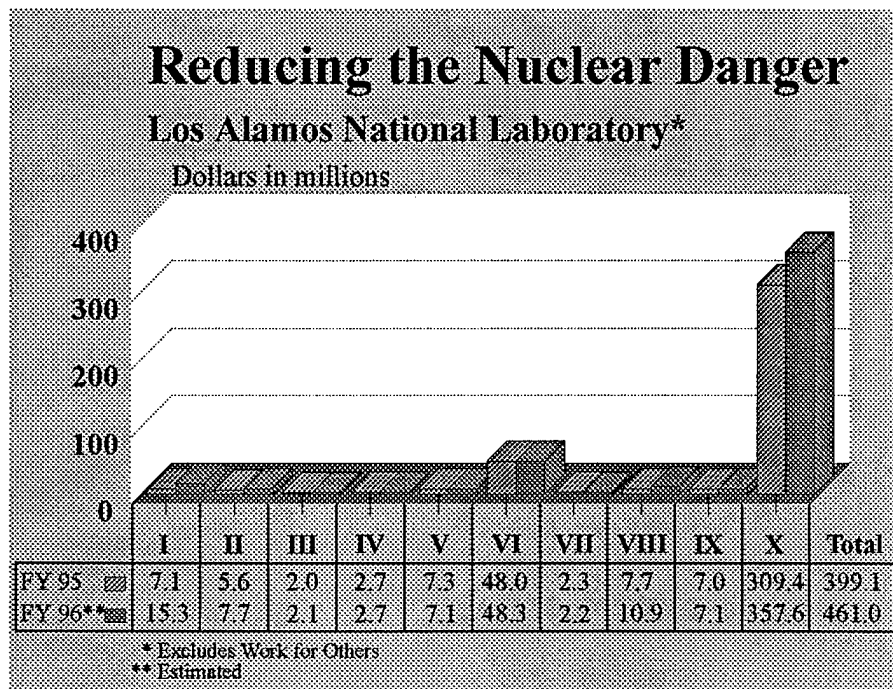


Chart 7. Los Alamos National Laboratory

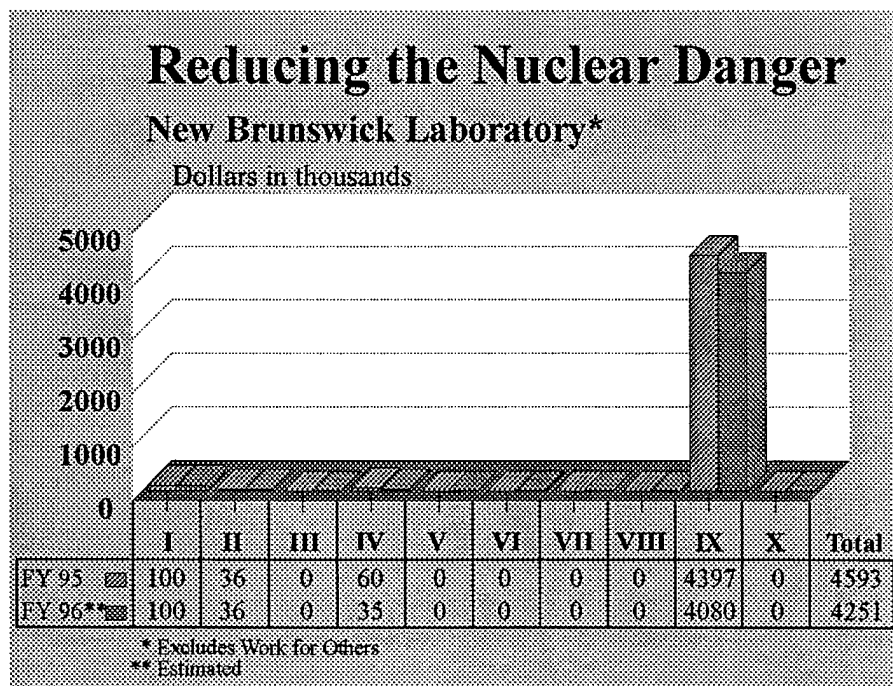


Chart 8. New Brunswick Laboratory

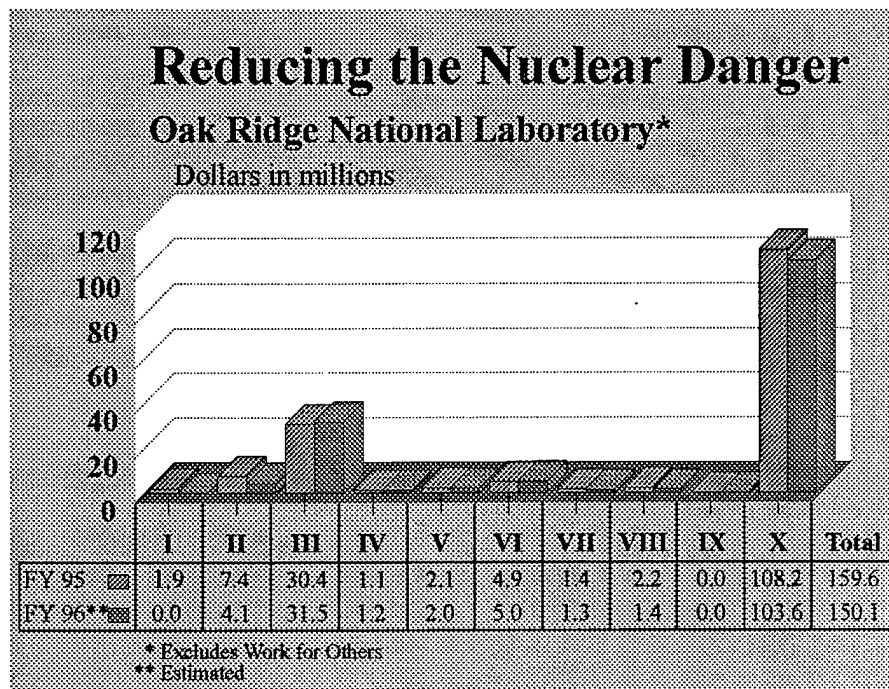


Chart 9. Oak Ridge National Laboratory

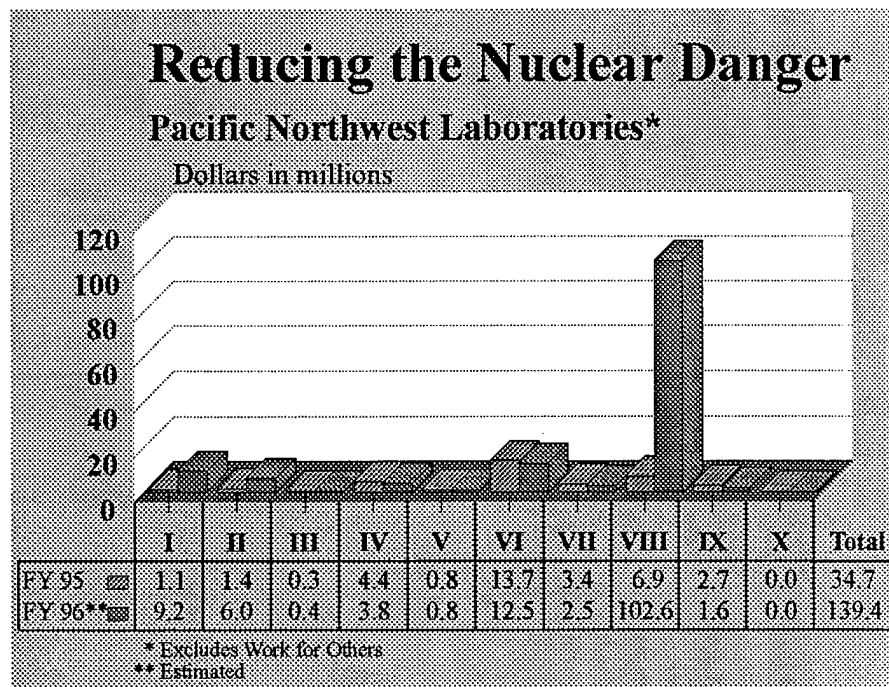


Chart 10. Pacific Northwest Laboratories

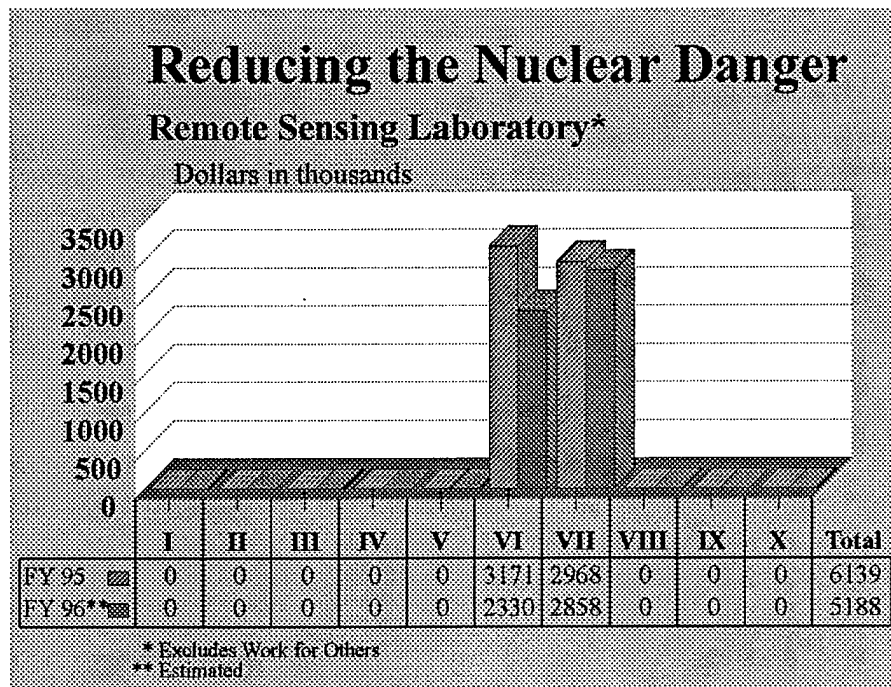


Chart 11. Remote Sensing Laboratory

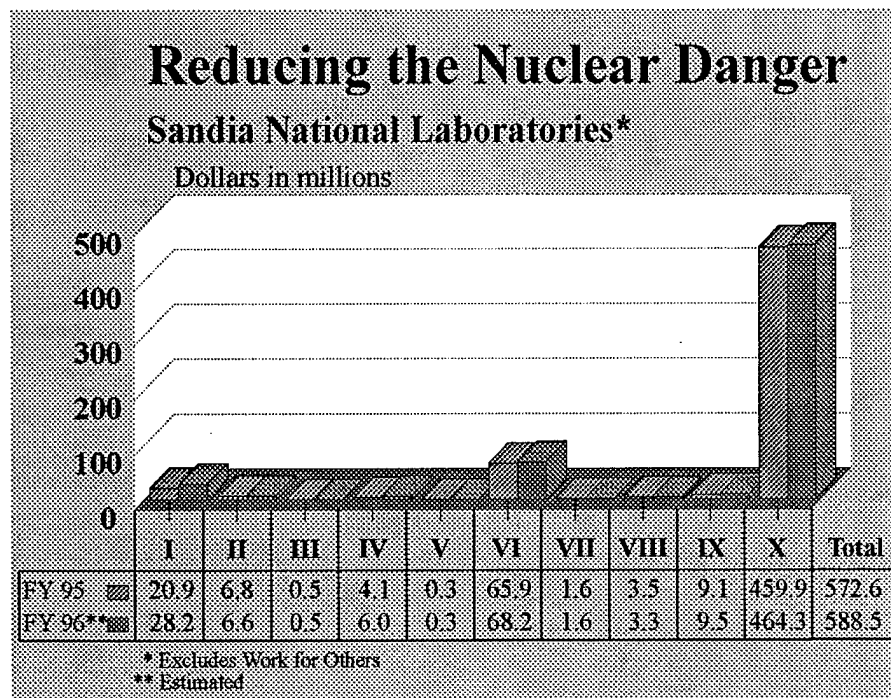


Chart 12. Sandia National Laboratories

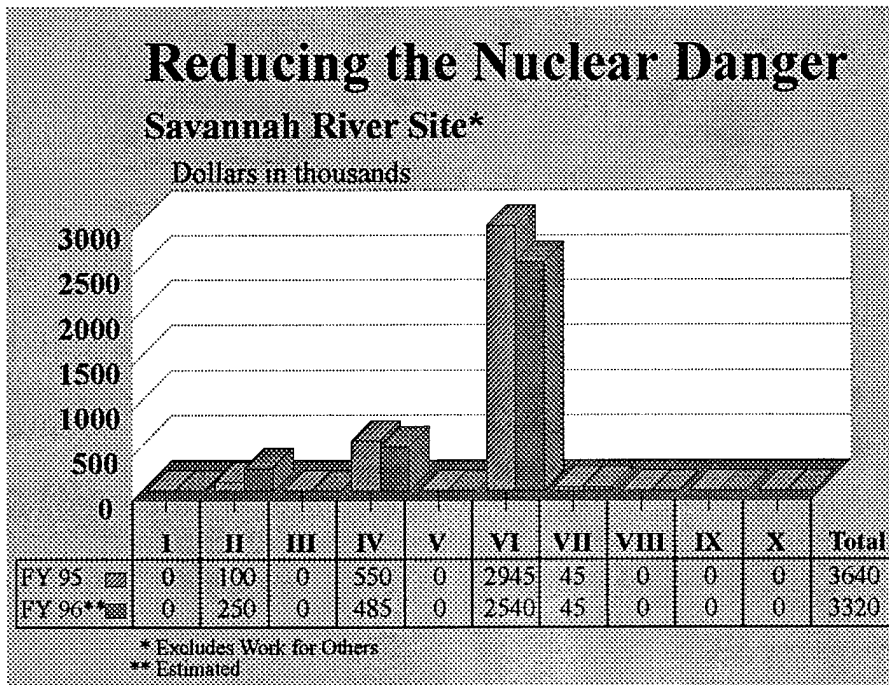


Chart 13. Savannah River Site

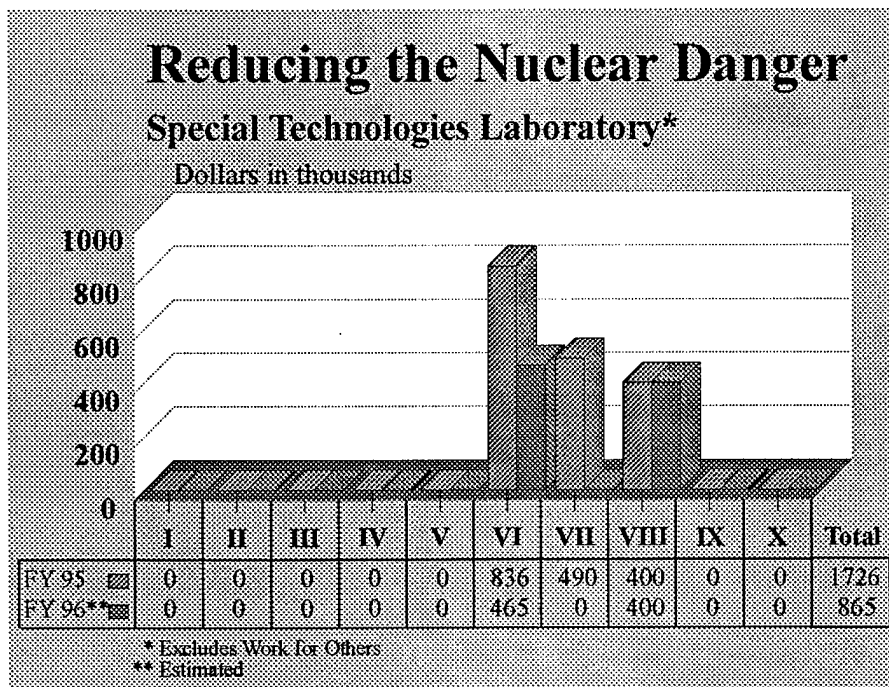


Chart 14. Special Technologies Laboratory

Acronym Glossary

ACDA	Arms Control and Disarmament Agency
ARAC	Atmospheric Release Advisory Capability
CTBT	Comprehensive Nuclear Test Ban Treaty
CTR	Cooperative Threat Reduction
DOE	Department of Energy
DPRK	Democratic Peoples Republic of Korea
EO	Executive Order
FSU	Former Soviet Union
HEU	Highly Enriched Uranium
IAEA	International Atomic Energy Agency
IPP	Industrial Partnering Program
LEU	Low Enriched Uranium
LIDAR	Light Intensity Distance and Ranging
MPC&A	Material Protection Control and Accounting
NEST	Nuclear Emergency Search Team
NIS	New Independent States
NN	Office of Nonproliferation and National Security
NPT	Nuclear Non-Proliferation Treaty
NSDD	National Security Decision Directive
OMB	Office of Management and Budget
PDD	Presidential Decision Directive
R&D	Research and Development
RERTR	Reduced Enrichment for Research and Test Reactors
START	Strategic Arms Reduction Talks
UN	United Nations