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# FISCAL YEAR 1981 DEPARTMENT OF ENERGY AUTHORIZATION FOR NATIONAL SECURITY PROGRAMS

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## HEARINGS

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### SUBCOMMITTEE ON ARMS CONTROL OF THE COMMITTEE ON ARMED SERVICES UNITED STATES SENATE NINETY-SIXTH CONGRESS

SECOND SESSION

ON

### S. 2341

A BILL TO AUTHORIZE APPROPRIATIONS FOR THE DEPARTMENT OF ENERGY FOR NATIONAL SECURITY PROGRAMS FOR FISCAL YEAR 1981 AND FISCAL YEAR 1982, AND FOR OTHER PURPOSES

APRIL 28, JUNE 24, 1980

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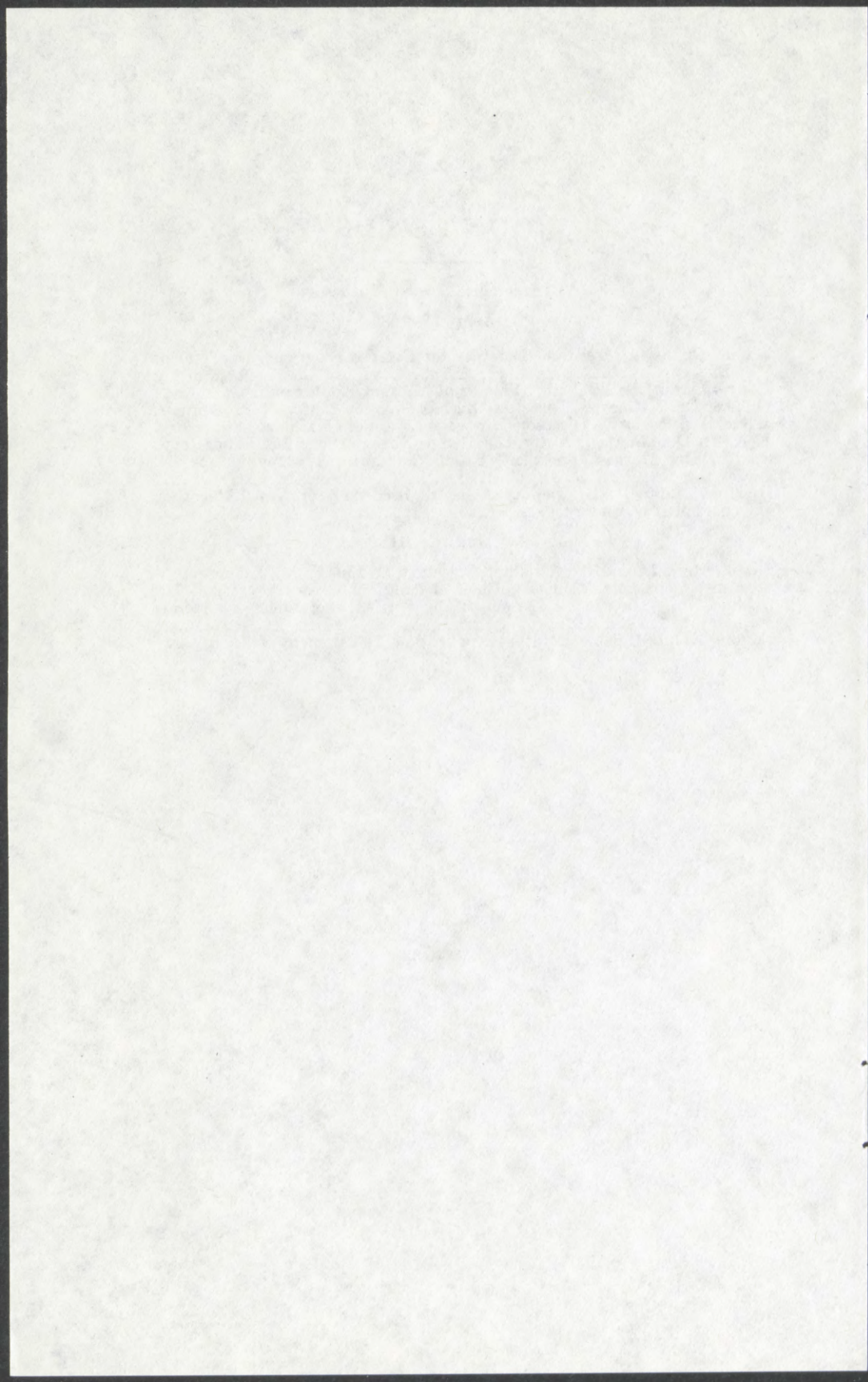
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# FISCAL YEAR 1981 DEPARTMENT OF ENERGY AUTHORIZATION FOR NATIONAL SECURITY PROGRAMS

MONDAY, APRIL 28, 1980

U.S. SENATE,  
SUBCOMMITTEE ON ARMS CONTROL  
OF THE COMMITTEE ON ARMED SERVICES,  
Washington, D.C.

The subcommittee convened, pursuant to call, at 8:14 a.m., in room 212, Russell Senate Office Building, Senator Henry M. Jackson, chairman of the subcommittee, presiding.

Present: Senators Jackson and Levin.

Staff present: Francis J. Sullivan, staff director; Rhett B. Dawson, counsel; James C. Smith and Ronald F. Lehman, professional staff members; and Frances B. Frazier, clerical assistant.

Also present: Frank Gaffney, assistant to Senator Jackson; and Greg Pallas, assistant to Senator Exon.

[The bill S. 2341 follows:]

[S. 2341, 96th Congress, 2d session]

A bill to authorize appropriations for the Department of Energy for national security programs for fiscal year 1981 and fiscal year 1982, and for other purposes

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1981".*

## TITLE I—NATIONAL SECURITY PROGRAMS

### OPERATING EXPENSES

SEC. 101. Funds are hereby authorized to be appropriated to the Department of Energy for fiscal year 1981 for operating expenses incurred in carrying out national security programs (including scientific research and development in support of the armed services, strategic and critical materials necessary for the common defense, and military applications of nuclear energy, and related management and support activities) as follows:

- (1) For inertial confinement fusion, \$159,500,000;
- (2) For naval reactors development, \$250,350,000;
- (3) For weapons activities, \$1,640,723,000;
- (4) For verification and control technology, \$40,591,000;
- (5) For materials production, \$391,900,000;
- (6) For defense nuclear waste management, \$264,655,000; and
- (7) For nuclear materials security and safeguards development, \$47,004,000.

### PLANT AND CAPITAL EQUIPMENT

SEC. 102. Funds are hereby authorized to be appropriated to the Department of Energy for fiscal year 1981 for plant and capital equipment (including planning, construction, acquisition, and modification of facilities; land acquisition

related thereto; and acquisition and fabrication of capital equipment not related to construction) necessary for national security programs, as follows:

- (1) For inertial confinement fusion:
  - Project 81-D-101, particle beam fusion accelerator-II, Sandia National Laboratories, New Mexico, \$36,750,000.
  - Project 80-AE-11, target fabrication facility, Los Alamos National Scientific Laboratory, New Mexico, \$14,300,000.
  - Project 80-AE-12, target fabrication facility, Ernest Orlando Lawrence Livermore National Laboratory, California, \$6,600,000.
  - Project 75-3-b, high energy laser facility, Los Alamos National Scientific Laboratory, New Mexico, an additional sum of \$8,000,000 for a total project authorization of \$62,500,000.
- (2) For naval reactors development:
  - Project 81-T-111, general plant projects, \$3,300,000.
  - Project 81-T-112, modifications and additions to prototype facilities, various locations, \$103,000,000.
  - Project 81-T-113, fuel materials examination area upgrading, Bettis Atomic Power Laboratory, West Mifflin, Pennsylvania, \$2,700,000.
- (3) For weapons activities:
  - Project 81-D-102, general plant projects, \$28,900,000.
  - Project 81-D-103, plant engineering and design, \$4,600,000.
  - Project 81-D-104, heavy duty drill repair facility, Nevada Test Site, Nevada, \$1,700,000.
  - Project 81-D-105, engineering office building, Nevada Test Site, Nevada, \$1,800,000.
  - Project 81-D-106, weaponization facilities, Ernest Orlando Lawrence Livermore National Laboratory, California, \$6,000,000.
  - Project 81-D-107, utilities and equipment restoration, replacement, and upgrade, various locations, \$31,000,000.
  - Project 81-D-110, upgrade industrial liquid waste treatment plants, Los Alamos National Scientific Laboratory, New Mexico, \$8,000,000.
  - Project 81-D-111, water system upgrade, Los Alamos National Scientific Laboratory, New Mexico, \$9,000,000.
  - Project 81-D-114, exhaust plenum modifications, Rocky Flats Plant, Golden, Colorado, \$10,500,000.
  - Project 81-D-115, M-X warhead production facilities, various locations, \$35,000,000.
  - Project 81-D-116, utilities and equipment restoration, replacement, and upgrade, Phase II, various locations, \$115,000,000.
  - Project 81-D-119, reclamation facility improvements, Savannah River Plant, Aiken, South Carolina, \$1,200,000.
  - Project 81-D-120, control of effluents and pollutants, Y-12 Plant, Oak Ridge, Tennessee, \$6,400,000.
  - Project 80-AE-5, ground launched cruise missile (GLCM) warhead production facilities, various locations, an additional sum of \$3,000,000, for a total project authorization of \$7,000,000.
  - Project 80-AE-6, utilities and equipment restoration, replacement, and upgrade, various locations, an additional sum of \$29,900,000, for a total project authorization of \$69,300,000.
  - Project 79-7-p, facilities for new modern strategic bomb, various locations, an additional sum of \$7,000,000 for a total project authorization of \$35,000,000.
  - Project 78-17-d, steam plant improvements, Y-12 Plant, Oak Ridge, Tennessee, an additional sum of \$1,500,000, for a total project authorization of \$27,000,000.
- (4) For materials production:
  - Project 81-D-123, general plant projects, \$14,600,000.
  - Project 81-D-124, plant engineering and design, \$4,200,000.
  - Project 81-D-125, N reactor safety and environmental improvements, Richland, Washington, \$2,100,000.
  - Project 81-D-128, restoration of production capabilities, various locations, \$34,100,000.
  - Project 81-D-129, supplemental N reactor irradiated fuel storage (A-E and long lead procurement), Richland, Washington, \$5,000,000.
  - Project 81-D-131, remote analytical facility upgrade and expansion, Idaho Fuels Processing Facility, Idaho National Engineering Laboratory, Idaho, \$28,500,000.

Project 77-13-a, fluorinel dissolution process and fuel receiving improvements, Idaho Chemical Processing Plant, Idaho National Engineering Laboratory, Idaho, an additional sum of \$34,000,000 for a total project authorization of \$149,400,000.

- (5) For defense nuclear waste management:
- Project 81-T-101, general plant projects, \$9,140,000.
  - Project 81-T-102, plant engineering and design, \$9,865,000.
  - Project 81-T-103, sixth set of calcined solids storage bins, Idaho Chemical Processing Plant, Idaho National Engineering Laboratory, Idaho, \$15,000,000.
  - Project 81-T-104, radioactive waste facilities improvements, Oak Ridge National Laboratory, Tennessee, \$20,000,000.
- (6) For capital equipment not related to construction—
- (A) for inertial confinement fusion, \$11,000,000;
  - (B) for naval reactors development, \$39,000,000;
  - (C) for weapons activities, \$113,700,000;
  - (D) for verification and control technology, \$800,000;
  - (E) for materials production, \$35,100,000;
  - (F) for defense nuclear waste management, \$25,000,000; and
  - (G) for nuclear materials security and safeguards development, \$3,400,000.

## TITLE II—GENERAL PROVISIONS

### REPROGRAMMING

Sec. 201. Except as otherwise provided in this Act—

(1) no amount appropriated pursuant to this Act may be used for any program in excess of 105 per centum of the amount authorized for that program by this Act or \$10,000,000 more than the amount authorized for that program by this Act, whichever is the lesser, and

(2) no amount appropriated pursuant to this Act may be used for any program which has not been presented to, or requested of, the Congress, unless a period of thirty calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three calendar days to a day certain) has passed after receipt by the appropriate committees of Congress of notice from the Secretary of Energy (hereinafter in this title referred to as the "Secretary") containing a full and complete statement of the action proposed to be taken and the facts and circumstances relied upon in support of the proposed action, or unless each committee before the expiration of such period has transmitted to the Secretary written notice to the effect that it has no objection to the proposed action.

### LIMITS ON GENERAL PLANT PROJECTS

Sec. 202. (a) The Secretary may carry out any construction project under the general plant projects provisions authorized by this Act if the total estimated cost of the construction project does not exceed \$1,000,000.

(b) If at any time during the construction of any general plant project, the estimated cost of the project is revised due to unforeseen cost variations and the revised cost of the project exceeds \$1,000,000 the Secretary shall immediately furnish a complete report to the appropriate committees of Congress explaining the reasons for the cost variation.

(c) In no event may the total cost of all general plant projects carried out under this Act exceed by ten percent the total amount authorized to be appropriated for such projects under this Act.

### LIMITS ON CONSTRUCTION PROJECTS

Sec. 203. (a) Whenever the current estimated cost of a construction project is authorized by section 102 of this Act, or which is in support of national security programs of the Department of Energy and was authorized by any previous Act, exceeds by more than 25 per centum the higher of (1) the amount authorized for the project, or (2) the amount of the total estimated cost for the project as shown in the most recent budget justification data sheets submitted to Congress, the project may not be started or additional obligations incurred in connection with the project above the total estimated cost, as the case may be, unless a period of thirty calendar days (not including any day in which either

House of Congress is not in session because of adjournment of more than three days to a day certain) has passed after receipt by the appropriate committees of Congress of written notice from the Secretary containing a full and complete statement of the action proposed to be taken and the facts and circumstances relied upon in support of the action, or unless each committee before the expiration of such period has notified the Secretary it has no objection to the proposed action.

(b) Subsection (a) shall not apply to any construction project which has a current estimated cost of less than \$5,000,000.

#### FUND TRANSFER AUTHORITY

SEC. 204. To the extent specified in appropriation Acts, funds appropriated pursuant to this Act may be transferred to other agencies of the Government for the performance of the work for which the funds were appropriated, and funds so transferred may be merged with the appropriations of the agency to which the funds are transferred.

#### AUTHORITY FOR CONSTRUCTION DESIGN

SEC. 205. (a) Within the amounts authorized by this Act for plant engineering and design, the Secretary may carry out advance planning and construction designs and may obtain architectural and engineering services in connection with any proposed construction projects.

(b) In any case in which the estimated design cost for any construction project is in excess of \$400,000, the Secretary shall notify the appropriate committees of Congress in writing of the details of the project at least thirty days before any funds are obligated for design services for the project.

#### FUNDS AVAILABLE FOR ALL NATIONAL SECURITY PROGRAMS OF THE DEPARTMENT OF ENERGY

SEC. 206. Subject to the provisions of appropriation Acts, amounts appropriated pursuant to this Act for management and support activities and for general plant projects are available for use, when necessary, in connection with all national security programs of the Department of Energy.

#### AUTHORITY FOR EMERGENCY CONSTRUCTION DESIGN

SEC. 207. In addition to the advance planning and construction design authorized by section 102, the Secretary may perform planning and design utilizing available funds for any Department of Energy defense activity construction project whenever the Secretary determines that the design must proceed expeditiously in order to meet the needs of national defense or to protect property or human life.

#### ADJUSTMENTS FOR PAY INCREASES

SEC. 208. Appropriations authorized by this Act for salary, pay, retirement, or other benefits for Federal employees may be increased by such sums as may be necessary for increases in benefits authorized by law.

#### AVAILABILITY OF FUNDS

SEC. 209. When so specified in an appropriation Act, amounts appropriated for "Operating Expenses" or for "Plant and Capital Equipment" may remain available until expended.

#### TITLE III—AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 1982

SEC. 301. (a) There is authorized to be appropriated to the Department of Energy to be available not earlier than October 1, 1981, such sums as may be necessary for fiscal year 1982 for programs set forth in this Act.

(b) All of the provisions which are applicable to amounts appropriated pursuant to other sections of this Act shall apply in the same manner to amounts appropriated pursuant to this section.

## OPENING STATEMENT BY SENATOR JACKSON, CHAIRMAN

Senator JACKSON, Good morning, gentlemen.

The Subcommittee on Arms Control of the Senate Armed Services Committee has the responsibility, as you know, to review and make recommendations on authorizing legislation for the Department of Energy's defense programs. The purpose of our hearing this morning is to receive testimony on S. 2341, the fiscal year 1981 Department of Energy authorization bill for defense programs.

In the way of administrative matters:

First, the Subcommittee had intended to have Secretary Duncan appear to give an overview of the energy-defense situation around the world. Unfortunately Secretary Duncan is not available this week; however, we may call him in the near future.

Next, we are in executive session this morning and I shall look to you, Mr. Sewell, to vouch for the proper security clearances for everyone at your end of the table. I feel we cannot intelligently discuss the nuclear weapons budget in open session.

We are fast approaching the May 15 deadline for reporting out authorizing legislation for fiscal year 1981. I will ask you gentlemen to help us in expediting the completion of this hearing transcript in your usual fine fashion.

Our agenda this morning calls for:

First, a panel of Assistant Secretary Sewell, Major General Hoover, Dr. Gilbert and Brigadier General Mullaney who is pinch-hitting for Dr. Wade and will provide us with the Defense Department perspective. This panel will cover the details of the fiscal year 1981 budget.

Second, another panel of distinguished scientists, the Directors of our national nuclear weapons laboratories—Dr. Roger Batzel of Livermore, Dr. Don Kerr of Los Alamos, and Dr. Morgan Sparks of Sandia. I have asked these gentlemen not to dwell on their lab's programs, but rather to focus on the one or two issues in the nuclear field that they feel are critical to the future of this country.

Finally, we will hear from Admiral Rickover and I am sure he will advise us on many nuclear matters as well as other matters.

We are looking at a budget for fiscal year 1981 that totals \$3.6 billion in new authorization. It is interesting to note that the Senate Budget Committee in developing the first concurrent budget resolution has added \$400 million to this budget request to cover areas that they feel are underfunded.

There are serious issues associated with this budget that I intend to get into here today.

First, are we doing enough in nuclear weapons testing in view of the apparent acceleration of the Soviet testing effort?

Is the production of new weapons budgeted adequately in view of emerging inflation rates?

Can we, in fact, field the enhanced radiation warheads if we have to, as the President has said we can?

Do we have the capacity to produce the special nuclear materials that we will need in the years ahead?

Are we on the brink of wholesale plant shutdowns because of "galloping obsolescence" of equipment and facilities?

Where will we get our plutonium in the 1990's?

Is the President's nuclear waste management policy wise or are we wasting 5 years that will be critical to the entire nuclear industry?

What is the status of WIPP, a project that was carefully put together last year to get on with solutions to the long-term storage of nuclear waste?

Mr. Sewell, I want to say we are delighted to have you back and we will proceed as I have previously indicated. Also, before we do that, I want to acknowledge the presence of Dr. Cunningham, the Assistant Secretary of Energy for Nuclear Energy, who has, as you know, the responsibility for defense nuclear waste.

Mr. Sewell.

**STATEMENT OF DUANE C. SEWELL, ASSISTANT SECRETARY  
FOR DEFENSE PROGRAMS, DEPARTMENT OF ENERGY**

Mr. SEWELL. Thank you, Mr. Chairman.

With your permission I would like to submit a statement for the record and then just summarize that statement.

Senator JACKSON. That is fine. The statement will be included in the record at this point and you go ahead with your summary.

Mr. SEWELL. Thank you.

[The prepared statement follows:]

PREPARED STATEMENT OF DUANE C. SEWELL, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS, U.S. DEPARTMENT OF ENERGY

INTRODUCTION

Mr. Chairman and Members of the Committee, it is my pleasure to appear before you today to testify on behalf of the Department of Energy's fiscal year 1981 budget request for atomic energy defense activities.

As you know, responsibility for accomplishing the Department's defense activities rests with two Assistant Secretaries. As Assistant Secretary for Defense Programs, I am responsible for the Department's nuclear weapons development and production; nuclear materials production; inertial confinement fusion; verification and control technology; and the nuclear materials security and safeguards programs.

The Assistant Secretary for Nuclear Energy, is responsible for the Department's defense waste management and naval reactors development programs under Defense Activities as well as managing the Department's nuclear reactor technology program.

In my testimony today, I want to discuss several important topics and then respond to any questions you have regarding the conduct of the defense program activities of our budget request.

With me today are Brig. Gen. David Mullaney, USAF, Deputy Assistant (Military Application), to the Assistant to the Secretary of Defense (Atomic Energy), Mr. Philip Coyle, Deputy Assistant Secretary for Defense Programs, and my program directors. They are:

- General William Hoover, Military Application;
- Dr. Charles Gilbert, Nuclear Materials Production;
- Dr. Richard Schriever, Inertial Confinement Fusion;
- Dr. Julio Torres, International Security Affairs;
- Mr. George Weisz, Safeguards and Security.

General Hoover and Dr. Gilbert will present more detailed testimony on their program activities and budget requests later this morning.

FISCAL YEAR 1981 BUDGET REQUEST

I would first like to summarize the Department's fiscal year 1981 budget request for atomic energy defense activities which is broken down by program in Table 1.

TABLE 1.—FISCAL YEAR 1981 BUDGET REQUEST: ATOMIC ENERGY DEFENSE ACTIVITIES

[By fiscal years, in millions of dollars]

	1980		1981	
	Authorization	Appropriation	Authorization	Appropriation
Weapons activities.....	1,738	1,654	2,056	1,972
Nuclear materials production.....	523	513	550	523
Inertial confinement fusion.....	139	195	236	202
Verification and control technology.....	38	38	39	39
Nuclear materials security and safeguards.....	46	47	47	47
<b>Total, ASDP.....</b>	<b>2,484</b>	<b>2,447</b>	<b>2,928</b>	<b>2,783</b>
Defense waste management.....	292	278	331	337
Naval reactors development.....	278	278	398	305
<b>Total, ASNE.....</b>	<b>570</b>	<b>556</b>	<b>729</b>	<b>642</b>
<b>Total, atomic energy defense activities.....</b>	<b>3,054</b>	<b>3,003</b>	<b>3,657</b>	<b>3,425</b>

<sup>1</sup> Includes fiscal year 1980 supplemental request of \$46,000,000.

As indicated in the table, the fiscal year 1981 authorization requested for the Department's atomic energy defense activities is \$3,657 million. Of the total \$2,928 million is for defense programs and \$729 million for nuclear energy.

The defense programs request represents an increase of 20 percent over the fiscal year 1980 authorization. The majority of this increase is for weapons activities with an increase of \$318 million or about 18 percent.

I will now address several topics in which this Committee has expressed interest.

#### UNIVERSITY OF CALIFORNIA CONTRACT STUDY

The first item is the University of California contract study. In the "Department of Energy National Security and Military Applications of Nuclear Energy Authorization act of 1980," the Congress required the Secretary of Energy to submit, no later than February 1, 1980, a plan for the termination of the contracts with the Regents of the University of California for the operation of the Lawrence Livermore National Laboratory and the Los Alamos National Scientific Laboratory. The language of the authorization act indicates that the Congress recognized that the long-standing contractual arrangements with the Regents has served the Nation well and should continue as long as the national interest is being served. Further, the language expresses the Congress' concern over efforts to influence the roles and missions of the laboratories. Therefore, in the interest of preserving the defense and nuclear weapons primary mission of the laboratories, the Congress directed the Secretary of Energy to study alternate contractual arrangements for operation of the laboratories.

I appreciate the interest and support which this Committee has provided to the Department for the operation of the nuclear weapons laboratories and the conduct of all of our defense activities. The Department of Energy does recognize that the nuclear weapons laboratories and other components of the nuclear weapons complex are unique national assets whose dedication to the nuclear weapons and defense missions must and will be preserved.

On February 1, 1980, the Department submitted a contingency plan for replacement of the University of California as contractor for operation of Los Alamos National Scientific Laboratory and Lawrence Livermore National Laboratory. In submitting that plan we also provided you with copies of a DOE report which resulted from study of the question of how best to go about replacing the UC in the event that becomes necessary or desirable. On balance, the University has done an outstanding job of serving the needs of the Government over the years. I believe that the University's interest, participation, and support of lab activities, has increased over the recent past. I have the assurances of both the University administration and members of the Board of Regents that such positive interest and participation can be expected to continue.

Nonetheless, as the Department's Energy Research Advisory Board indicated to then Secretary Schlesinger in its May 14, 1979, report on the relationship between the University and the labs, the DOE should be prepared to replace

the University if that eventuality develops. For that reason I asked Herman Roser, Manager of the DOE's Albuquerque Operations Office to chair the study which resulted in the report which we provided to you. I believe that report identifies the options which are open to the Department in such a way as to facilitate a careful, logical consideration of alternatives in a timely manner so as to responsibly secure a replacement of the University of California if we so decide. As the report (as well as our contingency plan to Congress) indicates, by about October 1980 we should determine whether such a replacement is to occur. The data-gathering and analysis prior to selection of a new contractor can then begin, with contractor selection to occur about 12-15 months later but in any case prior to the present contract expiration date of September 30, 1982.

Next, I want to discuss our nuclear materials requirements and production capabilities.

#### NUCLEAR MATERIALS REQUIREMENTS

This Committee has expressed concern over the availability of sufficient nuclear materials to accomplish the nuclear weapons production workload planned for the 1980s. Dr. Gilbert will discuss this in more detail later in the course of these hearings, so I will just highlight the situation now.

The Department forecasts that it will have sufficient nuclear materials through fiscal year 1985 to meet specified weapons requirements. For the latter part of the 1980s projections are more uncertain. We are studying the requirements and the rates of production and are proposing no increase in our national production capacity at this time.

Most of the nuclear materials required for building new warheads are obtained by reclaiming and recycling existing materials from retired weapons returned by DOD. Weapon program requirements which cannot be met from DOD returns or existing DOE inventories are satisfied by production of new nuclear materials. Some of the facilities previously used for production are now on standby and would require two to four years for restart or conversion. The FY 1981 budget provides for a constant level of effort in the production and processing of nuclear materials.

For the period from FY 1980 through about 1985, which includes all Presidentially approved deployments and procurements, the projected new plutonium and tritium requirements derived from the Stockpile Memorandum can be met by continued operation of the three Savannah River production reactors now in use. The FY 1981 budget supports the operations of the three presently operating Savannah River reactors; at Richland the N-reactor will continue to be operated in the fuel-grade plutonium mode and the PUREX plant will be maintained in standby. In the latter half of the 1980's, the outlook is less clear. The forecasting of special nuclear materials in the outyears is a complex process and becomes more uncertain the further one looks into the future. This forecast requires estimates of future weapons production and retirement and an appraisal of design uncertainties. Long-term projections in the Stockpile Memorandum indicate that requirements for special nuclear materials may take an upturn. These projections include planning uncertainties in the interest of preserving options until requirements harden. We are continuing to review projected future needs for plutonium and tritium, along with the corresponding production requirements.

Turning now to nuclear weapons activities, I will discuss a few areas which I believe will be of interest to this committee.

#### NUCLEAR WEAPONS PRODUCTION

As the Committee is aware, our weapons production workload is growing in order to meet identified and Presidentially approved delivery commitments to the Department of Defense. It was necessary for the Department to submit to the Congress a fiscal year 1980 supplemental budget request of \$30 million in this area. This was necessary because we experienced unanticipated increases in procurement costs, technical manufacturing problems, longer procurement lead times, and higher prices for natural gas due to implementation of the natural gas pricing act. Our fiscal year 1980 request for production and surveillance was \$732 million. Congress authorized \$761 million and appropriated \$718 million.

Our fiscal year 1981 request of \$895 million for production and surveillance represents an increase of 26 percent above the FY 1980 level, assumes an inflation

rate of 7.9 percent, and a manufacturing program free of major technical problems.

#### NUCLEAR WEAPONS RESEARCH, DEVELOPMENT AND TESTING

Assuming an annual escalation rate of 8.5 percent, our FY 1981 budget request will maintain the level of employment dedicated to weapons research and development activities at about the FY 1980 level of 7400 total full-time equivalents. The FY 1981 request for operating funds for research, development, and testing is about 12 percent over FY 1980.

#### NUCLEAR WEAPONS TESTING

Our proposed testing budget will fully support all ongoing warhead developments as currently defined in the President's Stockpile Memorandum and will permit some advancement in the state-of-the-art of weapons technology. In recent years the demand for new weapons has required us to give priority to weapons development tests, forcing a reduction in technology base testing. However, the Administration is continuing to review testing needs.

#### DOD/DOE PLANNING

It has been my desire that we within Defense Programs should always be examining our policies and methods of planning, managing, and implementing our responsibilities. We should be attentive to better and more efficient ways of doing business, thereby benefitting the national interest.

One such area that we need to make improvements in is DOE/DOD long-range nuclear weapons system planning. I am supporting a joint study between our two Departments.

The Nation's nuclear weapons systems are the joint responsibility of the DOE and the DOD. As you know, DOE is responsible for the warheads and bombs and DOD is responsible for the delivery systems. It has been agreed between the Departments that a joint long-range weapons systems planning analysis concerned with resources and investment planning is necessary. This analysis is particularly important at this time when long lead times, rising costs, and other uncertainties collectively complicate the allocation of already scarce resources. I am jointly directing this study with Dr. Jim Wade, the Assistant to the Secretary of Defense (Atomic Energy). The study, which is currently underway will:

- Review the planning and acquisition process;
- Develop and propose a stockpile program for resource planning purposes and analysis of DOD resources required;
- Analyze DOE capabilities and resources to meet the stockpile program;
- Propose guidance for a 20-year nuclear weapons program for DOD and DOE resource planning purposes.

#### EQUIPMENT AND UTILITIES RESTORATION

With the support of this Committee, we initiated in fiscal year 1980 our restoration program in the nuclear weapons facilities. Our fiscal year 1981 budget continues this effort and also includes a line item construction project to begin restoration of the nuclear materials production facilities.

The continuation of these programs is extremely important to ensure our capabilities to meet nuclear weapons and nuclear materials production requirements. General Hoover and Dr. Gilbert can discuss these programs in more detail, so I will limit myself to stating the importance of these efforts and express our gratitude to the Committee for its recognition of the problem and support in solving it.

The next topic I want to discuss for you is the NOVA-High Energy Glass Laser Facility, at Livermore, California.

#### HIGH ENERGY GLASS LASER FACILITY (NOVA)

In preliminary meetings on our FY 1981 budget request with members of the staff of this Committee, it has been noted that no FY 1981 funding is being requested for NOVA. The \$56 million provided for this project in fiscal year 1980 will enable us to complete the building project construction phase in fiscal year

1981 without additional appropriations. This stretchout of NOVA is to achieve a more balanced overall inertial fusion program.

As is stated in our budget request, glass laser experiments will provide the main body of data for evaluating various driver candidates to meet major program objectives. The mainline glass laser experiments will be conducted on the SHIVA laser system at the Lawrence Livermore National Laboratory. In fiscal year 1980 the main experimental effort on SHIVA will be directed toward long-pulse experiments to reach intermediate density compressions of target fuel. This degree of compression is a necessary, but not sufficient, condition for initiating significant thermonuclear burn in targets. Achieving significant thermonuclear burn (fusion energy gain equal to 10 percent of input energy) is a major program milestone that will require an order of magnitude more powerful laser system. This is the task of the NOVA laser system, which will be a scaleup of the existing SHIVA system.

One remaining DOE activity that this Committee has indicated its interest in is the Waste Isolation Pilot Plant (WIPP) project.

#### WASTE ISOLATION PILOT PLANT PROJECT

In the "Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980," the Congress directed the Secretary of Energy to proceed with WIPP as a defense activity to be administered by the Assistant Secretary of Energy for Defense Programs. The authorization further stipulated that the express purpose of the project is to provide a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission.

Although signing the authorization bill, the President indicated that he did not endorse the approach to the WIPP project stated in the bill. Rather, he stated that the disposal of defense nuclear wastes and the future of WIPP ought to be resolved only in the context of an overall nuclear waste management policy that would include both defense waste and spent nuclear fuel. The policy was still under development at the time the Congress passed the authorization bill.

Recently, the Administration has decided that the WIPP project, as authorized, should be terminated, and that defense waste previously intended for disposal in the unlicensed WIPP facility should be placed instead in the first commercial waste disposal facility. The characterization and protection of the WIPP New Mexico site as a potential licensed repository is included in the Department's FY 1981 budget request for commercial waste management. The commercial waste management program will investigate regions of the country for candidate sites for disposal of high level waste and spent fuel.

The Administration's view is that the long-term containment issues are identical for both defense-generated transuranic (TRU) and high-level defense-generated and commercial waste (HLW). However, in the present interim storage mode, these wastes do not present an undue health and safety problem. Once a commercial HLW repository is available, TRU wastes could be conveniently stored in that facility, making unnecessary a dedicated repository for the TRU waste.

I am confident that the administration and the Congress can arrive at a mutually acceptable approach to the waste problem that would be in the best interests of all parties.

#### CONCLUSION

Mr. Chairman, this completes my prepared statement. I appreciate the support and interest you and the Committee Members and staff have always had for our defense programs.

I have addressed areas in which the Committee has expressed interest. If there are any other topics which the Committee would like me to address, I would be pleased to do so, or I would be pleased to respond to any questions you may have.

Mr. SEWELL. In addition to those that you introduced, I would like to introduce others that I have here with me: Dr. Richard Schriever, Deputy Director, Office of Inertial Fusion; Dr. Julio L. Torres, Acting Director, Office of International Security Affairs; and Mr. George Weisz, Director, Office of Safeguards and Security. Each has a prepared statement to submit for the record.

[The prepared statements follow:]

PREPARED STATEMENT OF DR. R. L. SCHRIEVER, DEPUTY DIRECTOR, OFFICE OF  
INERTIAL FUSION, ON THE INERTIAL CONFINEMENT FUSION PROGRAM

THE DOE INERTIAL CONFINEMENT FUSION PROGRAM

Inertial confinement fusion as a distinct mission of the nuclear weapons program is now a decade old. It is worth while to look back over the past decade in order to put in perspective the future program for which the Department is requesting funding in fiscal year 1981 of \$202 million.

BACKGROUND

In the late 1960's the classified U.S. program at Livermore was broadened to include the Los Alamos and Sandia, Albuquerque, laboratories. The program then pursued two main lines of attack on the inertial fusion problem: development of a theory of irradiated pellet behavior, and development of high power lasers to test this theory. Independent efforts were initiated at Battelle-Columbus, the University of Rochester, and KMS Fusion, Inc. Much more vigorous efforts than the total U.S. program were then being carried on in France and the Soviet Union.

The goal of the U.S. weapons program effort was to pursue this extremely difficult scientific problem in areas of physics that were of interest to nuclear weapon designers. The key technologies of lasers and diagnostics were also capabilities that could be important in many ways to the nuclear weapon laboratories. Simply attempting to achieve inertial fusion conditions, and developing the capability to perform and diagnose experiments, was considered to be an important stimulus to the nuclear weapon design teams in the laboratories.

FISCAL YEAR 1981 ICF BUDGET SUMMARY

[By fiscal years, in millions of dollars]

	1980 budget authority	1981 requested authorization	1981 requested appropriation
Operating:			
ICF.....	110.8	158.2	158.2
Program direction.....	1.1	1.3	1.3
Total, operating.....	111.9	159.5	159.5
Equipment.....	8.5	11.0	11.0
Construction.....	71.5	65.7	31.5
Total.....	191.9	236.2	202.0

ICF CONSTRUCTION PROJECTS

[By fiscal years, in millions of dollars]

	Total estimated cost	Through 1980		1981	
		Authorization	Appropriation	Authorization	Appropriation
75-3-B: High energy laser facility (Antares) LANSL.....	62.5	54.5	38.7	8.0	14.0
78-4-A: High-energy laser facility (Nova) LLNL.....	195.0	195.0	79.0	0	0
80-AE-11: Target fabrication facility LANSL.....	15.3	1.0	1.0	14.3	7.0
80-AE-12: Target fabrication facility LLNL.....	7.6	1.0	1.0	6.6	5.5
81-D-101: Particle beam fusion accelera- tor (PBFA-II) SNLA.....	39.25	25.	2.5	36.75	5.0
Total.....				65.65	31.5

By the early 1970s, the additional goal of the core program to provide an energy source using virtually inexhaustible fuel was established. It was recognized

that achievement of this larger goal carried a much higher risk and would entail a much longer development effort than the purely technical goals of the existing effort. By the mid-1970's thermonuclear neutrons had been produced and their origin verified. Glass and gas laser technologies had been sufficiently well established that we could begin vigorous efforts to scale these lasers to high energy and high power operation. Pulse power technology was adapted to fusion requirements. Conventional heavy ion accelerator technology began to receive serious attention in the late 1970s. The rapid expansion of the size of the program, both in the core laboratories and in other Government, industrial and university laboratories, marked the transition from a predominately theoretical to an applied research program.

The effort to scale up the driver technologies in support of more and more realistic target experimentation has been largely successful. There has been a remarkable growth in understanding of the physics of energy absorption and transport in target materials. The original scientific expectations of this technology have, if anything, been exceeded in areas of physics that are not accessible by means of conventional testing activities. The large facilities now under construction are a major resource for maintaining the viability of weapons design personnel in the nuclear weapons program in the event of a comprehensive test ban. The laser and particle beam technologies and diagnostic instrumentation are important acquisitions to the weapons program and complement similar technologies being developed by the Department of Defense.

The development of all these scientific and technological capabilities is an important goal of the program and the most immediate payoff for the Nation. It is now possible to identify the key problem areas, the resolution of which will lead to the demonstration of controlled thermonuclear fusion by inertial confinement and provide a new basis for understanding selected areas of nuclear physics and weapons technology. These key problem areas are being assigned to teams of core and supporting laboratories in order to maximize the chances of eventual success and make the best use of the resources devoted to the program. I believe this is a major accomplishment and signifies a rapidly maturing program.

#### REQUIREMENTS FOR APPLICATIONS

Looking to the future, we can now identify with some confidence the characteristics required for specific applications of inertial fusion technology. For both nuclear weapons research and for civilian energy applications it will be necessary to demonstrate conclusively that high energy gain can be produced from small masses of fusion fuel. This objective, which is common to both applications, is being achieved with large single pulse drivers which offer the most cost effective approach to target research. High gain is an end in itself for the military applications, which are the study of weapon physics and weapon effects under carefully controlled, readily reproducible conditions. For civilian energy production, it will be necessary also to develop driver and target systems capable of reliable, repetitive operation. Containment of this energy and transfer as heat, and the fusion fuel cycle, would require engineering developments that overlap or closely resemble those of the magnetic fusion energy program. Much of the energy systems engineering would be analogous to that of the breeder reactor program. Thus inertial fusion would benefit in important ways from the basic engineering of the other advanced nuclear energy programs. This will be a very long-range effort; however, we see at this time no scientific or technical problems that would prevent demonstration of feasibility. We continue to believe that it should be a national priority to determine as soon as practical that inertial confinement fusion is in fact a real energy option for the United States and for others.

#### SCIENTIFIC FEASIBILITY DEMONSTRATION

Let us now look at the feasibility demonstration objective in some detail. Our present understanding of the driver and fuel pellet interaction leads us to believe that high energy gain from targets will be achieved only when we can provide more than a megajoule of energy to suitable targets. This will be two orders of magnitude—a hundred times—more energy than we can now effectively deliver to targets. This large beam energy requirement arises from the extremely complex interaction of laser beams with targets. Only a small fraction of laser beam energy is transported into the fuel to compress it to fusion conditions. This

simply means lasers are less efficient in transferring their energy than we had expected. In addition, there is the other critical inefficiency of lasers, which are electrically very inefficient. Cumulatively these inefficiencies mean that for known lasers the cost will be very high for the driver portion of a high gain demonstration facility. Particle beam technologies provide relatively high electrical efficiency, but there are important uncertainties concerning our ability to focus short pulses of particle energy tightly enough to reach the required power density on target. The most important issue in ICF is therefore the selection of the best high gain driver option from among the laser and particle beam technologies now being developed. In the multi-megajoule energy range, driver issues and interaction physics issues both must be considered.

#### HIGH GAIN DRIVER OPTIONS

Let us now look more closely at the driver options. The first in terms of its stage of development is the neodymium glass laser. A series of large systems developed at Livermore has provided the main experimental basis for the program. Smaller systems are in operation at the University of Rochester, KMS Fusion, and the Naval Research Laboratory. We will continue to rely on glass lasers to provide most of the immediate target interaction data in the program. This will make the best use of the large national investment in the development of these lasers and the experimental and theoretical effort associated with them.

One result of the glass laser development effort has been to drive down significantly the cost per joule of energy from glass lasers on target. Still, a multi-megajoule glass laser would have to store enormous amounts of energy for each pulse because its electrical efficiency is well below one percent. Theory, and some initial experiments, indicate that light from lasers operating at much shorter wavelengths than the one-micron wavelength characteristic of neodymium lasers would be more efficiently absorbed by targets. If this effect is a strong one, and if the short wavelength laser is also electrically more efficient, a much smaller facility would accomplish the high gain demonstration. Fortunately it is practical to shorten the wavelength—i.e., double or triple the frequency—of glass lasers by the use of special crystals. It also appears to be practical to develop damage resistant coatings for optics that will permit high energy operation of frequency-converted glass lasers. By this means we can study the target interaction of short wavelength lasers before they are actually developed. This capability now exists at Livermore and KMSF, and could be added to the Nova facility at moderate additional cost provided that large area optics and new coatings are developed in the next few years.

The main effort in glass laser experiments will be experiments on the Shiva system at Livermore using longer pulses of energy to drive targets to higher density. Long pulse experiments will more nearly approximate the conditions we expect to encounter with Nova. Supporting efforts will be hydrodynamic modeling of target behavior at the Naval Research Laboratory and investigation of target behavior under more nearly symmetrical illumination provided by the system at Rochester. The KMSF Chroma and Livermore Argus systems will be devoted mainly to short wavelength experiments to verify that absorption improves at the half- and third-micron wavelengths. The Nova system, which is now expected to be in operation by 1984, will be a large step forward in the direction of operation under more realistic fusion conditions. Nova at the 100 kilojoule level will be about an order of magnitude above that of Shiva.

The second driver under investigation is the carbon dioxide gas laser. The Helios system at Los Alamos is gradually being improved to meet its design level of 10 kilojoules on target. Its immediate task is to provide comparative data on target coupling at the 10-micron wavelength of CO<sub>2</sub> laser light. There currently appear to be some disadvantages to this longer wavelength for target coupling. There is a critical need to establish whether these long wavelength problems will be reduced to acceptable levels as we scale the lasers to high energy and power. This is because CO<sub>2</sub> has the highest efficiency of any lasers that could now be scaled to fusion requirements. We are requesting funds to complete the Antares CO<sub>2</sub> laser facility with two of its planned six modules so that experimental data can be obtained as soon as possible at about ten times higher energy than is now available from Helios. Antares is the only means to obtain the required 10-micron target interaction data.

The third driver option is light ion beams produced by pulsed power machines. The Particle Beam Fusion Accelerator scheduled to begin operation next summer will produce a beam of light ions with an energy of a megajoule—more than enough for ignition and breakeven experiments—but the power density on target may be too low for driving targets to significant thermonuclear burn. This facility was planned originally to be upgraded to double the number of beams. We are requesting funds to begin construction of the second phase of this facility in the fiscal year 1981 budget. Preliminary design work indicates that the beam energy can be raised to nearly four megajoules and the power to above 100 terawatts, which should be sufficient to drive targets to gain unity and perhaps beyond to net energy gain. Light ion accelerators are relatively simple and inexpensive compared to both lasers and heavy ion accelerators. Their very high energy levels are useful for weapon effects simulation. If the power concentration issues can be resolved favorably, PBFA-II could be the basis for high pellet energy gain demonstration in the next major program facility beyond the generation of facilities now under construction.

The remaining high gain options are to develop a short wavelength, electrically efficient laser and to adapt conventional high energy particle accelerator technology to produce beams of heavy ions suitable for target implosion. Both these approaches have already been studied sufficiently to identify concepts suitable for scaling demonstrations. In the FY 1981 budget we are requesting funds to develop two test beds for the krypton fluoride laser and for two design approaches to a heavy ion accelerator. With the scaling information from these test bed demonstrators in hand, we expect to be able to select in the mid- to late-1980s the best driver and pellet system for high gain demonstration and the downstream applications of inertial fusion.

It is important to stress that all these drivers are high gain options—i.e., any one of them may be the best single choice for development to the multimegajoule level in order to demonstrate conclusively that high gains are possible from pellet fusion. This is a requirement for the feasibility of both the military and civilian applications of inertial fusion. At the time when calculations indicated that ignition and burn up of most of the fuel could be initiated at a few tens or a hundred kilojoules, it was possible to view the advanced lasers and heavy ions as candidate drivers for civilian applications only. The present indications are that megajoule-size experiments may be required for high gain implosions. The apparent advantages of these drivers and their required development times are consistent with program needs for a high gain target facility that would operate in the early 1990s. The highest confidence driver for this facility may well prove to be either an advanced short wavelength laser or a heavy ion accelerator.

Before leaving the subject of high gain driver options, and turning to the interaction physics area of the program, it is well to summarize the driver development logic:

- Scaling up the best understood drivers—glass and CO<sub>2</sub> lasers, and light ions—as rapidly as possible in order to support increasingly realistic target experimentation;

- Developing test beds to demonstrate the capability of scaling short wavelength lasers and heavy ion accelerators to the energy levels that would be required by high gain fuel pellets;

- Selecting in the mid-1980s the optimal driver for high gain demonstration and downstream applications.

The near-term impact of this strategy is to develop large single-pulse driver capabilities in the national weapons laboratories to support both weapons-technology related experiments and feasibility demonstration experiments. Supporting efforts in advanced driver development would be drawn from other Government laboratories, industry and to some extent universities.

#### TARGET INTERACTION PHYSICS

The interaction physics effort is based on the unique capabilities of the weapons program to draw upon classified weapons-related experience and on the theory and computational capabilities of the weapons laboratories. Supporting laboratories can and do provide important additional experimental capabilities. However, the critical theory effort is necessarily that based directly on weapons experience. Experiments, called HALITE at Livermore and CENTURION at Los Alamos, address the fundamental questions of ignition and propagating burn in small

fuel capsules. This activity could, if successful, establish the minimum energy requirements for obtaining high gains from inertial fusion-scale pellets before megajoule class laser or particle beam facilities are constructed. We are requesting funds to support a joint effort of Los Alamos and Livermore to accomplish at least one such test each year.

It is necessary to demonstrate the ignition of targets using laser or particle beam drivers. The major facilities now planned or actually under construction will address this objective. The Nova glass laser facility at Livermore is the primary ignition experiments facility. In its first phase, operating at 100 kilojoules and 100 terawatts, Nova will probe the threshold of ignition. Nova experiments will also provide critical information on the scaling to higher energies of the energy absorption, transport and implosion phenomena which we are now beginning to understand in some detail from recent experiments. In its second phase, which has been authorized but for which no appropriations have been requested, Nova would operate at the 200-300 kilojoule level at which calculations indicate ignition will be achieved. In the interest of maintaining balance within the available resources, we are not requesting appropriation of funds for Nova in fiscal year 1981.

DOE is requesting that the authorized scope of the Antares gas laser facility at Los Alamos be changed to permit us to bring the facility into operation earlier than would otherwise be possible with two of the planned six beams. This would provide about 40 kilojoules on target, a factor of ten more energy than is currently available from Helios, and permit critical scaling experiments to be performed in time to impact the driver selection process in the mid-1980s. There is an urgency to determining the magnitude of the absorption, transport and implosion problems observed at the CO<sub>2</sub> laser's very long wavelength as we achieve higher energy on target. The laboratory believes that adequate information can be obtained at the 40 kilojoule level to estimate CO<sub>2</sub> laser target performance to the threshold of ignition. By introducing phased construction into this project we will be able to avoid the substantial increase in the total project cost that would be required to complete the facility at the 100 kilojoule level. We will be better able to judge at a later time the scale of the full Antares if proceeding with the larger facility is indicated by experimental results.

The Particle Beam Fusion Accelerator at Sandia will begin operation during fiscal year 1980. In the near term this program element will focus on beam formation, transport and concentration issues rather than fusion experiments. The Proto II facility, which has been in operation since 1977 and has gradually improved in performance, has been converted to light ion generation and will be available to test target designs for use on PBFA-I when the latter comes into operation as a target shooter in 1982-83. We are requesting in the fiscal year 1981 budget initial construction funds to double the number of beams in PBFA and raise its performance to 4 megajoules and 100 terawatts. If light ion beam-handling work proceeds on schedule and continues to be successful, PBFA-II may demonstrate ignition of targets and reach breakeven, possibly even net energy gain. Because of the expected high efficiency of these pulse power machines, a gain on the order of 3 to 5 would achieve this major program milestone. The PBFA-II project also provides for a laboratory area for developing repetitive pulse technology. The very high energy level of PBFA-II will also provide to the weapons program an important laboratory weapon effects simulation capability.

The supporting research budget category includes glass laser experiments at the Naval Research Laboratory, KMS Fusion, and the University of Rochester, and pellet fabrication work at KMSF. These are now closely integrated with the core program at Livermore. This budget category also includes funds for developing advanced short wavelength laser test beds and test beds for two approaches to heavy ion acceleration. These will be very small scale technology demonstration machines rather than target shooters. Target interactions characteristic of these advanced drivers will be studied using frequency-altered glass lasers, Argus at Livermore, Chroma at KMSF, the University of Rochester laser, and light ion machines at Sandia. The capability to study the target interaction physics of advanced drivers, years in advance of actually developing these drivers to high energy and power, permits the program to explore these high gain driver options in the near term at relatively low cost.

In addition we are requesting a significant increase in capital equipment funds for the program in fiscal year 1981. This part of the program has been funded

at a flat rate in recent years, and has had to support key equipment items to bring the six-beam Zeta system at Rochester into operation as a target shooter. Beginning in FY 1981 the DOE-sponsored share of experimental activity on this facility will be supported, as indicated above, out of the supporting research funds.

The remaining construction funds requested are for proceeding with the construction of target development facilities at Livermore and Los Alamos. These activities are now inadequately housed in temporary units. Increasingly complex targets need to be developed and fabricated to very close tolerances in order to relax somewhat the demands on the driver facilities. The new target facilities are urgently required to support experiments on the Nova, PBFA and Antares facilities.

#### SUMMARY

The fiscal year 1981 budget will shift the program into better balance to address in the 1980s the key physics milestone of target ignition. Provisions of funds for HALITE/CENTURION activities will permit the program to address the possibility of achieving ignition and propagating burn in the near term. Completion of the planned driver facilities in the core program will permit the program to address the ignition milestone with confidence in the 1983-87 timeframe. This activity will be supported and the risks significantly lowered by the provision of target development facilities and closely integrated supporting research activities in the outside program. Finally, a beginning will be made in the direction of qualifying advanced drivers so that the program can select with high confidence the best driver option for scientific feasibility demonstration by the early 1990s. We believe this balanced program, and the closer integration of supporting research with the core program, will make the best use of program resources in the next few years.

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#### PREPARED STATEMENT OF DR. JULIO L. TORRES, ACTING DIRECTOR, INTERNATIONAL SECURITY AFFAIRS, U.S. DEPARTMENT OF ENERGY

Mr. Chairman and members of the committee, it is my privilege to appear before you today to testify on behalf of the Department of Energy's FY 1981 budget request for the Verification and Control Technology Program.

#### INTRODUCTION

This program has four specific goals:

To provide the technology base and production capability for systems necessary to monitor foreign nuclear tests, to monitor nuclear-weapons related treaties, and to monitor our own nuclear tests at the Nevada Test Site.

To conduct nuclear weapons related analyses necessary to help resolve nuclear policy issues, and support treaty initiatives.

To provide the Department's unique weapons and nuclear-related expertise to the Intelligence Community.

To execute the Department's responsibilities in controlling proposed exports of nuclear and energy-related materials, equipment and technology to determine whether they are in the national security interest and consistent with U.S. non-proliferation policy.

Budget authority for FY 1980 was \$37,860,000 and the request for FY 1981 is \$39,391,000, which takes into account the President's budget revision. The requested increase of \$1,531,000 is to: continue development and acquisition of National Seismic Stations (NSS) for use in the domestic Regional Seismic Test Network (RSTN) research program; appreciably increase the scope of non-seismic detection technology initiatives; and increase analytical activity in foreign energy technologies.

The principal activities within the Verification and Control Technology Program are concerned with the research, development, test and evaluation of systems used for the detection, identification, location and characterization of nuclear explosions in underground, atmospheric and near space environments. This activity directly supports: the verification requirements of nuclear test ban treaties and their negotiations; and the monitoring of United States underground nuclear tests.

The Verification and Control Technology Program consists of three basic elements. These are: (a) a base technology program, (b) an applications program, and (c) an operational component.

#### BASE TECHNOLOGY

The base technology program, for which \$7,000,000 is requested, provides for research in nuclear explosion detection disciplines and seeks to develop new techniques and methods for event characterization through seismic and non-seismic means. The present activity concentrates on the seismological properties of various geophysical conditions as they relate to regional seismic research, correction techniques in regional propagation phenomenology, fundamental properties of the earth's mantle as a propagation medium, and detection and characterization theory in nonseismic media.

Another base technology effort seeks to gain a more precise understanding of the fundamental properties of the earth's magnetosphere as it relates to the detection and characterization of nuclear events. Directly supporting overall U.S. surveillance systems, the base technology element supports a continuing effort directed toward sensor technology improvement. A significant effort, particularly at Sandia Laboratories, continues in terms of understanding radiation interaction with specific classes of microelectronic components, as well as the development of consistent and repeatable manufacturing techniques.

#### APPLICATIONS

The applications segment of the Verification and Control Program provides the necessary hardware and production capability for satisfying national treaty monitoring requirements. The requested funding level for this portion of the Verification and Control Technology Program is \$16,051,000.

The most significant effort in FY 1981 in terms of dollar costs and system complexity will be a continuation of the National Seismic Stations acquisition program to meet technology development requirements. The program will demonstrate the discrimination capability of regional phenomena for nuclear monitoring.

The stations, essentially unattended in current design, consist of below ground seismometers and a data authentication package and an above ground segment containing power conditioning and communications components which enable the direct transmission of seismic data via satellite. The stations, founded on past developments within the base technology program, have been tested through the prototype stage at an existing installation in Tennessee. A second station is being deployed in Alaska in 1980, for testing in an environment consistent with that expected in low-satellite-angle, permafrost areas. These stations, under continuing construction in FY 1980 and FY 1981, will be used to establish a Regional Seismic Test Network for the purpose of further refining the design, completing regional seismicity studies and gaining experience in northern hemisphere geophysical environments.

Another important element of the production program satisfies requirements for nuclear detection sensor systems; a program which has been traditionally unique to the Department of Energy and its predecessor organizations.

#### OPERATIONS

The third component of the program, projected to cost \$8,900,000 in FY 1981, provides operational support to deployed systems, covers installation costs and generally supports data collection and processing expenses for test, evaluation, operation and analysis of program-related activities.

The operational segment also provides resources for the maintenance and readiness of the equipment and personnel necessary to fulfill provisions of the not yet ratified Peaceful Nuclear Explosions Treaty (PNET). This equipment, maintained at the Nevada Test Site, would be deployed to insure the peaceful character of the explosion and to assure that yield limits, specific to the Treaty, are complied with.

A considerable FY 1981 effort, costing \$4,875,000 will be undertaken within the Verification and Control Technology Program for analytical activities which

support arms control negotiations and, the export control function of the Department of Energy.

The assessment of energy strategies and technology development programs assists in the formulation of U.S. domestic energy policies, in the direction of U.S. energy development programs, and in the management of international programs of cooperation.

The analytical activity of most current interest and significance relates to nuclear non-proliferation and is in direct support of the Nuclear Non-Proliferation Act of 1978 and DOE responsibilities under part 57b of the Atomic Energy Act. This effort directly utilizes the technical expertise within the DOE nuclear weapons complex and complements U.S. activities and policies relating to export control and agreements of nuclear cooperation with foreign countries.

Capital equipment:

Fiscal year 1980 appropriations-----	\$1,060
Fiscal year 1981 request-----	\$800

Capital equipment expenditures support research, development, test and production activities through the provision of test equipment and instrumentation related to the total program. FY 1981 reflects a decrease of \$260,000 in requested funds as some of the initial requirements related to National Seismic Station development are being satisfied in FY 1980. There is, however, a continuing need to update test equipment.

Personnel resources:

Fiscal year 1980 appropriations-----	\$1,725
Fiscal year 1981 request-----	\$1,765

Personnel resource funds, increased by \$40,000, provide for the personnel salaries, benefits, staff support, advancement and normal administrative costs for 42 full time and three other-than-full time staff members associated with the management and direction of this program at the Headquarters facility located in Washington, D.C. These employees are responsible for the management, administration and technical support of the program and associated activities, such as budget formulation and execution, maintenance of program records and accounting for program funds. The technical management staff devotes primary attention to program activities such as:

Coordination and continuous review of research, development, test and fabrication of verification and control technology instrumentation and equipment accomplished in the weapons complex.

Participating in interagency working groups of the National Security Council related to arms control, non-proliferation and export control matters.

Participating in committees of the Director of Central Intelligence in matters relating to foreign nuclear weapons and foreign nuclear and non-nuclear energy programs, capabilities, and resources.

Processing export license applications related to the control of nuclear materials, technology and production.

Participating in arms control negotiations as a member of the United States delegation, when appropriate.

Assessment of information related to nuclear proliferation.

Planning organizing and developing analytical and technical efforts in direct support of emerging national requirements in areas of arms control, nuclear intelligence, and the control of critical technologies.

Mr. Chairman, this concludes my prepared statement. If there are any questions, I would be pleased to respond.

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PREPARED STATEMENT OF MR. GEORGE WEISZ, DIRECTOR, OFFICE OF SAFEGUARDS AND SECURITY, U.S. DEPARTMENT OF ENERGY

Mr. Chairman and Members of the Committee: I am pleased to have this opportunity to present to you the proposed program for the Department of Energy's (DOE) Office of Safeguards and Security in fiscal year 1981.

We are requesting \$46.7 million in budget authority for the fiscal year 1981 program effort—\$43.3 million for operating expenses, including \$3.8 million for personnel resources, as well as \$3.4 million for capital equipment. I will address each of these during the course of my presentation.

## CHART 1

DEPARTMENT OF ENERGY—NUCLEAR MATERIALS SECURITY AND SAFEGUARDS,  
FISCAL YEAR 1981 BUDGET REQUEST

[By fiscal years, budget authority in millions of dollars]

	1980	1981	Change
Operating expenses <sup>1</sup> .....	39.5	39.5	-----
Capital equipment .....	3.4	3.4	-----
Program direction .....	3.7	3.8	+0.1
Total .....	46.6	46.7	+ .1

<sup>1</sup> Excludes program direction.

The primary responsibility of the Office of Safeguards and Security is to work with responsible DOE program managers to assure that adequate protection is provided to DOE nuclear weapons, facilities, materials, and classified information against theft and sabotage by potential adversaries. In carrying out this responsibility, we set policy, manage a program of research and development, coordinate with responsible DOE program officials, and provide oversight on effective implementation.

We support DOE program managers and field managers who are responsible for the facilities and operations in a number of ways. We provide DOE-wide policies, standards, and guidance on what threats these facilities and operations have to be prepared to successfully counter, and what requirements must be met by their safeguards and security systems to be effective.

We manage a research and development program. A large part of this program is aimed at developing and evaluating safeguards and security instruments, components, subsystems, and procedures to provide a base of technology which can be used by the field and program managers in providing adequate protection for both existing and new facilities. Another major part of this research and development program is oriented toward assisting the DOE contractors in putting together new safeguards and security systems or adapting existing ones that integrate physical protection, material control, and material accountability. Such systems must be relevant to field needs and effective against the perceived range of credible threats. Actual implementation and operation of the safeguards and security systems for protecting weapons, nuclear materials, facilities and classified information are funded by the responsible program managers. We coordinate with the program managers and support field implementation of these systems. We are also taking steps to minimize the potential consequences of malevolent threats or acts through contingency planning and the use of special emergency response resources.

Finally, we have an oversight responsibility which includes the review of the implementation of safeguards and security at DOE facilities to assure that the policies and standards are being adhered to and that the systems in place are indeed adequate and effective in countering perceived threats.

While our major responsibility must be to support DOE managers in assuring adequate protection of nuclear weapons, facilities and materials, this same technology base, with some modifications, supports a number of other important activities as well.

Many of these same components and systems are directed toward helping assure that non-nuclear resources of DOE, particularly those important to national security and the public well-being, receive effective protection against potential adversaries. Additionally, we make available to the private nuclear industry and the Nuclear Regulatory Commission (NRC), safeguards and security information which can enable them to provide and assure adequate protection of nuclear materials and facilities in the private sector. It should be noted that we jointly manage a nuclear material information system with the NRC and cooperate closely with them to maintain comparably effective protection at DOE and licensed facilities. The program also focuses on providing safeguards technical support to U.S. and international activities designed to minimize the possible proliferation of nuclear weapons. In particular, this involves participation in U.S. efforts to identify and promote promising nuclear fuel cycles support of the International Atomic Energy Agency (IAEA) in its safe-

guards objectives to effectively inspect powerful nuclear activities; cooperation with other nuclear nations in protecting their materials and facilities, particularly those supplied by the U.S.; and conducting a limited data exchange program on international nuclear materials transactions.

It is quite important in understanding the safeguards and security program to recognize that it is a dynamic discipline. Adversaries change with time as do their capabilities and intentions; targets become more numerous, more varied, and more or less attractive for adversary actions; and our capabilities for protecting such facilities continue to increase. Threats vary with location and changes in the socio-political climate, and public tolerance of risks is modified with experience. As a result, what was adequate in the past may be more than adequate or insufficient in the future. Therefore, the process of providing safeguards protection and assuring the adequacy of the protection is a continuing one. As part of this, our perceptions of the threat have changed from time to time, and no doubt will continue to be modified as a reflection of future events. Likewise, safeguards system requirements must also continue to change with time. I will now turn to the budget request.

#### OPERATING EXPENSES

The FY 1981 budget request for operating expenses, excluding program direction, is \$39.5 million, the same amount as was appropriated for FY 1980. As mentioned, these funds support two sets of activities: a research and development program and an operational support program.

#### CHART 2

#### DEPARTMENT OF ENERGY—NUCLEAR MATERIALS SECURITY AND SAFEGUARDS, FISCAL YEAR 1981 BUDGET REQUEST

[By fiscal years, budget authority in millions of dollars]

	1980	1981	Change
Research and development:			
Threat/risk characterization .....	1.4	1.4	-----
Safeguards evaluation and methodology .....	1.6	1.8	+0.2
Technology development .....	12.3	12.9	+ .6
Systems design and implementation .....	16.3	13.4	-2.9
Operational support programs:			
Incident management .....	1.3	2.0	+ .7
Assessments .....	.6	.6	-----
Safeguards analytical laboratory .....	2.1	2.3	+ .2
Nuclear materials management and safeguards system .....	2.6	3.4	+ .8
International training and technology transfer .....	1.3	1.7	+ .4
<b>Total, operating expenses .....</b>	<b>39.5</b>	<b>39.5</b>	<b>-----</b>
Total, capital equipment .....	3.4	3.4	-----
Total, personnel resources .....	3.7	3.8	+ .1
<b>Total .....</b>	<b>46.6</b>	<b>46.7</b>	<b>+ .1</b>

#### RESEARCH AND DEVELOPMENT

The objective of the research and development program is to provide safeguards and security methods, components and systems which, when implemented, are effective against a range of potential credible threats.

#### THREAT AND RISK CHARACTERIZATION

Fundamental to the entire program is an understanding of the range of possible adversaries and targets and the consequences of potential hostile acts. In FY 1980 we are broadening our threat and risk evaluations in several dimensions. First, we are initiating studies with the objective of improving our understanding of the potential problems from people inside our systems, including strategies to deter or defeat such adversaries. We are also improving our ability to identify important risks and vulnerabilities, including the social and political dimensions of the threat and use of plutonium as a radiological weapon. A limited number of such non-technical studies are or will be competitively con-

tracted and represent a conscious intent to broaden participation in this multidisciplinary program.

A comprehensive evaluation of risk and consequences of possible malevolent acts against DOE facilities will be completed in fiscal year 1981. This effort should provide the basis for identifying major vulnerabilities that will require additional policy changes, R&D, security enhancements, and further studies. The risk and consequence assessments will be coupled with our continuing evaluation of the characteristics and attributes of adversaries to produce more refined guidance with regard to the major threats these facilities face.

We are requesting \$1.4 million for these activities in fiscal year 1981.

A key policy product which will be developed in part with support from these studies will be the issuance of a revised threat guidance. The guidance will provide important benchmarks against which the effectiveness of the safeguards in place at DOE's nuclear facilities can be measured. Its adaption to apply to DOE nonnuclear facilities, such as the Strategic Petroleum Reserve Office will be addressed. Additionally in fiscal year 1981, a mechanism to periodically review and issue this threat guidance will be implemented. This will add an ability to identify short term changes in threat that can be responded to by operational changes.

#### SAFEGUARDS EVALUATION AND METHODOLOGY

We are requesting \$1.8 million for "Safeguards Evaluation and Methodology" development. This is the first step in the safeguards research and development process to develop countermeasures to nullify the threat. It involves application of methods to systematically highlight design requirements of safeguards systems, highlight deficiencies of existing systems, and assist us in evaluation of the effectiveness of those systems. The fiscal year 1981 effort will be directed at making greater use of computer simulation models and data processing equipment to improve the design and evaluation of safeguards systems.

#### TECHNOLOGY DEVELOPMENT

Vulnerabilities and potential countermeasures identified in the concepts are used as a basis for "Technology Development" to adapt or design, develop and evaluate prototype instrumentation and components under controlled conditions as well as in an operational environment. For FY 1981, we are requesting \$12.9 million. This funding will permit continued emphasis on the development of advanced nondestructive assay (NDA) instrumentation and better measurement standards to solve problems in measuring special nuclear material (SNM, which is plutonium and enriched uranium)<sup>1</sup> in a more rapid, accurate way and with reduced direct access or exposure to operating personnel. The instrumentation is being designed to go on-line on normal process streams, where possible, and will be used for scrap and waste processing and spent fuel storage. The objective is to provide information on the location and condition of SNM in a more timely and accurate manner to minimize inventory differences and detect attempted diversions. Additionally, we will continue to develop improved components and systems to provide means for more positive control of personnel entering into or leaving a facility or having access to SNM. This will include better intrusion detection equipment which is more sensitive and less susceptible to false alarms, and more reliable and sensitive devices to detect metal, explosives, and SNM. A prototype of automated equipment for positive personnel identification and control will be tested and evaluated by the end of FY 1981.

By FY 1981, exterior and interior intrusion sensors and closed circuit TV cameras will be advisable as state-of-the-art technology for use by field managers. We will also complete major development and evaluation of active and passive barrier technologies. Other physical protection activities will include work on improved guard communication equipment, and sensor systems test and evaluation.

FY 1981 work will include an extension of these efforts. Potential improvements in microwave and other exterior sensors, more effective ways of applying video motion detection techniques, and the combination of intrusion detection sensors will also be investigated.

<sup>1</sup> Isotopes U-233 and U-235.

## SYSTEMS DESIGN AND IMPLEMENTATION

\$13.4 million is identified for system design and implementation activities. These activities will build directly on FY 1980 activities for developing integrated safeguards systems. System design activities include the development of a national spent fuel storage system design and associated equipment development, and system concepts for major nuclear facilities. In addition, we are developing a systematic approach to assist program managers in protecting non-nuclear DOE facilities of national security significance against malevolent acts.

The system implementation effort provides direct safeguards and security expert assistance to field offices and DOE contractors to help them assure that DOE's facilities have adequate safeguards and security systems. The system implementation in both FY 1980 and 1981 will support safeguards at specific major DOE installations<sup>2</sup> as well as provide more generic support through guard armed engagement education. Other implementation support tasks will focus on establishing news systems and procedures, and identifying sources of malfunctions in existing equipment.

## OPERATIONAL SUPPORT PROGRAM

*Incident Management*

Management capability for dealing with safeguards and security incidents will continue in FY 1981. We are requesting \$2.0 million for this activity. The Incident Management activity is required to manage incidents resulting from malevolent acts or threats directed against DOE facilities or operations or threats involving improvised nuclear explosive or dispersal devices. In FY 1981, the activity will continue its direct support of the Nuclear Emergency Search Team (NEST) in terms of enhancing NEST capabilities for search and diagnostics involving improvised nuclear devices. In addition, we have established a capability for rapidly determining the credibility of communicated threat messages. This capability has greatly facilitated our ability to respond appropriately to the many threats which are directed at DOE interests. Finally, in order to assure an effective organizational response to an emergency, we conducted a major exercise which involved the major emergency response elements of the Department as well as the FBI.

The expansion of the Incident Management function in FY 1981 will enable us to establish and maintain access to a terrorist data base for utilization during an incident. Also, we will define our system requirements for response to emergencies at major non-nuclear DOE facilities.

*Assessments*

An assessments program to conduct independent reviews of the effectiveness of DOE systems for protection of DOE's national security level interests is supported under the operational support program. This activity, which is under the direct supervision of the Assistant Secretary for Defense Programs, consists of reviews of the quality of management interaction and the effectiveness of DOE protective systems. In FY 1980, reviews will be conducted of three field offices including certain facilities under their administration; for FY 1981, this program is planning to conduct reviews at approximately six field offices as well as conduct special studies as requested by the Assistant Secretary. The budget request for these increased activities in FY 1981 is \$0.6 million.

*Safeguards Analytical Laboratory*

The "Safeguards Analytical Laboratory" is a subprogram for which we are requesting \$2.3 million for FY 1981. The Safeguards Analytical Laboratory provides nuclear materials measurement support to the defense programs and monitors DOE contractors' measurement performance, and develops analytical standards and measurement procedures. This laboratory provides similar services to the NRC and the IAEA on a full cost recovery basis.

*Nuclear Materials Management and Safeguards Systems (NMMSS)*

The NMMSS is a computerized nuclear materials information and safeguards data system for which we are requesting \$3.4 million for FY 1981. This data system provides the central repository for storage and retrieval of information on 19 nuclear materials vital to DOE production and defense programs, including those under safeguards control. Input to the NMMSS is provided by all DOE

<sup>2</sup> They include: LANSLS, TA-55; Oak Ridge, Y-12; Savannah River, Production Reactors; Idaho Falls, Zero Power Plutonium Reactor (ZPPR).

contractors and private firms licensed by the NRC. U.S. nuclear materials furnished under international agreements to foreign countries are also tracked by this system. In FY 1981, NMMSS will be modified to enable the U.S. to meet its formal reporting requirements to the IAEA under the terms of the U.S. offer to place selected non-defense nuclear facilities under IAEA safeguards. Those requirements will become effective following Senate ratification of the U.S.-IAEA safeguards agreement.

#### *International Training and Technology Transfer*

The final "International Training and Technology Transfer" effort involves the transfer of safeguards technology to the International Atomic Energy Agency and the international community. This effort, which is closely coordinated with the Department of State, the Arms Control and Disarmament Agency, and the Nuclear Regulatory Commission, provides for rapid transfer of newly developed safeguards technology and information as appropriate to the IAEA and to other countries to enhance international safeguards. For FY 1981 we are requesting \$1.7 million. These funds will be used to conduct international training and transfer safeguards technology to the international community. The FY 1981 budget request provides the funds to allow these basic courses to expand to include more comprehensive training in physical protection and nuclear material control and accountability. This task is complementary to the Program for Technical Assistance to IAEA Safeguards (POTAS), which provides U.S. support for the transfer of DOE-developed technology to the IAEA. This program of about \$6.1 million is primarily funded on a reimbursable basis by the State Department. We provide management for the technical program.

This completes my description of the allocation of requested FY 1981 operating expenses.

#### CAPITAL EQUIPMENT

We are also requesting \$3.4 million for capital equipment not related to construction. This is the same amount as was appropriated for FY 1980. These funds will provide the capital equipment required for test and operational evaluation of the safeguards systems and subsystems modules mentioned earlier. This funding will provide the equipment and hardware for prototype safeguards systems being evaluated at plutonium processing, uranium enrichment, DOE material production reactors, spent fuel storage, and reprocessing facilities.

#### PERSONNEL RESOURCES

The FY 1981 budget request includes \$3.8 million for the Office of Safeguards and Security's program administration activities. These funds provide for the salaries, benefits, and travel expenses for 105 full-time, and five other than full-time Headquarters Federal employees associated with the technical direction and management of the safeguards and security programs. The staff also has oversight responsibility for ensuring cost-effective implementation of the Department of Energy's safeguards "crosscut" budget (approximately \$208 million in FY 1981) which is supported and funded by DOE program managers (largely within Defense Programs) to maintain and improve the effectiveness of safeguards and security systems at their respective Department of Energy facilities.

Personnel resources also provide for the salaries and related costs for the staff which operates and manages the Personnel Security Program. This activity involves the processing and analysis of over 24,000 security investigations per year. These resources also provide for administering the Program of Technical Assistance to IAEA Safeguards (POTAS).

#### *New Initiatives*

As I mentioned before, the nature of our protection program requires that we maintain the flexibility to react rapidly to changing safeguards and security needs. Thus, before concluding, I would like to highlight briefly some of the new initiatives we are undertaking through our office. First, we have taken positive steps to broaden the base of our technical and other programmatic support by involving a wider diversity of contractors in our development activities. This will provide new insight and perspectives and furnish a degree of independent peer review which will benefit the entire program.

In addition, it will allow us to integrate the human elements of safeguards into our program in a positive way. The Three Mile Island accident has borne witness to the fact that it is difficult to predict the responses of both personnel

and equipment to changes in complex systems. Safeguards and Security differs from safety, however, in that human motivations, capabilities, and responses play key roles in both causing and responding to safeguards incidents and, therefore, are even more fundamental to understanding and enhancing our effectiveness. In recognition of this fact, we are devoting increasing attention to the human component of safeguards and security systems. Activities in this area will include an improved security awareness program, the study of how safeguards and security systems may best be employed to complement the capabilities and responses of the individuals who must operate them, and the study of the deterrence features of those systems.

In discussing our threat characterization program it was noted that the most certain thing about the future is that it is uncertain. In light of this, we are taking steps to involve those most affected in the DOE field to participate in the development and dissemination of comprehensive and timely threat guidance. A major focus in FY 1981 will involve an in-depth evaluation of internal conspiracy as part of threat characterization.

Partly in response to this hypothetical insider threat and to minimize the chances that such a threat might become a reality, we are also taking some internal security initiatives for day-to-day operations within the Department. These initiatives include the study of a uniform government and contractor badge system, uniform access controls to and security for DOE computer systems, and a major new internal program of Operations Security (OPSEC). OPSEC is designed to protect classified and unclassified operations and activities from the inadvertent release of intelligence indicators which are susceptible to hostile intelligence exploitation. OPSEC will operate to raise the awareness of such potential problems and to identify and eliminate potential vulnerabilities.

In addition, we are also taking steps to focus more directly on two important responsibilities. First, our new systems implementation activity will work to ensure that the systems we develop are both cost effective and relevant to the actual protection needs of the DOE's managers. Second, in keeping with our defense-in-depth approach, the deployment of effective safeguards systems needs to be backed up by a comprehensive approach to effectively responding to malevolent attempts against those systems by criminal adversaries. To accomplish this function, we have initiated a Contingency Planning and Response element to plan for and provide the necessary resources for effective response to terrorist incidents involving DOE security interests.

I believe these new initiatives are enabling us to more fully and effectively prepare for, prevent, and if necessary, respond to serious malevolent actions.

#### CONCLUSION

In summary, Mr. Chairman, we are requesting an authorization of \$46.7 million for the Nuclear Materials Security and Safeguards program. We believe that safeguards and security equipment and systems have been improved in recent years and with your continued support, DOE safeguards and security activities will continue to improve in effectiveness in coming years. I will be glad to answer any questions the Committee may have.

Mr. SEWELL. Also, we are fortunate to have here today Mr. Robert Morgan, the new manager of the Savannah River operations office, of the Department of Energy.

In my testimony I want to address a few important topics, and then briefly summarize at the end the three programs—the inertial confinement fusion program, the verification and control technology program, and the safeguards and security program. Following that General Hoover and Dr. Gilbert will present a more detailed testimony on their program activities.

#### BUDGET

I would like to first summarize the budget of the fiscal year 1981 shown on the slide.

[Chart.]

## FISCAL YEAR 1981 BUDGET REQUEST—ATOMIC ENERGY DEFENSE ACTIVITIES

[By fiscal years, in millions of dollars]

	1980 <sup>1</sup>		1981	
	Authorization	Appropriation	Authorization	Appropriation
Weapons activities.....	1,738	1,654	2,056	1,972
Nuclear materials production.....	523	513	550	523
Interital confinement fusion.....	139	195	236	202
Verification and control technology.....	38	38	39	39
Nuclear materials security and safeguards.....	46	47	47	47
<b>Total, ASDP.....</b>	<b>2,484</b>	<b>2,447</b>	<b>2,928</b>	<b>2,783</b>
Defense waste management.....	292	278	331	337
Naval reactors, development.....	278	278	398	305
<b>Total, ASNE.....</b>	<b>570</b>	<b>556</b>	<b>729</b>	<b>642</b>
<b>Total, atomic energy defense activities.....</b>	<b>3,054</b>	<b>3,003</b>	<b>3,657</b>	<b>3,425</b>

<sup>1</sup> Includes fiscal year 1980 supplemental request of \$46,000,000.

As you noted, we are asking for \$3.65 billion of authorization for 1981. The authorization for defense programs is \$2.928 billion and the authorization for naval reactors and defense waste under Dr. Cunningham, the Assistant Secretary for Nuclear Energy, is \$729 million.

## UNIVERSITY OF CALIFORNIA CONTRACT STUDY

I would like now to just hit a few topics that this committee has expressed an interest in. The first is the University of California contract to operate the two nuclear design laboratories, the Lawrence Livermore National Laboratory and the Los Alamos National Laboratory. In the Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 the Congress required the Secretary of Energy to submit no later than February 1, 1980, a plan for the termination of the contracts with the Regents of the University of California for the operation of these two laboratories. The language of the authorization act indicates that the Congress recognized that the long-standing contractual arrangements with the Regents has served the Nation well and should continue as long as the national interest is being served.

Furthermore, the language expresses the concern of Congress over efforts to influence the roles and missions of the laboratories. Therefore, in the interest of preserving the defense and nuclear weapons primary mission of the laboratories, the Congress directed the Secretary of Energy to study alternate contractual arrangements for operation of the laboratories.

On February 1, 1980, the Department submitted a contingency plan for replacement of the University of California as contractor for operation of Los Alamos National Scientific Laboratory and Lawrence Livermore National Laboratory. In submitting that plan we also provided you with copies of a DOE report which resulted from study of the question of how best to go about replacing the University of California in the event that becomes necessary or desirable.

This plan to Congress indicates that by October 1, 1980, we should determine whether or not such a replacement is to occur. The data gathering and the analysis prior to the selection of a new contractor

can then begin remembering that the present contract with the University of California expires on September 30, 1982, and regardless of which way we go, with the university or with a new contractor, it is going to take the better part of 2 years to finish those negotiations. I think 2 years is enough to do the job but no more than enough.

#### NUCLEAR MATERIALS REQUIREMENTS

This committee has expressed concern over the availability of sufficient nuclear materials to accomplish the nuclear weapons production workload planned for the eighties.

The Department forecasts that it will have sufficient nuclear materials through fiscal year 1985 to meet specified weapons requirements. For the latter part of the eighties projections are not as certain.

For the period from fiscal year 1980 through about 1985, which includes all presidentially approved deployments and procurements, the projected new plutonium and tritium requirements derived from the stockpile memorandum can be met by continued operation of the three Savannah River production reactors now in use. In the latter half of the eighties the outlook is less clear. The forecasting of special nuclear materials needs in the outyears is a complex process and becomes more uncertain the further one looks into the future. This forecast requires estimates of future weapons production and retirement and an appraisal of design uncertainties. Long-term projections in the stockpile memorandum indicate that requirements for special nuclear materials may take an upturn in the last half of the eighties. These projections include planning uncertainties in the interest of preserving options until requirements harden. The administration is continuing to review projected future needs for plutonium and tritium, along with the corresponding production requirements.

#### NUCLEAR WEAPONS PRODUCTION

As the committee is well aware, our weapons production workload is growing in order to meet identified and presidentially approved delivery commitments to the Department of Defense. It was necessary for the Department to submit to the Congress a fiscal year 1980 supplemental budget request of \$30 million in this area. This was necessary because we experienced unanticipated increases in procurement costs and some technical manufacturing problems.

In fiscal year 1981 the request for \$895 million for production and surveillance represents an increase of about 26 percent above the fiscal 1980 level. It assumes, and I want to emphasize this, an inflation rate of only 7.9 percent. It also assumes a manufacturing program free of major technical problems. However we have experienced higher inflation and some technical problems, and General Hoover will comment on some of that in his presentation.

#### NUCLEAR WEAPONS RESEARCH, DEVELOPMENT, AND TESTING

Now let me turn to nuclear weapons research, development, and testing. We have assumed an escalation rate in this case of 8.5 percent. You might wonder why that is different from the 7.9 percent that I

mentioned. It is because the details of these programs vary to some extent in their inflation rates and the mix of personnel and materials used; therefore, the number calculated is a little different in each case. So in R. & D. we have in the plan 8.5 percent for the fiscal 1981 request. This, we calculate, should hold the laboratory research and development manpower level at the 7,400 it is today. The increase for the 1981 request for operating funds for research and development is about 12 percent over fiscal 1980.

On nuclear weapons testing, here again we have assumed an 8.5-percent inflation rate. Our proposed testing budget will support ongoing warhead developments as currently defined in the President's stockpile memorandum and will permit some advancement in the state of the art of weapons technology. In recent years the demand for new weapons has required us to give priority to weapons development tests, forcing a reduction in technology base testing. However, the administration is continuing to review testing needs.

#### DOD/DOE PLANNING

Now let me turn to DOD/DOE planning. It has been my desire that we within defense programs should always be examining our policies and methods of planning, managing, and implementing our responsibilities. We should be attentive to better and more efficient ways of doing business, thereby benefiting the national interest.

One area that I feel we need to make improvements in is DOE/DOD long-range nuclear weapons system planning. I am supporting a joint study of this issue by our two Departments.

The Nation's nuclear weapons systems are the joint responsibility of the DOE and the DOD. As you know, DOE is responsible for the warheads and bombs and DOD is responsible for the delivery systems. It has been agreed between the Departments that a joint long-range weapons systems planning analysis concerned with resources and investment planning is necessary. This analysis is particularly important at this time when long leadtimes, rising costs, and other uncertainties collectively complicate the allocation of already scarce resources. I am jointly directing this study with Dr. Jim Wade, the Assistant to the Secretary of Defense (Atomic Energy).

#### UTILITIES RESTORATION

Another item that this committee has expressed an interest in is the equipment utilities restoration. With the support of this committee, we initiated, in fiscal year 1980, a restoration program in the nuclear weapons facilities. Our fiscal year 1981 budget continues this effort and also includes a line item construction project to begin restoration of the nuclear materials production facilities.

The continuation of these programs is extremely important to insure our capability to meet nuclear weapons and nuclear materials production requirements.

#### WIPP

In the Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980, the Congress

directed the Secretary of Energy to proceed with WIPP as a defense activity to be administered by the Assistant Secretary of Energy for Defense Programs. The authorization further stipulated that the express purpose of the project is to provide a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission.

Now in signing the bill the President indicated that he did not endorse the approach to the WIPP project stated in the bill. Rather, he stated that the disposal of defense nuclear wastes and the future of WIPP ought to be resolved only in the context of an overall nuclear waste management policy that would include both defense waste and spent nuclear fuel. The policy was still under development at the time the Congress passed the authorization bill.

Recently, the administration has decided that the WIPP project, as authorized, should be terminated and that defense waste previously intended for disposal in the unlicensed WIPP facility should be placed instead in the first commercial waste disposal facility. The characterization and protection of the WIPP New Mexico site as a potential licensed repository is included in the Department's fiscal year 1981 budget request for commercial waste management. The commercial waste management program will investigate regions of the country for candidate sites for disposal of high level waste and spent fuel.

#### INERTIAL CONFINEMENT FUSION

Now with these general statements about the program, let me turn to specific programs and the first is Inertial Confinement Fusion. By way of summary you will remember that this program's prime objective is to concentrate energy in time, and space, typically times of the order of a fraction of a millionth of a second, and to deliver this energy to small targets, a few tenths of a millimeter in diameter, in order to achieve thermonuclear fusion on a small scale.

To give you a feeling for that, these targets are small microballoons filled with high pressure deuterium-tritium gas and approximately 100 of these will fit on the head of a pin. It is a very small volume and a very small time in which we are attempting to deliver energy. We have two choices as to how we deliver this energy—one is light that comes from lasers and the other is matter and that comes from ion beams. In current terminology, these are both called drivers because they are the driving energy that, if delivered properly to these small targets, will force them to be compressed and heated and, therefore, get the deuterium-tritium mixture to "burn" and fusion energy will be released.

Now there are some problems with this. First, it is not clear how much energy is really needed to do this job, and second, it is not clear what form the energy should be in in order to couple the right amount of energy for the job that we want to have done.

Let me go a little bit further on that, one question concerns the nature of the light energy that we get with very short pulses of light from the lasers. It is not clear which wavelength of light is the best to use for doing this job. Therefore, in our program we have a variety of experiments starting with the national laboratory at Los Alamos

which will have a 40-kilojoule energy driver in its Phase 1 form. It is a long wavelength carbon dioxide laser giving 10 micrometer wavelength light.

In addition to that there is the NOVA facility at the Lawrence Livermore National Laboratory, which in the first phase will be a 100-kilojoule facility and deliver light pulses at one micron as well as one-half to one-quarter of a micron.

The fusion organization at the University of Rochester, KMS Fusion, and the Naval Research Laboratory support this effort at shorter wavelengths. Now with these facilities at the various wavelengths of light we should be able to get an answer to the question; which wavelength is best to use for the job that we have to do in compressing these small pellets? At that time then it will be necessary to look at the appropriate driver for doing the job.

Now in addition, though I mentioned that, we are looking at beams of matter or ions for doing the job. At the present time our program has under construction a pulsed beam fusion accelerator at the Sandia Laboratory in Albuquerque. This will be a light ion accelerator—hydrogen ions—and will deliver in its first phase one megajoule of energy. From that we should be able to get a comparison between delivering energy through light beams and delivering energy through ion beams. [Deleted.]

Now on top of all this, theory says that the short wavelength is better for the laser drivers and that heavy ions are better for the accelerators. So that in terms of not being left behind if that turns out to be the case, we do have an advanced driver program that we are starting, to look for more efficient short wavelength drivers and high current heavy ion accelerators.

In addition to the driver technology that I have been talking about, certainly the target design fabrication and the diagnostics are very important. These areas are being supported in terms of building new capabilities for the target fabrication and many new instruments for the measurements that need to be made.

Now one final point that I would like to bring up. The question frequently arises, why aren't we doing more in the civilian energy side? Why is this a defense program? Now it turns out that the experiments are quite expensive as you are well aware, even on the single-pulse-type experiments which we are doing. All of these drivers I have talked about are just for single pulses and by that I mean a pulse every several hours. This is an adequate and proper way to develop this technology for either defense or for civilian use.

Now it turns out that as soon as we get the single pulse driver so that they are doing the job, then we have what we need for the defense program. But the civilian program has still a long way to go in engineering machines that can be operated continuously—in a continuous sequence of pulses that go on and on and on at a very rapid rate. That is not a small job but they will have the foundation for that once we achieve the single pulse results that we require. In the meantime the defense program will have what it needs in the single pulse to go ahead and do experiments with that.

The budget that we have submitted does not include the Nova construction, the \$236 million for the inertial confinement fusion

on this chart and the reasoning behind it came about in the following way: With the \$236 million that is available for the program, it was concluded that we could arrive at a better balance by deferring for 1 year the Nova project. It would delay that final construction of the first phase project between a year and a year and a half, giving a better balance for addressing all these problems that I have mentioned in fiscal year 1981.

#### VERIFICATION AND CONTROL TECHNOLOGY

The verification and control technology program has as its objectives to execute the DOE responsibilities regarding nuclear test treaties, to execute the DOE export control responsibilities, to conduct nuclear weapons related analyses to support intelligence needs, to analyze foreign energy technologies, to support intelligence needs, and to provide DOE unique resources to the intelligence community.

Now in this program we are actually producing nuclear test detection hardware for the global positioning systems which are satellite systems. The event that was detected in the South Atlantic last September was detected with one of these instruments that was produced by this program. We also are producing hardware for the regional seismic test network. In the operations areas we have maintained the necessary personnel and technical equipment to observe Soviet peaceful nuclear explosions onsite should the 1976 U.S./U.S.S.R. Treaty on Peaceful Nuclear Explosives be approved for ratification by the Senate, to analyze foreign nuclear weapons activities, to assess foreign energy technologies, to analyze [deleted].

The final amount of money that we have in the budget as you can see for the verification and control technology program is \$39 million. We cut \$2 million in the last budget balancing exercise of a few weeks ago.

#### NUCLEAR MATERIAL SECURITY AND SAFEGUARDS

Finally, let me turn to the nuclear materials, security and safeguards program. We requested \$46.7 million for it and that includes a \$3.7 million cut that occurred in the last budget exercise. In brief, this is a program that looks at the development and the implementation of safeguards and security, policies, procedures, instruments and subsystems, and also develops procedures to provide a technology base to support the DOE field managers as well as others.

Now the \$46.7 million covers research and development as well as activities which overseas people such as the International Atomic Energy Agency. There is within our programs quite a bit more money spent on the safeguarding and security of the materials and the things that we have to protect. Our estimates of that in looking at our operating programs is about three times this amount or \$150 million per year so the total safeguard and security program with that cross-cut budget is around \$200 million a year. This \$46.7 million is a very important part of it in that it looks at the development of new things and new procedures and it evaluates the operations that are being carried on in the field in this area.

Now, Mr. Chairman, this completes my statement and I would suggest that we have two choices here. You can start the questioning

now on my part or I might recommend that General Hoover proceed followed by Dr. Gilbert and then we start the questioning.

Senator JACKSON. I would select the latter. We can begin our questioning after the statements. We will hear from General Hoover next and then Dr. Gilbert, if that is agreeable.

General Hoover, we are delighted to have you with us.

## STATEMENT OF MAJ. GEN. WILLIAM HOOVER, DIRECTOR OF MILITARY APPLICATION

### WEAPONS PROGRAM

General HOOVER. Mr. Chairman, it is my pleasure to be making my first appearance before you.

With your permission, I also would like to submit my formal statement for the record and make some remarks at this time.

Senator JACKSON. So ordered.

General HOOVER. Thank you.

[The prepared statement follows:]

PREPARED STATEMENT BY MAJ. GEN. WILLIAM W. HOOVER, USAF, DIRECTOR OF  
MILITARY APPLICATION, U.S. DEPARTMENT OF ENERGY ON THE WEAPONS PROGRAM

### INTRODUCTION

Mr. Chairman and Members of the Committee, it is my pleasure to appear before this Committee. My statement will address the Department of Energy's fiscal year 1981 nuclear weapons program and the funding required to execute that program.

[Chart deleted.]

### MILITARY APPLICATION

This chart illustrates how the weapons program is organized for program direction and coordination, with my Office of Military Application highlighted in red. In view of the Committee's familiarity with the program, I shall not discuss our organization and operating procedures; however, I would be pleased to respond to any questions that you may have.

I plan to discuss some of the significant issues which we face, review our funding request, and conclude with a brief status report on specific weapon development programs. Before I address the budget request, however, I would like to make a few remarks about the nation's nuclear weapon stockpile to place our program in perspective.

[Chart deleted.]

Despite the popular belief that the stockpile is constantly increasing, the general trend has been downward from a high of [deleted] weapons to [deleted] in the early eighties [deleted]. It is important to note that, even at current levels, the stockpile is in a dynamic evolution. In large measure, what I will be doing today is pointing out some of the challenges and opportunities associated with increasing production to replace older weapons with modern designs better suited to current needs.

In the past, improved yield-to-weight ratios, smaller size, and decreased weight characterized a "more bang for the bucks" approach in our research. As we look to the future, these objectives will still be important, but other objectives such as maintainability, reliability, producibility, safety, security, special outputs, and command control will become more and more significant. Suffice to say, these desirable but often competing features make our design problem more complicated.

[Chart deleted.]

Contrary to what some recent magazine articles seem to imply, successful design and fabrication of a modern thermonuclear weapon is a complex and demanding task. The task requires a research, development, and testing program supported by the nation's finest technical brains and most powerful computer capability. Our nuclear designs must accommodate phenomena that occur in millionths of a second and generate temperatures of tens of millions of

degrees. We must be able to fabricate exotic materials and build components that have tolerances measured in millionths of a meter. Often our equipment, facilities, and skilled people are one of a kind. Needless to say, we are many times confronted with technical problems and rising costs. Our entire complex is alert to these problems and has made a concerted effort to minimize their impact. For example, we have eliminated redundant circuitry where reliability considerations will permit; we have used off-the-shelf components for designs, where possible; and we have encouraged the DOD to reconsider requirements when development or production costs seem high compared to their prospective benefits.

[Chart deleted.]

As but one specific example, during the past year, we have examined numerous cost reduction options for the B83—one of our more complicated and expensive bombs. Among the options to be implemented are changes to the firing set and the radar fuze and antenna, as well as material substitutions. It is important to note that these and other savings have not been at the cost of capability desired by the DOD. Actions such as these are an integral part of all our programs and contribute to our ability to slow the growth of cost.

In these preliminary remarks, I've tried to show that we are engaged in a challenging design and production effort in support of a [deleted] enhancement of the nuclear weapon stockpile, and that this effort demands careful management. The budget request before you reflects a careful scrutiny of these issues and includes only those funds necessary to do the job properly. With those thoughts in mind, I'll turn to the budget request itself.

[Chart deleted.]

#### FISCAL YEAR 1981 BUDGET REQUEST

The fiscal year 1981 authorization request for the weapons program totals approximately \$2.0 billion. Our budget request is divided into Operating, Construction, and Equipment which I will address in sequence.

#### OPERATING

The proposed operating program of \$1.6 billion includes funding for research, development, and testing; production and surveillance; and program direction.

[Chart deleted.]

#### RESEARCH AND DEVELOPMENT

Our research and development efforts are conducted principally by three organizations: the Lawrence Livermore National Laboratory (LLNL), the Los Alamos National Scientific Laboratory (LANSL), and the Sandia National Laboratories (SNL).

[Chart deleted.]

The \$467 million requested is an increase of 11 percent over fiscal year 1980. These funds provide the resources—manpower, materials, and services—needed to support the weapons program. This funding includes 8.5 percent for inflation.

[Chart deleted.]

This chart shows, both in actual year dollars and fiscal year 1970 dollars, the funding trend for our research and development activities since fiscal year 1970. The upper line shows the manpower history very closely tracking the trend of the fiscal year 1970 dollar line. As you will note, in recent years our manpower has stayed at about 7,400. While this can be viewed as a constant level of effort, it must be noted that emphasis on current weapon R. & D. has resulted in a reduction in emphasis on development of advanced concepts.

[Chart deleted.]

The goals of our R. & D. program are many; this chart shows some of the important ones. Usually a goal can be achieved by various means; our job is to develop alternate means and select the most appropriate one for a given application. For example, the desire for increased safety leads to the use of insensitive high explosive in some designs to reduce the probability of plutonium scattering in a fire or crash environment. The same goal could be achieved by designing weapons that do not use plutonium [deleted].

[Deleted.] This concept has been demonstrated in the laboratory and is soon to be tested at Nevada in a configuration suitable for a reentry vehicle. By seeking alternative methods of achieving these goals, the basic and applied research at our laboratories is contributing to the maintenance of a strong weapons program.

#### TESTING

[Chart deleted.]

Nuclear testing is at the crossroads of all our research, development, and production efforts. It is, if you will, the "litmus test" for the success of our efforts.

Today, we still cannot design and build a modern nuclear weapon from theory and guarantee its performance without testing. Moreover, testing gives us insight to new ideas and many fundamental aspects of nuclear physics not yet fully understood.

[Chart deleted.]

To support this important effort, we are requesting \$241 million in fiscal year 1981. This amount includes 8.5 percent for inflation and represents an increase of 15 percent over fiscal year 1980.

[Chart deleted.]

This chart displays the recent history of the testing program. The trend lines show funding outlays in current year and constant fiscal year 1970 dollars. The bars show the number of tests in each year. You will note, for example, that in recent years, the demand for new warheads has caused us to give priority to weapons development tests, forcing a curtailment of testing for the technology base. Though technology tests do not directly support the development of a specific nuclear weapon system, they do assist in the development of the new ideas in design, materials, and processes upon which the future of the program depends and so, in a very real sense, the technology base is the foundation of the program.

The currently proposed program of [deleted] tests includes [deleted] for weapons development, engineering, and certification, and [deleted] for the technology base. This schedule will support all ongoing warhead developments as currently defined in the Presidential Stockpile Memorandum and permits some further development in the state-of-the-art of weapons technology.

[Chart deleted.]

One of the methods we have employed to compensate for the reduced number of tests is the use of add-on experiments. Here you see a schematic of the AZUL event [deleted].

[Chart deleted.]

This is a photograph of the AZUL [deleted] going downhole. Those cables you see are used to transmit data from the device to the recording equipment located above ground.

[Chart deleted.]

Here is another view of the site which shows the vast array of equipment needed to support a test. I believe the multiplicity of diagnostic cables, some 162, is eloquent testimony to our determination to wring as much data as possible out of each test.

[Chart deleted.]

This sketch shows the entire test layout schematically. The six lines of sight provide separate measurement paths tracing from the various aspects of the [deleted] through the diagnostic cables to the recording equipment. The heavy use of diagnostic equipment and add-on experiments does increase the cost per test, but permits us to derive the maximum technical benefit and capitalize on drilling and support costs for the overall test program.

[Chart deleted.]

#### PRODUCTION AND SURVEILLANCE

Turning now to production and surveillance activities, the authority requested for fiscal year 1981 amounts to \$895 million. The increase of \$177 million, or about 25 percent, over fiscal year 1980 includes 7.9 percent for inflation.

The funds requested are for production of new war reserve weapons, lifetime surveillance and maintenance of the weapons stockpile to assure its high state of readiness and reliability, and process development to prepare for new designs and improved technology. Also included are funds for the retirement of warheads, which involves the recovery and processing of nuclear materials.

[Chart deleted.]

The funds requested are for our seven plants that manufacture components and assemble nuclear weapons. The people and equipment at these plants provide the wide range of industrial engineering skills and special capabilities needed to manufacture nuclear weapons, including the ability to produce components from uranium, plutonium, rare elements, and their compounds.

[Chart deleted.]

The trends for production funding and manpower are shown here. Our resource allocations are rising to accommodate increases in DOD delivery requirements and inflation. The significant impact of factors such as the unexpected high inflation rate, the increased cost of gold and other materials, and technical manufacturing problems was recognized by the Congress in our fiscal year 1980 authorization. That recognition was not reflected in the appropriation and those

factors have persisted. The Administration has, therefore, forwarded to the Congress a fiscal year 1980 supplemental budget request of \$30 million for our P&S activities.

[Chart deleted.]

The production complex feels the pinch of increasing costs just as everyone else does. This chart shows some of the recent increases in the cost of basic commodities. The effect of these increases is aggravated by another factor—increased leadtimes.

[Chart deleted.]

Here we see examples of increases in leadtimes for various components. The combination of increased cost and increased leadtime compounds the requirement for additional budget authority, because some long leadtime procurements scheduled for fiscal year 1982 must now be initiated in fiscal year 1981. These trends are not peculiar to the nuclear weapons program and, at times, put us in competition with other national security programs for scarce materials and precision equipment.

[Chart deleted.]

This next chart displays nuclear weapons deliveries projected through fiscal year 1989. These deliveries are based on the latest Presidential Stockpile Memorandum. That memorandum provides production authority for fiscal year 1980 through fiscal year 1982, authorizes the initiation of long leadtime activities to prepare for fiscal year 1983 and fiscal year 1984 production, and notes planning projections through fiscal year 1987. The [deleted] increase in deliveries in fiscal year 1981 contrasts dramatically with the [deleted] units delivered in fiscal year 1978. Let me reemphasize that we are not just looking out [deleted]. A significant amount of the funding requested for fiscal year 1981 is to support these deliveries by procuring long-lead tooling, hardware, and components. This workload is primarily a function of new requirements such as the cruise missile and Trident and the continuing need to replace older weapons.

This growth in the production workload, coupled with the increased sophistication of weapons and rising material and labor costs, make it absolutely essential that we find better, more efficient ways to do our job. One way we approach this problem is through something we call process development wherein we attempt to improve the materials, technology, and fabrication techniques which support current and future plant operations. This budget request provides an increase of \$14 million for these activities.

[Chart deleted.]

For example, improved production technologies can yield enormous benefits in cost avoidance, as is illustrated here. The process depicted on the left is our present method of producing plutonium pits. The process involves eight individual steps and requires unique pieces of equipment at each step [deleted]. On the right is a [deleted] method now in development. This method reduces the effort to two steps, with an obvious saving in time and equipment.

Less obvious is the reduction in scrap produced and the savings from avoiding the reprocessing of that scrap. It is expected that this new process could reduce the direct labor hours per piece [deleted]. Needless to say, this improved technology has the potential for truly significant savings in the long term.

#### FISCAL YEAR 1981 WEAPONS BUDGET—PROGRAM DIRECTION

[By fiscal years, budget authority in millions of dollars]

	1979	1980	1981
<b>Salaries, benefits, and travel:</b>			
Office of military application .....	2	3	3
Albuquerque operations office .....	20	21	21
Nevada operations office .....	8	8	9
<b>Total, salaries, benefits, and travel .....</b>	<b>30</b>	<b>32</b>	<b>33</b>
<b>Contractual services, supplies, and equipment:</b>			
Albuquerque operations office .....	2	2	4
Nevada operations office .....	1	1	1
<b>Total, contractual services, supplies, and equipment .....</b>	<b>3</b>	<b>3</b>	<b>5</b>
<b>Total .....</b>	<b>33</b>	<b>35</b>	<b>38</b>

## PROGRAM DIRECTION

My discussion of the operating budget concludes with the program direction category. It includes the salary, benefits, travel expenses, and contractual services to support 957 Federal employees associated with the technical direction and management of the weapons program.

## PLANT AND CAPITAL EQUIPMENT

Turning from Operating to the Plant and Capital Equipment portion of our budget, the funds requested here provide the buildings, special facilities, and the fixed and mobile equipment required to support our research, development, testing, and production activities.

*Construction*

[Chart deleted.]

The amount requested for fiscal year 1981 authorization in construction is \$301.1 million. The requested authorization includes 11 new projects. The amount required for appropriation is \$217.5 million. In addition to the usual construction activities, this funding provides for the continuation of the equipment and utilities restoration program initiated last year.

*Restoration program*

The restoration initiative constitutes a program to correct deterioration in equipment and utilities throughout the weapons complex.

[Chart deleted.]

The complex consists of 24 million square feet of floor space and 250,000 items of equipment, located on 1.3 million acres of land, with a replacement cost of \$7.5 billion. We have identified approximately 35,000 items of equipment as well as important building services and utilities that need to be replaced or restored over the next six years. The results of our most recent appraisal indicate that the magnitude of this multiyear program is approximately \$675 million. Let me emphasize that at the end of six years this program only gets us back to where we should be today. In this budget, and in future budgets, we must also fund plant and equipment at a level to preclude the kind of yearly deterioration that we have experienced since 1970.

## FISCAL YEAR 1981 WEAPONS BUDGET—WEAPONS COMPLEX RESTORATION INITIATIVE

[By fiscal years, in millions for dollars]

Project No. and title	Total estimated cost	Appropriation through 1980	1981 appropriation	1981 authorization
Research development, and testing:				
Capital equipment restoration.....	21.0	21.0	0	0
81-D-107: Utilities and equipment restoration, replacement, and upgrade, various locations.....	31.0	0	31.0	31.0
Production and surveillance:				
81-D-116: Utilities and equipment restoration, replacement, and upgrade, phase II, various locations..	115.0	0	30.5	115.0
80-AE-6: Utilities and equipment restoration, replacement, and upgrade, various locations.....	69.3	25.0	30.3	29.9
79-7-N: Utilities system restoration, Y-12, OR.....	18.0	15.5	2.5	0
Total.....		61.5	94.3	175.9

This chart summarizes the funding thus far for the restoration initiative. Two of our eleven new projects and two of the seven continuing construction projects are part of the restoration program.

[Chart deleted.]

This chart shows an example of the type of problem we hope to correct through this initiative. These are corroded pipes in our plating facility at the Bendix Plant in Kansas City.

[Chart deleted.]

This chart shows preheat steam coils at the Y-12 Plant in Oak Ridge. The present heat transfer capacity of the coil is at best marginal due to the many repaired areas.

[Chart deleted.]

The deteriorating equipment in this picture is a water softener, part of the heating system at the Bendix Plant.

[Chart deleted.]

Here you see a deteriorating heat treating furnace at the Y-12 plant.

#### SAMPLING OF MOBILE HCE TREND

TYPE	UNITS	SERVICE LIFE	UNITS OVERAGE	COST P/H OVERAGE	COST P/H UNDERAGE
FORKLIFT, 10 TON	35	8	15	5.27	3.98
FORKLIFT, 15 TON	15	8	8	9.62	2.14
GRADERS	15	8	10	14.30	9.29
FRONT END LOADERS -	15	8	11	13.98	3.12
CRAWLERS, TRACTORS W/RIPPERS	14	8	7	35.72	4.39
SCRAPERS	6	8	2	62.04	25.52
COMPRESSORS, 900-1200 CFM	17	12	5	14.22	5.10
HYDRA-CRANES	7	10	1	37.45	13.81

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This chart displays some interesting information about the cost of operating old construction equipment at the Nevada Test Site. From left to right, it shows the type of equipment, normal service life, the number of units we have that exceed the normal service life, the cost per hour for operating overage equipment, and finally, the cost per hour for operating equipment which is within the normal service life. You can see, for example, that the cost of operating an overage front-end loader is more than four times that of operating one in good condition. These data show that there are considerable savings to be realized in operating dollars by replacing overage equipment.

#### FISCAL YEAR 1981 WEAPONS BUDGET—EQUIPMENT

[By fiscal years, budget authority in millions of dollars]

	1979	1980	1981
Research, development, and testing.....	56	71	66
Production and surveillance.....	30	26	48
<b>Total.....</b>	<b>86</b>	<b>97</b>	<b>114</b>
Computers (included above).....	6	7	9

#### Capital equipment

Turning now to capital equipment, the fiscal year 1981 request totals \$114 million, an increase of \$16.5 million, or about 17 percent, over fiscal year 1980. Included are \$105 million for basic equipment and about \$9 million for computer-related acquisitions.

It should be noted that equipment costs have risen dramatically under the dual pressures of general inflation and the growing complexity of required equipment. Additionally, increased requirements involving health, safety, safeguards, and security continue to strain our capital equipment budget. Real funding growth is provided in the basic equipment area in fiscal year 1981.

## DEVELOPMENT AND PRODUCTION OVERVIEW

Gentlemen, turning from the budget itself, I would like to briefly discuss the accomplishments of the past year. My comments will cover the two nuclear bombs and eleven nuclear warheads in Phase 3 development engineering or production and the M-X warhead development which has not yet reached Phase 3.

## STRATEGIC SYSTEMS

- W76 warhead—Trident.
- W78 warhead—Minuteman III.
- WXX warhead—MX.
- W80 warhead—cruise missile.
- B83 bomb—modern strategic bomb.

*Strategic weapons*

First, I'll discuss the strategic systems.

The W76 warhead for the TRIDENT missile is now in quantity production and we have already delivered [deleted] to the Navy. [Deleted.] The W78, an improved warhead for the MINUTEMAN III ICBM system, is experiencing some production delays due to unexpected difficulties in the machining of certain components. Corrective action has been taken, [deleted]. The W78 will approximately [deleted] the yield of the W62 warhead being replaced. We are anticipating a Phase 3 request for an M-X warhead this fall. Currently, there are two warheads being considered. The baseline design is the W78. The DOD has requested that we also maintain the [deleted] as an alternative to provide insurance for stockpile reliability and as a hedge against a possible requirement [deleted]. The W80 warhead is in development engineering for both the air launched cruise missile and the sea launched cruise missile. [Deleted.] The W80 cruise missile warhead program and the production funds requested will support the first deliveries programmed [deleted].

The B83, scheduled for delivery [deleted] provides a modern high-yield strategic bomb to replace aging B28 and B43 bombs. It will have [deleted] insensitive high explosive, and other improved safety features. The primary carriers for the B83 are the B52 and FB-111, though many other aircraft including the F-4 and F-111 will be compatible.

## LONG-RANGE THEATER NUCLEAR SYSTEMS

- W84 warhead—ground launched cruise missile.
- W85 warhead—Pershing II air burst/surface burst.
- W86 warhead—Pershing II earth penetrator.
- B61-3, 4 bomb—modern tactical bomb.

*Long-range theater nuclear systems*

Turning now to the long-range theater nuclear systems, we have one bomb and three warhead programs underway.

The W84 warhead is in development engineering for the ground launched cruise missile. It will provide a [deleted] the desired operational flexibility in the NATO environment. The W84 will contain insensitive high explosives and the latest command control technology. First deliveries are scheduled [deleted].

The W85 is in engineering development as a warhead for the Pershing II system. Scheduled for first deliveries [deleted] it is designed for air burst or surface burst [deleted] the system represent a significant improvement in NATO's tactical nuclear force capability.

The W86 is a second warhead in development engineering for the Pershing II system. It will provide [deleted] in an earth penetrator configuration.

The B61 is a modern tactical bomb currently being produced in 2 versions [deleted] B61-3s and B61-4s will be produced providing a safe, secure, versatile gravity bomb for delivery by modern high-speed tactical aircraft.

## BATTLEFIELD NUCLEAR SYSTEMS

- W70 warhead—Lance missile.
- W79 warhead—8-inch artillery fired atomic projectile.
- W82 warhead—155mm artillery fired atomic projectile.

### Battlefield nuclear systems

There is also an ongoing effort to upgrade the shorter range tactical systems. An improved LANCE warhead and two artillery shells are being developed.

The W70 is a modernized warhead for the LANCE missile. It received considerable attention in the press as a "Neutron Bomb" or enhanced radiation (ER) weapon. At the request of the Senate Armed Services Committee, a report on ER weapon production and deployment options was submitted in November of 1979. As outlined in that report, we plan to build all the hardware elements required for an ER capability, [deleted]. If a decision is made [deleted] to incorporate the ER feature, it will be possible [deleted] have the ER feature in the first deliveries. If the decision comes later, [deleted]. The delay associated with [deleted] accomplishing the conversion varies considerably depending on the timing of the decision. First deliveries of the W70-4 are planned for [deleted].

The W79, [deleted] is a replacement warhead for the existing W33 8-inch artillery fired atomic projectile. The new 8-inch projectile will provide [deleted] increased range, minimal field assembly, and improved security and command control features. The W79 will also be produced with an enhanced radiation option available for later installation, if authorized.

The W82 is in development engineering as a replacement for the W48 155mm artillery first atomic projectile. It would provide a [deleted] warhead with a rocket assist module for increased range. [Deleted.] The W82 would also incorporate improved reliability, security, and command control features. If a decision is made to produce the W82, deliveries could be made as early as [deleted].

### Fleet air defense

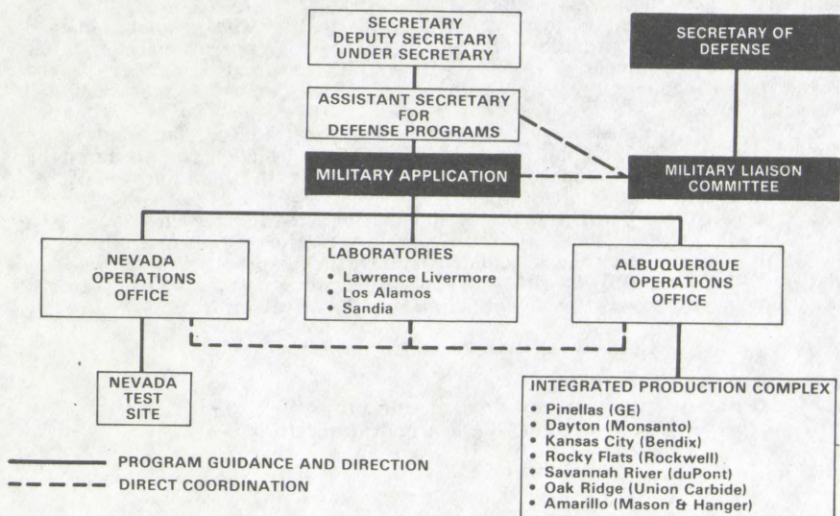
[Deleted.]

There is one Fleet Air Defense warhead in development. The W81 provides a nuclear warhead for the Navy's SM-2 missile [deleted]. The Terrier and Aegis systems will be used with the nuclear SM-2. DOD is reviewing the need for this warhead and, meanwhile, DOE has a hold on all production activities associated with the W81.

### CONCLUSION

Mr. Chairman, this concludes my statement. As I mentioned in my opening remarks, the programs underway represent both a challenge and an opportunity. With your help, I know we can meet the challenge and, in so doing, take advantage of the opportunity to modernize the United States nuclear weapon stockpile and tailor it to the demanding requirements of the 1980's and 1990's. I appreciate this opportunity to review with the Committee the Department of Energy's weapons program for fiscal year 1981. Thank you.

## WEAPONS PROGRAM GUIDANCE/COORDINATION



General HOOVER. This chart illustrates how the weapons program is organized for program direction and with coordination, with my Office of Military Application highlighted in red. In view of your familiarity with the program, I shall not discuss our organization or operating procedures in detail. However, I would be pleased to respond to questions at any time during my presentation.

Before I address the budget request, I would like to make a few remarks about the Nation's nuclear weapon stockpile to place our program in perspective.

[Chart deleted.]

Despite the popular belief that the stockpile is constantly increasing, the general trend has been downward. If I may draw your attention to the right-hand ordinate and the solid line marked "Stockpile," you will see that the stockpile has gone from a high of around [deleted] weapons down to [deleted].

It is important to note that even at current levels the stockpile is in a dynamic evolution as you will see by the left-hand ordinate and the bars that represent the number of units produced in any one year. You can see that we have had some peaks and valleys over the years in our production with a high of [deleted] weapons produced in any one year. What is not shown is the weapons that we are retiring every year; approximately [deleted] warheads will be retired in fiscal year 1980.

What I will be doing today is pointing out some of the challenges and opportunities associated with increasing production to replace older weapons with modern designs better suited to current needs.

In the past, improved yield-to-weight ratio, smaller size, and decreased weight characterized a "more bang for the bucks" approach in our research. As we look to the future, these objectives will remain important, but other objectives such as maintainability, reliability, safety, security, special outputs, and command and control will become more significant. Suffice to say, these desirable but competing features make our design problems more complicated.

Contrary to what some recent magazine articles seem to imply, successful design and fabrication of a modern thermonuclear weapon is a complex and demanding task. The task requires research, development, and testing programs supported by the Nation's finest technical brains and most powerful computer capability. Our nuclear designs must accommodate phenomena that occur in millionths of a second and temperatures of tens of millions of degrees. We must be able to fabricate exotic materials and build components that have tolerances measured in thousandths of a millimeter.

Often our equipment, facilities, and skilled people are one of a kind. Let me emphasize that we are becoming increasingly dependent on our own in-house capability because outside suppliers either cannot meet the quality we demand or do not find it economically feasible for them to supply us.

[Chart deleted.]

This chart displays the nuclear weapon deliveries projected through fiscal year 1989. We call it our [deleted]. These deliveries are based on the latest Presidential stockpile memorandum. The increase in deliveries in fiscal year 1981 contrasts [deleted] with the [deleted] units

delivered in fiscal year 1978 and perhaps best dramatizes the task before us. Let me emphasize that we are not just looking out [deleted].

Please note that the production workload is primarily a function of new requirements such as the cruise missile and Trident and the continuing need to replace older weapons. The budget request before you reflects a careful scrutiny of our needs and includes only those funds necessary to do this job properly.

With those thoughts in mind, I will turn to the budget itself.

"A"

FISCAL YEAR 1981 WEAPONS BUDGET—AUTHORIZATION REQUEST

	Millions
Operating:	
Research, development, and testing.....	\$708
Production and surveillance.....	895
Program direction.....	38
Total, operating.....	1,641
Construction.....	301
Equipment.....	114
Total.....	2,056

The fiscal year 1981 authorization request for the weapons programs totals approximately \$2 billion. Our budget request is divided into operating, construction, and equipment which I will address separately.

RESEARCH AND DEVELOPMENT

The proposed operating program of \$1.6 billion includes funding for research, development, and testing production and surveillance, and program direction.

Our research and development efforts are conducted principally at the Lawrence Livermore National Laboratory, the Los Alamos National Scientific Laboratory, and the Sandia National Laboratories.

"B"

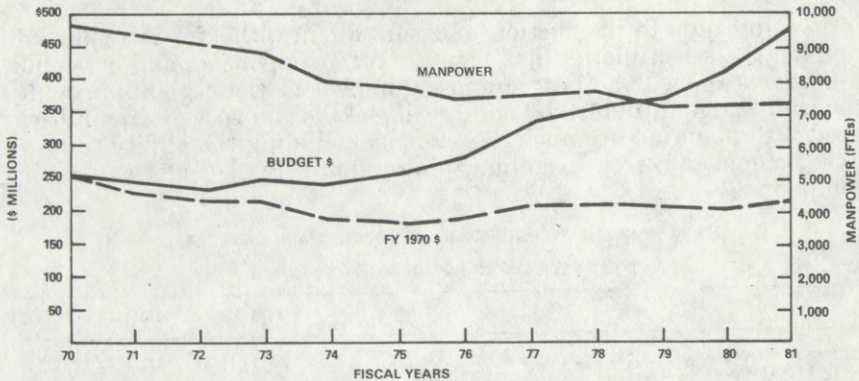
FISCAL YEAR 1981 WEAPONS BUDGET—RESEARCH, DEVELOPMENT, AND TESTING

[By fiscal years, budget authority in millions of dollars]

	1979	1980	1981
Research and development.....	376	419	467
Testing.....	221	209	241
Total.....	597	628	708

The \$467 million requested is an increase of 11 percent over fiscal year 1980 and includes 8.5 percent for inflation.

### R&D HISTORY — OPERATING/MANPOWER (BUDGET OUTLAYS)



This chart shows, both in actual year dollars and in fiscal year 1970 dollars, the funding trend for our research and development activities since fiscal year 1970. The upper line shows the manpower history very closely tracking the trend of the fiscal year 1970 dollar line. As you will note, in recent years our manpower has stayed at about 7,400. While this can be viewed as a constant level of effort, it must be noted that because of emphasis on current weapons R. & D., a reduction in development of advanced concepts has, in fact, accrued.

#### NUCLEAR TESTING

Nuclear testing is at the crossroads of all of our research, development, and production efforts. It is, if you will, the litmus test for the success of our efforts.

Today we still cannot design and build a modern nuclear weapon from theory and guarantee its performance without testing. Moreover, testing gives us insight to new ideas and many fundamental aspects of nuclear physics not yet fully understood. To support this important effort, we are requesting \$241 million in fiscal year 1981. This amount represents an increase of 15 percent over fiscal year 1980 and includes an inflation factor of 8.5 percent.

[Chart deleted.]

This chart displays the recent history of the testing program. The trend lines show funding outlays in current year and constant fiscal year 1970 dollars. The bars show the number of tests in each year. You will note, for example, that in recent years the demand for new warheads has caused us to give priority to weapon development tests, forcing a curtailment of testing for the technology base. Though technology tests do not directly support the development of a specific nuclear weapon, they do assist in the development of the new idea in design, materials, and processes upon which the future of the program depends and so, in a very real sense, the technology base is the foundation of the program.

The currently proposed program of [deleted] tests includes for weapons development, engineering, and certification and [deleted] for the technology base. This schedule supports all ongoing warhead developments in the Presidential Stockpile Memorandum and permits some further development in the state of the art of weapons technology.

## PRODUCTION AND SURVEILLANCE

Turning now to production and surveillance, the funds requested are for the seven plants that manufacture components and assemble nuclear weapons. The people and equipment at these plants provide the wide range of industrial engineering skills and special capabilities needed to manufacture nuclear weapons, including the ability to produce components from uranium, plutonium, rare elements and their compounds.

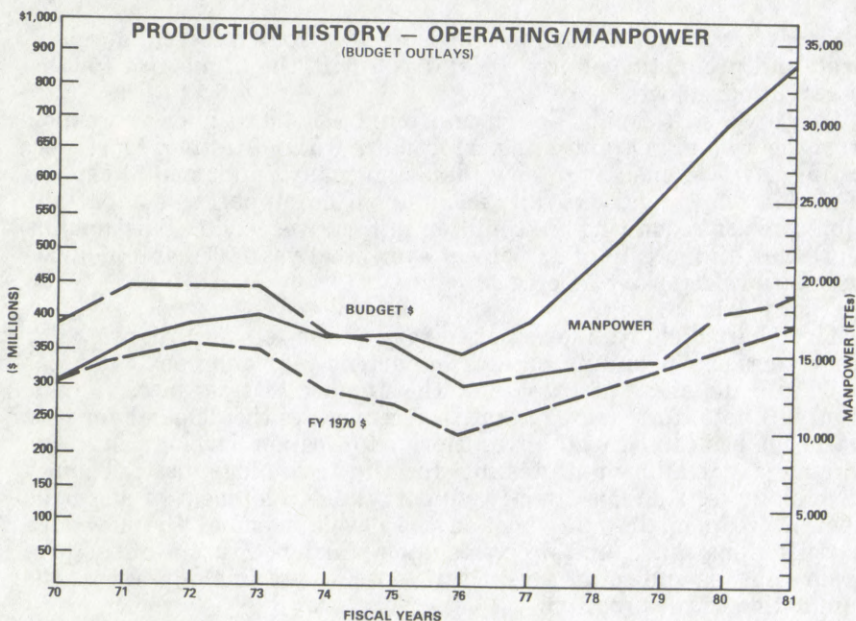
## FISCAL YEAR 1981 WEAPONS BUDGET—PRODUCTION AND SURVEILLANCE

[By fiscal years, budget authority in millions of dollars]

	1979	1980	1981
War reserve new production.....	351	422	549
Stockpile maintenance.....	68	75	84
Stockpile reliability.....	70	71	88
Process development.....	48	50	64
Other costs.....	77	100	110
Total.....	614	718	895

The authority requested for fiscal year 1981 amounts to \$895 million, an increase of \$177 million or about 25 percent over fiscal year 1980, including 7.9 percent for inflation.

The funds requested are for production efforts in the categories shown and also include funds for the retirement of warheads, which involves the recovery and processing of nuclear materials.



The trends for production funding and manpower are shown here. Our resource allocations are rising to accommodate increases in the Department of Defense delivery requirements and inflation.

## INFLATION

The significant impact of factors such as the unexpected high inflation rate, the increased cost of gold and other materials, and technical manufacturing problems was recognized by the Congress in our fiscal year 1980 authorization. However, that recognition was not reflected in the appropriation and these factors have persisted. The administration has, therefore, forwarded to the Congress a fiscal year 1980 supplemental budget request of \$30 million for our production and surveillance activities.

## COMMODITY PRICE TRENDS

[Fiscal years]

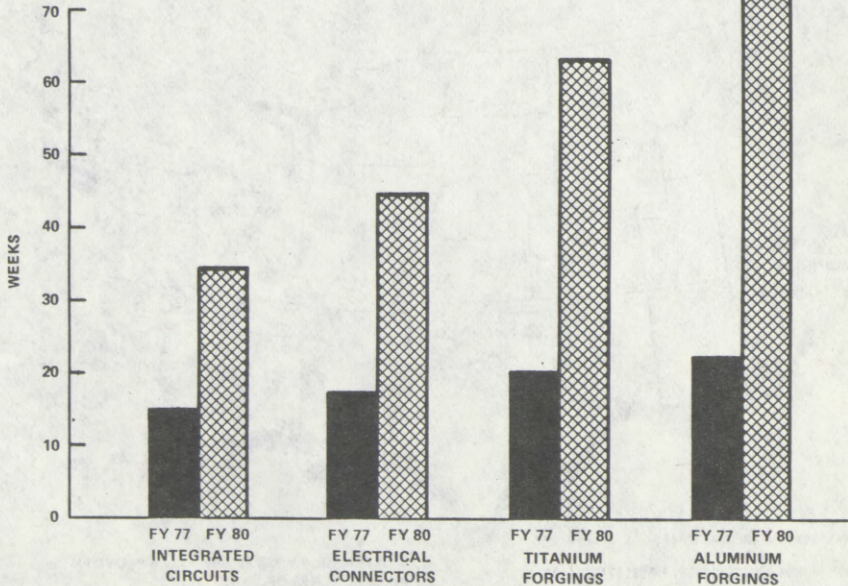
Commodity	1977	1980	Percent change 1977 to 1980
Gold (per ounce, troy).....	\$136.10	\$695.00	410.7
Cobalt (per pound).....	6.50	25.00	286.6
Titanium (per pound).....	2.50	12.00	380.0
Aluminum (per pound).....	0.45	0.75	66.7

The production complex continues to be plagued by the pinch of inflation just as everyone else. Many items of equipment are displaying dramatic cost increases. This chart shows some of the recent increases in the cost of basic commodities.

## LEADTIMES

The effect of these increases is aggravated by another factor, increased leadtimes.

## LEADTIME TRENDS



Here we see examples of increases in the leadtime for various components as measured against what the situation was in fiscal year 1977. The combination of increased cost and increased leadtime compounds the requirement for additional budget authority because some long leadtime procurement scheduled for 1982 must now be pulled up into fiscal year 1981. These trends are not peculiar to the nuclear weapons program and at times put us in competition with other national security programs for scarce materials and precision equipment.

#### FISCAL YEAR 1981 WEAPONS BUDGET—CONSTRUCTION

[In millions of dollars]

	New authorization	New appropriation
New projects (11).....	226.2	101.7
Continuing projects (7).....	41.4	82.3
General plant projects.....	28.9	28.9
Plant engineering and design.....	4.6	4.6
<b>Total.....</b>	<b>301.1</b>	<b>217.5</b>

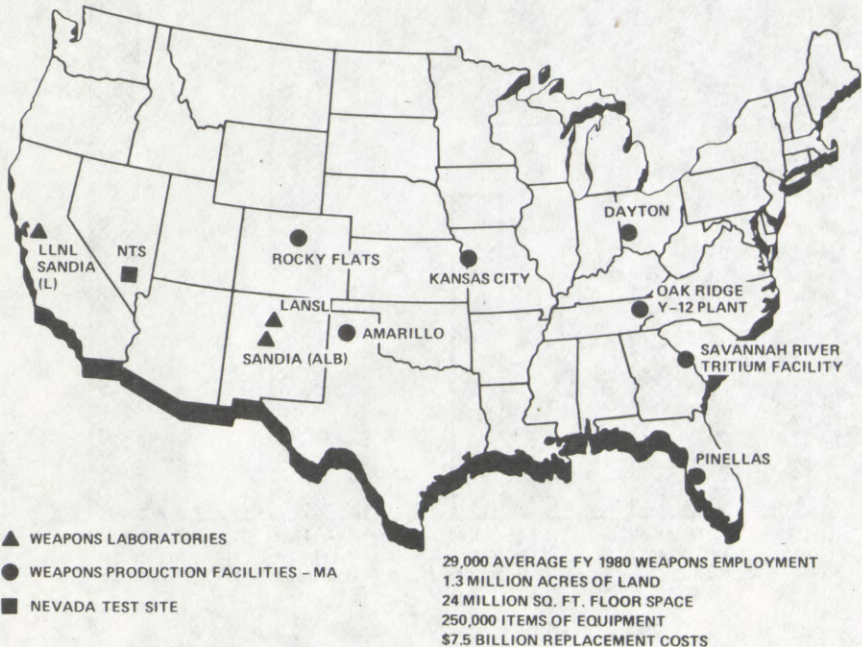
#### CONSTRUCTION

Turning from the operating to the plant and capital equipment portion of the budget, the amount requested for fiscal year 1981 in construction is \$301 million. The requested authorization includes 11 projects. The amount required for appropriation is \$217 million. In addition to the usual construction activities, this funding provides for the continuation of the equipment and utilities restoration program initiated last year.

#### RESTORATION

The restoration and initiative constitutes a program to correct deterioration in equipment and utilities throughout the weapons complex.

#### WEAPONS DEVELOPMENT, TESTING, AND PRODUCTION FACILITIES



The complex consists of some 24 million feet of floor space, 250,000 items of equipment located on 1.3 million acres of land with a replacement cost of some \$7.5 billion. We have identified approximately 35,000 items of equipment as well as important building services and utilities that need to be replaced or restored over the next 6 years. Our most recent appraisal indicates that the magnitude of this multi-year program is approximately \$675 million.

Let me emphasize that at the end of the 6 years this program only gets us back to where we should be today. In this budget and in future budgets, we must also fund plant and equipment at a level to preclude the kind of yearly deterioration that we have experienced since 1970.

[Charts deleted.]

These next charts will show some examples of the type of problem we hope to correct through this initiative. These are corroded pipes in the plating facility at our Bendix facility in Kansas City. The next chart shows preheat steam coils at Oak Ridge. The present heat transfer capacity of the coil is at best marginal due to the many repaired areas. The deteriorating equipment in this picture is a water softener part of the heating system at the Bendix plant.

#### WEAPONS PROGRAM

At this point, I would like to call to the committee's attention a few points in regard to weapons in development and production and some of our accomplishments since we last came before you. I would just like to touch on some of our more important strategic systems and the enhanced radiation systems which have some special interest.

We are maintaining two warhead options for the MX missile and are anticipating a phase 3 request this fall. With regard to the W76, we have produced [deleted] warheads for the Trident system. The W78 is an improved warhead for the Minuteman ICBM system and it is one we are experiencing some production delays with due to unexpected technical difficulties. Corrective action has been taken [deleted].

The W80 warhead for the cruise missile is progressing normally and first deliveries are anticipated by late [deleted]. Among the theater nuclear system, the W70 for the Lance and the W79 8-inch artillery shell have both received considerable attention in the press as neutron bombs.

At the request of this committee, a report on enhanced radiation weapons production and deployment options was submitted in November 1979. As outlined in that report we plan to build all the hardware elements required for the enhanced radiation capability, [deleted]. If a decision is made [deleted] it will be possible to [deleted] have this feature in the first deliveries. If a decision comes later, [deleted]. The delay associated with [deleted] accomplishing the conversion varies considerably depending on the time of the decision.

Mr. Chairman, this concludes my remarks.

Senator JACKSON. Thank you, General Hoover.

Now we turn to Dr. Gilbert.

**STATEMENT OF DR. F. CHARLES GILBERT, DIRECTOR, OFFICE  
OF NUCLEAR MATERIALS PRODUCTION**

Dr. GILBERT. Thank you, Mr. Chairman, and members of the committee.

**NUCLEAR MATERIALS PRODUCTION**

It is a pleasure to appear again before your committee to discuss the nuclear materials production program.

As my predecessors, with your permission I will submit my full testimony for the record and cover the highlights this morning.

Senator JACKSON. Without objection, so ordered.

[The prepared statement follows:]

PREPARED STATEMENT OF DR. F. CHARLES GILBERT, DIRECTOR, OFFICE OF NUCLEAR MATERIALS PRODUCTION, U.S. DEPARTMENT OF ENERGY

**NUCLEAR MATERIALS PRODUCTION PROGRAM**

The Nuclear Materials Production activities are supported by our final year 1981 request for \$550 million in new authorization and \$523 million in budget authority for Nuclear Materials Production. That request provides for a 5.2-percent increase in authorization and a 3.1-percent increase in budget authority. I will discuss the details of this budget increase later in this testimony. The Office of Nuclear Materials Production has program management responsibility for production of nuclear materials, primarily materials produced in nuclear reactors dedicated to defense programs.

The management responsibility for the processing of Naval propulsion reactor fuels and DOE test reactor fuels at the Idaho Chemical Processing Plant was recently transferred to the Office of Nuclear Materials Production. This transfer and the addition of Special Isotope Separation activities were made pursuant to the DOE Nuclear Authorization Act of 1980. Special [deleted] Isotope Separation Activities were begun in fiscal year 1980 at the initiation of Congress. In addition, management responsibilities for the recovery of highly enriched uranium (U-235) from scrap materials and the management of americium-241 and uranium-234 inventories, part of the inventory titled "other special materials" were transferred to the Office of Nuclear Materials Production from other offices within DOE.

The objectives of the Nuclear Materials Production Program are:

To provide nuclear materials, primarily tritium, plutonium, and deuterium, for national defense requirements, DOE reactor research and development programs, other Federal programs and industry;

To process reactor fuels such as the defense production reactors at Savannah River, South Carolina, as well as fuels from Navy propulsion reactors and research and test reactors, for recovery of enriched uranium and plutonium contained in them;

To make available sufficient N-Reactor byproduct steam to the State of Washington Public Power Supply System to generate 3.9 billion kilowatt-hours of electricity per year for the Bonneville Power Administration power grid;

To develop improved and advanced methods for nuclear materials production and to maintain the technical capability to perform process improvements;

To manage scrap nuclear materials in a cost-effective manner to reduce the need for new materials production, minimize storage costs, minimize safeguards requirements, and conserve materials and energy;

To operate and maintain the reactors, processing plants, and other facilities, consistent with production requirements, in a safe, secure, environmentally-acceptable, and cost-effective manner.

To accomplish these objectives, the Nuclear Materials Production program provides for operation of (chart deleted) the following facilities as shown: production reactor feed plants at Fernald and Ashtabula, Ohio and Oak Ridge, Tennessee; (chart deleted) the dual-purpose N-Reactor at Richland, Washington; (chart deleted) three nuclear materials production reactors at Savannah River, South

Carolina; chemical processing plants at Idaho, Richland, and Savannah River; and supporting facilities at the production sites. This program also maintains two reactors in standby at Savannah River.

The 1981 request for Nuclear Materials Production operating expenses is \$391 million in authorization and budget authority, which is 9.4 percent above the 1980 authorization and 11.9 percent above the 1980 appropriation. The operating budget increase may maintain a level-of-effort for production activities depending upon inflation effects. However, recent assessments of our facilities indicate the need to increase our safety, safeguards, and reliability activities. In addition, we need to provide for increased production of reactor feed materials.

The 1981 request for Nuclear Materials Production Program capital equipment is \$35 million in authorization and budget authority, which is the same as the 1980 appropriation. A majority of the existing equipment and facilities is over 25 years old. To keep this aging equipment operating, significant annual repair and replacement is required to correct accumulating deficiencies for facilities which have an investment cost in current year dollars of \$9 billion.

The 1981 request for Nuclear Materials Production Program construction projects is \$122.5 million in new authorization, and \$95.5 million in budget authority. This amount includes \$34 million of new budget authorization for one project previously authorized and \$88.5 million for six new projects.

An important part of the construction program is the restoration (upgrading) of production facilities at various sites. The upgrading implementation is based on the following order of priority: (1) safety; (2) reliability; (3) efficiency; and (4) State-of-the-art improvements. A formal assessment of the condition of our facilities and a proposed restoration program was provided to Congress last summer (1979) as requested in the fiscal year 1979 authorization bill. The total estimated costs for upgrading as evaluated in 1980 is \$352 million expressed in 1981 dollars. This does not include that upgrading needed at the Idaho Chemical Processing Plant which is now under evaluation.

Project 81-D-128, Restoration of Production Facilities at various locations is for \$34.1 million in new authorization and \$9 million in budget authority. This project provides initial work for restoration of facilities for production of special nuclear materials in support of the national defense programs. This fiscal year 1981 project is limited to the restoration of two key facilities at Savannah River. Safety improvements to machines used for charging and discharging fuel and target assemblies in the Savannah River reactors are provided by this project. (Chart deleted.) Also provided are new structures and equipment to replace obsolete and deteriorating neptunium oxide facilities in the HB-Line at the Savannah River Plant.

In conclusion, Mr. Chairman, I would like to summarize the major elements of the proposed fiscal year 1981 budget.

Three Savannah River reactors will continue to operate to produce [deleted] tritium, [deleted] weapon-grade plutonium, and other isotopes,

The Richland N-Reactor will continue to operate to produce 530 kg of fuel-grade plutonium and byproduct steam sufficient to generate 3.9 billion kwh of electricity,

The Savannah River and Idaho chemical processing plants will continue operations,

The Purex processing plant at Richland will be placed in a reduced standby condition,

Two key restoration construction subprojects will be initiated,

Two Savannah River reactors will be maintained in standby condition,

Heavy water plant operation will continue at a minimum level based on sales,

The Special [deleted] Isotopes Separation program will be continued.

Mr. Chairman, this concludes my prepared presentation. I am now prepared to answer any questions you may have.

Dr. GILBERT. I would like to introduce the new manager of our Savannah River Operations Office, Mr. Bob Morgan. He will be here this morning to answer questions concerning that facility if you have some. He has no prepared statement.

Senator JACKSON. Very good.

Dr. GILBERT. The nuclear materials production activities are supported by our 1981 requests for \$550 million in new authorization and

\$523 million in budget authority. That request provides for a 5.2-percent increase in authorization and a 3.1-percent increase in budget authority. I will discuss the details of this budget increase later in this testimony.

NUCLEAR MATERIALS PRODUCTION, FISCAL YEAR 1981 BUDGET REQUEST—TOTAL REQUEST

[By fiscal years, dollar amounts in millions]

	1980 budget auth.	1981 request new auth.	Percent change	1980 budget B/A	1981 request B/A	Percent change
Materials production.....	521.6	548.2	.....	505.65	521.2	.....
Program direction.....	.95	1.3	.....	.95	1.3	.....
Total.....	522.55	549.5	5.2	506.6	522.5	3.1

The Office of Nuclear Materials Production has program management responsibility for the production of nuclear materials primarily produced in nuclear reactors dedicated to defense programs. The management responsibility for the processing of naval propulsion reactor fuels for DOE at the Idaho chemical processing plant was recently transferred to the Office of Nuclear Materials Production and the funds for that operation are included in our budget. [Photo deleted.]

This transfer and the addition of the special isotope separation activities were made pursuant to the DOE Authorization Act of 1980. Special [deleted] isotope separation activities were begun in fiscal year 1980 at the initiation of Congress. In addition, management responsibilities for the recovery of highly enriched uranium from scrap materials and uranium-234 were also transferred to this office.

The objectives of the nuclear materials production program are illustrated in this chart.

NUCLEAR MATERIALS PRODUCTION PROGRAM

PROGRAM OBJECTIVES

- To provide nuclear materials, primarily: Tritium, plutonium, and deuterium.
- To process reactor fuels for recovery of enriched uranium and plutonium.
- To deliver N-reactor byproduct steam to the Washington public power supply system.
- To develop improved methods for nuclear materials production.
- To managed scrap nuclear materials.
- To operate facilities in a manner that is: Safe and secure, environmentally acceptable, and cost effective.

First of all, primarily to provide nuclear materials—primarily tritium, plutonium and deuterium—for national defense requirements for DOE reactor research and development programs and other Federal programs as well as industry.

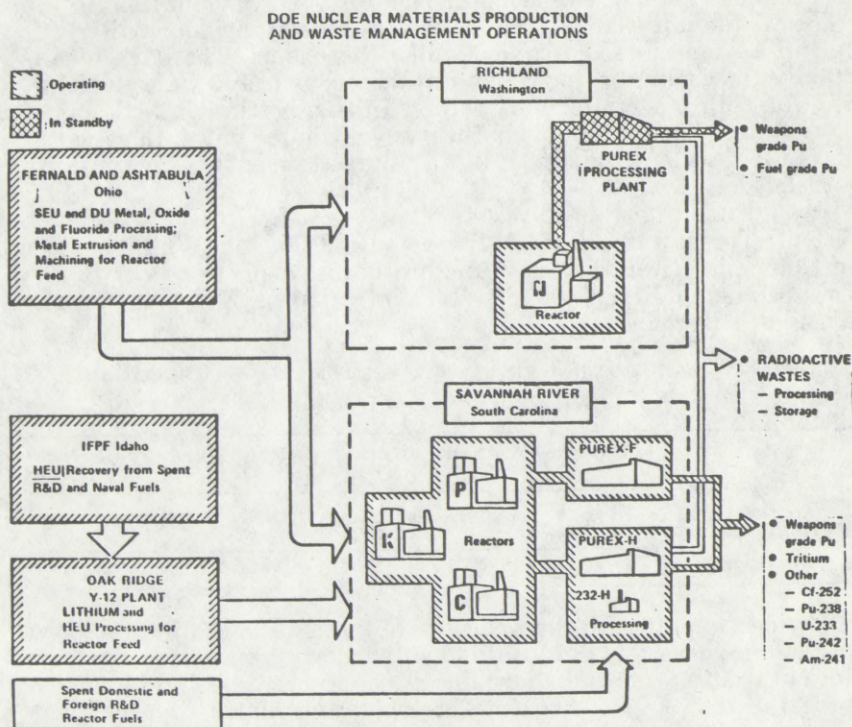
Second, to process reactor fuels such as those from the defense production reactors at Savannah River as well as fuels from Navy propulsion reactors and research and test reactors.

Third, to make available sufficient reactor byproduct steam to the State of Washington Public Power Supply System to generate 3.9 billion kilowatt-hours of electricity per year.

Fourth, to develop improved and advanced production methods and to maintain the technical capability to perform process improvements.

Fifth, to manage scrap nuclear materials in a cost effective manner in order to reduce the need for new materials.

And sixth, to operate and maintain the reactors processing plants and other facilities consistent with production requirements in a safe, secure and environmentally acceptable and cost effective manner.



This next chart shows the flow of materials within this program. Now what I would like to do is just outline for you how the facilities operate within this complex. Slightly enriched uranium and depleted uranium metals are fabricated into billets at two plants in Ohio called Fernald and Ashtabula. The slightly enriched uranium, approximately 1-percent enrichment, is utilized in the N-reactor at Richland, Wash. The depleted uranium billets go to the three reactors at Savannah River where they are fabricated into targets for breeding plutonium.

The highly enriched uranium is used in the three Savannah River reactors and comes, in a large measure, from uranium recovered from spent Navy fuels. [Deleted.] When we get them back that uranium is then processed at Idaho and sent to Oak Ridge where it is fabricated into driver rods to drive the Savannah River reactors.

At Savannah River the plutonium produced by the reactors is recovered from the targets by processing the irradiated fuel in the canyons located at the site. There are two canyons there, one for processing the targets to obtain the plutonium, and one devoted to processing the driver fuels to get back the uranium which is rerouted back through the other facilities to again drive the reactors.

Now the Savannah River reactors produce weapons materials and a variety of other isotopes used in research and development as well as in industry. Now the N-reactor at Richland, Wash., is producing power as I mentioned. It does not at the moment provide directly usable weapons grade plutonium. It is producing fuel grade plutonium in the rods but these are not being processed because the processing plant at Richland, Wash., is closed and in standby at the present time.

The plutonium that is bred in the reactors at Savannah River is bred in a uranium rod that looks like this model. The dark blue is actually the cooling water which in this case is heavy water which is used for both moderator and cooling. In this bottle is a little bit of heavy water. The uranium is in these silver colored rings. In actuality this is a 16-foot long rod, this is just a cross section of it.

[Deleted.]

I would like to go ahead just to show you a few pictures. [Photos deleted.] This is a photo of the N-reactor at Richland, Wash., next to the Columbia River. The next picture is just a photo of one of the three Savannah River reactors. I believe that is K reactor on the Savannah River site.

#### NUCLEAR MATERIALS PRODUCTION, FISCAL YEAR 1981 BUDGET REQUEST—OPERATING EXPENSES

[By fiscal years, dollar amounts in millions]

	1980 budget auth.	1981 request new auth.	Percent change	1980 budget B/A	1981 request B/A	Percent change
Materials production.....	\$356.8	\$390.6	-----	\$349.1	\$390.6	-----
Program direction.....	.95	1.3	-----	.95	1.3	-----
Subtotal.....	357.75	391.9	9.5	350.05	391.9	12.0

Now continuing with the budget information, the 1981 request for operating expenses is \$392 million in authorization and budget authority. That is 9 percent above the 1980 authorization and 12 percent above the 1980 appropriation. This operating budget increase may maintain the level of effort for production activities depending upon inflation effects. Recent assessments of our facilities indicate the need to increase our safety, safeguards and reliability activities particularly in view of the TMI occurrence.

#### NUCLEAR MATERIALS PRODUCTION, FISCAL YEAR 1981 BUDGET REQUEST—CAPITAL EQUIPMENT

[By fiscal years, dollar amounts in millions]

	1980 budget auth. and B/A	1981 request auth. and B/A	Percent change
Materials production.....	\$35.0	\$35.1	0.3

The 1981 request for capital equipment is \$35 million in authorization and budget authority which is the same amount as in the 1980 appropriation. A majority of the existing equipment and facilities is over 25 years old. To keep this aging equipment operating, significant annual repair and replacement is required to correct accumulating deficiencies for facilities which have an investment cost in current year dollars of about \$9 billion.

## NUCLEAR MATERIALS PRODUCTION FISCAL YEAR 1981 BUDGET REQUEST—CONSTRUCTION

[By fiscal years, dollar amounts in millions]

	1980 budget auth.	1981 request new auth.	Percent change	1980 budget B/A	1981 request B/A	Percent change
Materials production.....	\$129.8	\$122.5	-5.6	\$121.6	\$95.5	-21.

The 1981 request for construction projects is \$122.5 million in authorization and \$95.5 million in budget authority. This amount includes \$34 million of new budgetary authorization for one project previously authorized and \$88.5 million for six new projects.

## NUCLEAR MATERIALS PRODUCTION—RESTORATION OF PRODUCTION FACILITIES AT VARIOUS SITES

Program definition placed emphasis on safety and continuity of operations.

## HIGHLIGHTS

Report to Congress 1979.

Multiyear program with TEC of \$352 million (express in fiscal year 1981 dollars).

Program to begin in fiscal year 1981—project 81-D-128 “restoration of production facilities”—authorization \$34.1 million; BA \$9 million.

Reactor charge and discharge machines at SR.

Replace obsolete HB-line at SR.

An important part of the construction program is the restoration of production facilities at our various sites. Mr. Sewell alluded to the problem of deterioration of facilities earlier in his presentation. Our upgrading implementaton will be based on the following priorities: First, safety; second, reliability; third, efficiency; and fourth, state-of-the-art improvements.

A formal assessment of the condition of our facilities and a proposed restoration program was provided to Congress last summer as requested in the fiscal 1979 authorization bill. The total estimated cost with upgrading as evaluated in 1980 is about \$350 million. This does not include that upgrading needed at the Idaho Chemical Processing Plant which was recently transferred to defense programs. The condition of that plant and the need for upgrading is now under evaluation.

For the restoration of production facilities we have requested \$34.1 million in authorization and \$9 million in appropriations in the 1981 budget. This provides the initial work for restoration of facilities for production of special nuclear materials at Savannah River. The total funding for restoration in 1981 will go to Savannah River.

This 1981 project is limited to the restoration of two key facilities: Safety improvements to the machines used for charging and discharging the fuel from the Savannah River reactors and second to provide new structures and equipment to replace obsolete and deteriorating neptunium oxide facilities in one of the canyons at the Savannah River site.

## NUCLEAR MATERIALS PRODUCTION—FISCAL YEAR 1981 BUDGET REQUEST

## MAJOR ELEMENTS OF FISCAL YEAR 1981 BUDGET

Three Savannah River reactors—operate at normal operating capacity to produce [deleted] tritium, [deleted] plutonium-239, and other isotopes.

N-reactor—continues to produce 530 kg of fuel-grade plutonium and by-product steam.

Savannah River and Idaho chemical processing plants—continue operations.

Purex processing plant—placed in reduced standby condition.

New fluorinel facility—continued construction.

Facilities upgrade—construction project initiated.

Two Savannah River reactors—maintained in standby condition.

Heavy water plant—operate based on sales.

Special isotope separation—continue program.

In conclusion, Mr. Chairman, I would like to summarize the major elements of the proposed 1981 budget. First of all, as I stated earlier, the three Savannah River reactors will continue to operate in their present mode to produce [deleted] tritium and [deleted] weapon-grade plutonium as well as certain other isotopes.

The Richland N-reactor will continue to operate to produce 530 kilograms of fuel-grade plutonium and steam. The Savannah River and Idaho chemical processing plants will also continue operations. The PUREX processing plant, as I mentioned, at Richland is now in standby and with this budget will be placed in a reduced standby condition. Two restoration construction projects will be initiated. Two Savannah River reactors, in addition to the three that are operating, will be maintained in standby condition. The heavy water plant at Savannah River will continue at minimum level based on sales of heavy water and the special isotope separation program will be continued at the 1980 level.

Mr. Chairman, this concludes my presentation. I am now prepared to answer any questions you may have.

Senator JACKSON. Thank you, Dr. Gilbert.

General Mullaney, I understand you do not have a prepared statement.

General MULLANEY. That is correct, Mr. Chairman.

Senator JACKSON. You will respond to questions?

General MULLANEY. Be happy to.

Senator JACKSON. All right.

Mr. Sewell, the question here of the R. & D. testing program, my understanding is that that is underfunded by \$100 million. Your weapons production program is based on what appears to be a rather low inflation rate. The Consumer Price Index does not necessarily apply in every respect to each program in the same way but I understand that there will be a shortage of \$100 million.

Your budget for the production of nuclear materials, is at the margin? It makes no provision for additional capacity that will be needed in the mideighties. Your defense waste program is underfunded to the extent that you will not have enough money at Hanford and Savannah River to remove the high level nuclear waste from old, leaking tanks and put in the new tanks that are ready to receive the waste. Could you comment on that?

Mr. SEWELL. Yes. I have a similar concern to yours with respect to the inflation levels. Certainly we have all been surprised by the very large increase in inflation over the last 12 months and I believe your estimates are certainly in the ball park of the problems that we are going to face in the areas of the defense programs. My estimate is that somewhere between 14 and 15 percent is the more likely inflation rate that we are likely to see. The numbers you give of \$100 million in each

of the programs is certainly adequate to handle the increase above the 7.9 and the 8.5 as mentioned.

In the nuclear waste area I will have to turn to Dr. Cunningham to get his comments on that.

Dr. CUNNINGHAM. Mr. Chairman, with regard to the defense waste program I am not quite sure of the basis for the concern over the transfer from the leaky tanks but it is our intention to increase the effort in the interim storage of handling of the high level waste and we do intend to maintain our schedule with regard to transfer of those wastes.

Senator JACKSON. Let me just say, Dr. Cunningham, every now and then there is a story in the press about leakage of tanks.

Dr. CUNNINGHAM. Yes, sir.

Senator JACKSON. And I think we in the State of Washington are carrying roughly 80 percent of all of the defense nuclear waste, and I am concerned about the publicity. Our people at Hanford are unique, as they say they are not worried about the nuclear problem because they understand it. The problem is to get the rest of the country to understand it. But it does make national publicity whenever there is any kind of a leak. I think we need to speed up the program to take care of those old tanks.

Over 30 years ago I was at Hanford and I sat on the Atomic Energy Committee and we were told those tanks were going to last like the pyramids. I know it is only a matter of prediction, and in this case the prediction was wrong in terms of how long it would survive.

Dr. CUNNINGHAM. Yes, sir. As you know, there was recently an investigation both by the Department of Energy Office of the Inspector General and also by the Assistant Secretary for Environmental Affairs. As a result of those investigations and evaluations we have increased our monitoring of efforts on some of the tanks which were known or suspected to be leakers so we have increased those efforts. As far as the funding requests for fiscal 1981, we have increased that at the Hanford reservation from the fiscal 1980 appropriation of \$56,945,000 to \$62,900,000 for fiscal 1981. We are increasing those efforts and are very much concerned about the same factors that you are, Senator.

Senator JACKSON. I understand these new tanks are at Hanford and Savannah River.

Dr. CUNNINGHAM. Yes, sir.

Senator JACKSON. And it is a matter of funding to get those tanks in place and remove the waste into the new tanks. Isn't that correct?

Dr. CUNNINGHAM. Yes, sir. As I say, we have increased the funding but there continue to be some problems which I believe are not funding limited. As you know, at Hanford we have problems concerning the salt cake which is left as residue in the tanks. At Savannah River we have problems concerning slurry which is left in the tanks and these are more difficult removal problems and they require both some research and development as well but in terms of removing the liquid which is the major factor contributing to leaks, I believe we are making very excellent progress in that line.

Senator JACKSON. Mr. Morgan is here from Savannah River. Will you comment on that?

Mr. MORGAN. We are working with Dr. Cunningham in the removal of the waste. There is a situation we are looking at in the 1981 budget, we are trying to maintain our schedule to get all the waste out of the old tanks by 1985 and into the new tanks. We are still looking at that. We hope to initiate the program this year. We have currently demonstrated that we can take the slurry from tank 16 and we are now demonstrating salt removal from another tank.

Senator JACKSON. My concern is that the relationship here between the management of defense nuclear waste and the civilian nuclear waste get commingled in the minds of the public and it is so important that we do a good job on the defense nuclear waste. We have enough problems, needless to say, on civilian nuclear waste and I would like to see the management of the defense nuclear waste be handled in such a way that we set a good example for the power program. I want to make sure that we are going to foreclose every possibility of adverse reaction due to some incident that could occur in the future on the issue of nuclear waste.

Nuclear waste has become the biggest problem I think we have in the whole area of management of nuclear weapons—the custody, control, and production of them in the nuclear program. Nuclear waste management is a matter of public concern and I think with justification. So how we manage our defense nuclear wastes has a direct bearing on all of this and I think it should be given very high priority.

Mr. MORGAN. Yes. It is because of the tests we have done on tank 16 and the removal of salt that we have been able to accelerate the schedule for getting it out. It was planned to be early in 1988. We moved that schedule up to 1985 and hope to work to that goal, sir.

Senator JACKSON. All right, sir.

Let me turn for a moment, Mr. Sewell, to WIPP. Some of us worked long and hard trying to put that one together and now we have a rescission and I want your candid comments. It seems to me this program should go forward. We were able to address the issue of having the States involved in it but not vetoing it; that is, as to the military waste. We simply cannot tolerate giving the States the authority to have a veto over the management and how you handle military nuclear wastes. In my judgment it would be unconstitutional.

Where are we now on WIPP? A rescission has been sent up here. I doubt whether we on the Senate side are going to go along with the request.

Mr. SEWELL. Yes, sir. I believe the—

Senator JACKSON. There is no money in the budget?

Mr. SEWELL. Well, we have enough money to keep things going at a very low level.

Senator JACKSON. I meant in fiscal year 1981.

Mr. SEWELL. In fiscal year 1981 there is no money in the budget because that appears in the civilian side as I stated earlier. At the present time we have had to cut back on the manpower that the various contractors have assigned to the project to keep a base from which we can use to launch the project as a defense project if it is decided to do so after the rescission notice has been fully considered and final conclusions have been reached.

We have had to cut back on the manpower because the amount of money that was available during this interim period was not enough to keep the levels at the place where they were prior to that time. After

the rescission notice is finally concluded and if it is decided to return the \$17 million to us that was in the project at the time the rescission notice came out, we will be able to add additional manpower and get back to the evaluation of this site looking toward the situation where an exploratory shaft can be sunk sometime in the future. The program will have to be evaluated and certainly we are in the position, we feel, to go ahead on whatever basis the Government and the Congress decide is appropriate for the WIPP site.

Senator JACKSON. Let me turn a moment [deleted].

Do you agree with that assessment?

Mr. SEWELL. Not completely, no. Let me describe what I believe the situation to be and see if that matches the picture that you have.

At the present time we are in a position, if the decision is made prior to [deleted].

Now the situation changes gradually through time. Those warheads will be produced over a [deleted] period depending on which one you look at. As we approach the end of that production time, [deleted] we will then be in a position under present plans where we will require [deleted] to complete the conversion of all of the warheads that have produced [deleted]. That time varies from zero in [deleted] up to [deleted] in, let's say, [deleted].

Now you suggested, I believe, [deleted]. If that were done, our estimate is that it could cut that [deleted] time down to [deleted] but you are still going to require at the end of the production run to our best estimates, [deleted] to produce or [deleted] convert those warheads.

Senator JACKSON. [Deleted.]

Mr. SEWELL. [Deleted.]

Senator JACKSON. [Deleted.]

Mr. SEWELL. [Deleted.]

Senator JACKSON. [Deleted.]

Mr. SEWELL. That is correct.

Senator JACKSON. In order to maintain the necessary state of readiness.

#### NUCLEAR TESTING

A word about the weapons testing. There was a story in the paper the other day, saying that the underground test was quite successful. Which warhead was that?

Mr. SEWELL. Well, there was the warhead—

Senator JACKSON. I think it was last week.

Mr. SEWELL. There was the warhead [deleted] and then the United Kingdom had a shot [deleted].

Senator JACKSON. Are we announcing publicly when their testing is? We don't?

Mr. SEWELL. Yes. Usually, it is announced just after the test that the United Kingdom has participated. While this test was announced prior to execution, United Kingdom participation was not announced until after the test was conducted.

Senator JACKSON. Now I understand that for fiscal year 1981 you requested tests for [deleted] devices. DOE allowed [deleted] and OMB allowed [deleted]. Is that roughly a summary?

Mr. SEWELL. Yes, that is correct.

Senator JACKSON. How many of the tests are the Soviets undertaking per year? What has it been running?

Mr. SEWELL. Over the last couple of years, the Soviets have conducted approximately [deleted] per year, tests [deleted]. I state that level because we cannot be sure we detect the [deleted] and identify it. Prior to the last couple of years the Soviets were running at a level, if I remember right, of about [deleted] per year [deleted]. In the last couple of years, as the chart that General Hoover showed you, we have gone down from [deleted] down to roughly [deleted] and are now going down to [deleted] the average number as seen in 1981. There is no indication that the Soviet testing rate has been reduced any over the past couple of years, so we assume they are still running at about the [deleted] per year rate.

Senator JACKSON. I wanted to ask for the cruise missile, of course it depends on the range that you wish to use for a cruise missile. What is a maximum yield warhead that we can put on the cruise missile for say an air-launched one of more than 2,500 kilometers or one that would be used from the B-52's?

Mr. SEWELL. Let me turn to General Hoover to get an answer to that question.

General HOOVER. The warhead that we are currently designing and postured to produce for the air-launched cruise missile will have [deleted] in accordance with the weight and volume available.

Senator JACKSON. Then out of the same design [deleted].

General HOOVER. I believe the [deleted].

Senator JACKSON. [Deleted.]

General HOOVER. Yes.

Senator JACKSON. In terms of weight for the warhead, there is how much of a variation?

General HOOVER. Well, the weight is [deleted].

Senator JACKSON. It is what we have been doing for a long time [deleted].

General HOOVER. Yes, sir.

Mr. SEWELL. Excuse me, Mr. Chairman. Were you asking [deleted].

Senator JACKSON. Yes, I wanted to have that, too.

Mr. SEWELL. Let me turn to one of the laboratory directors, Dr. Kerr.

Dr. KERR. The yield of some of the W80 candidate designs were tested [deleted]. It would be possible within the weight and volume available on the air launched cruise missile to get [deleted] if that were desired.

#### NUCLEAR TESTING

Senator JACKSON. [Deleted.]

Dr. KERR. No.

Senator JACKSON. [Deleted.]

Dr. KERR. We don't believe one could go, for this kind of [deleted].

Senator JACKSON. [Deleted.]

Dr. KERR. That is correct.

Senator JACKSON. Have we not had some reason to believe that the Russians on their underground testing have been over 150 kilotons?

Mr. SEWELL. [Deleted.]

## RESTORATION

Senator JACKSON. One other question related to facilities restoration—the whole problem here of obsolescence and the time factor. What do you estimate to be the kind of investment that we need to make to address this problem because it is one that is going to occur over a period of time. You do need to have a well programed effort, it seems to me, in amortizing these facilities.

Mr. SEWELL. Yes.

Senator JACKSON. Do you have any round numbers on that and what do we have in the current budget? What kind of a deficit are we building up here? You alluded to it earlier but could you identify it a little more pointedly.

Mr. SEWELL. Yes. I can give you some round numbers on this. Let me start first with the research, development, and testing complex plus the production and surveillance complex on the weapons area.

This plant that we have, to give you a feeling of size, is worth about \$7.5 billion at today's prices and our estimate is that it will take about \$175 million per year to maintain that plant and its equipment at a constant operating level. Now in addition to that we are faced with about a \$675 million deficit in terms of the maintenance that has not been performed up to the proper level during the last approximately 10 years.

We have started on a 6-year program to completely restore that obsolete and over-aged equipment and therefore if you take the total numbers it would require the \$175 million in 1981 dollars to maintain the plant at a constant level and \$125 million a year for the next 5 years to complete our restoration project. So, overall, that is \$300 million a year in 1981 dollars which is required for the weapons complex.

In this budget, we are asking for \$237 million against that \$300 million. If you then take the last two numbers that I gave you, the \$300 million per year that we estimate we need and the \$237 million that we are asking for, I have to admit that that really then puts us on roughly a 10-year restoration program rather than a 6-year program. That summarizes the weapons area.

Now the nuclear materials production area is a little bit different situation. It is a larger valued plant, it is almost a \$10 billion plant. We estimate that it will take about \$115 million per year to maintain that plant at an even level. We are faced with about \$360 million of restoration that is needed for that plant and if we start on a 6-year program that would be roughly \$60 million per year added to the \$115 million or \$175 million a year in 1981 dollars over the next 6 years and we would have then a fully restored plant.

In fiscal 1981 we are asking for \$97 million, \$9 million of it in the restoration area and \$88 million of it for maintenance. So you can see there is roughly an \$80 million difference between my \$175 million number and the \$97 million number.

## SECURITY

Senator JACKSON. Thank you, Mr. Secretary.

One question on security breaches. The Morland article and the Rotow findings bring to the attention of all of us the problem of ade-

quate security. Do you have any suggestions or recommendations as to what we can do to avoid some of these problems based on our past experience?

Mr. SEWELL. First, I have to remind myself and the members in the room that the court proceedings are still not completed in the Morland case; therefore, there are certain things we have not done in view of the possible jeopardizing of the outcome of that case. However, we were able to use the Atomic Energy Act to prevent, for the better part of 6 months, the publication of the article in the Progressive magazine.

As you know, the Hanson letter to Senator Percy was published in a newspaper in Madison, Wis. We did not know that they had a copy of it at the time. We were in the process of getting to everyone who had copies of that letter and actually had a restraining order issued in the San Francisco area to prevent a newspaper out there from publishing it, when the Madison Press connection published a special Sunday morning edition containing the Hanson letter and, in particular, containing essentially the same information as was in the Morland article. That really made moot the case that the government had against the Progressive magazine publishing the Morland article.

I look upon that as evidence that the Atomic Energy Act was enforceable to prevent publication once we knew of the existence of any article. We worked with the Justice Department. They have underway a preliminary inquiry into the possible prosecution, on criminal charges, of some of the people or organizations that have been involved in this case and in the publications. At the present time that inquiry is not complete. As I say, we are working with them.

My judgment is that the law is adequate for investigations and potential indictment of people if such investigations can be and are carried out. We have reported all cases where we believe that potentially the law may have been broken. To my knowledge, in no case has there been any investigation by the Justice Department or the Federal Bureau of Investigation.

Senator JACKSON. Of course in the one case they found the information in the Los Alamos library. That was one of those administrative errors where people who are running the library made it possible for the person to obtain the information and you cannot very well prosecute on a criminal basis in that kind of a situation.

Mr. SEWELL. The question of the report being on the shelves of the Los Alamos library and open to the public certainly has complicated the case. Based upon the statements made by the individuals who had the information for the two articles, they had not used that particular report. That, however, does not change the situation, as you point out, to say in a criminal case that the material was not available is certainly very much hampered by the fact that the material is on the shelves.

Let me add to that to help clarify the situation at the present time. All of the reports and documents that were declassified in the early 1970's have been, to the best of our ability, put under control and the entire 36,000 documents are slowly and painstakingly being reviewed. Not one but two people in sequence will analyze any documents that have been declassified to determine that they indeed are unclassified so that we do not run into a reoccurrence of the errors which occurred at Los Alamos.

In addition to that, the Los Alamos reports library, which was open to the public up until this occurrence, has now been closed. All of the reports have been put in the vault of the library and will be handled as classified documents when they are handed out to people until the classification review I mentioned is complete.

Senator JACKSON. Thank you, Mr. Secretary.

Senator LEVIN?

Senator LEVIN. Thank you, Mr. Chairman.

Talking about articles and declassification, there was an article in the Atlanta Journal on the 19th about the IOC of neutron bombs. Apparently that information was declassified, is that correct?

Mr. SEWELL. I am not aware that that was declassified.

General Mullaney.

General MULLANEY. Yes, Senator, there was an article in the paper. I think Mr. Albright used the data. He used [deleted].

Senator LEVIN. Wasn't a timetable for that possibility published?

General MULLANEY. The timetable for the delivery of the weapon also was published but that is a distinct issue from whether or not the decision for it would or would not be made.

Senator LEVIN. Let's talk about the delivery timetable. Did that catch you by surprise?

Mr. SEWELL. Frankly, it caught me by surprise. The reporter Albright called me and said that he had gotten this information out of the arms control impact statement that had been released just prior to his writing the article.

Senator LEVIN. Isn't there a coordination between the two agencies?

Mr. SEWELL. Yes, there is.

Senator LEVIN. What happened in this case?

Mr. SEWELL. In this case let me turn to the Director of my Office of International Security Affairs who was dealing directly with them.

Dr. Julio Torres?

Dr. TORRES. Senator, I am glad you asked that question. The arms control impact statement for the warhead in question was reviewed in detail by our Office of Classification and Office of International Security Affairs. [Deleted]. There was an administrative problem with regard to that distribution [deleted].

Senator LEVIN. In other words, there was an error?

Dr. TORRES. Yes, sir.

Senator LEVIN. Mr. Sewell, it was pointed out that your own budget estimate shows that the W-79 warhead will be going into production this year. That is unclassified.

Mr. SEWELL. That is correct, yes.

Senator LEVIN. Is that not inconsistent with what was just stated back there?

Mr. SEWELL. Well, one is [deleted] the start of production.

Dr. Torres, do you have other comments you want to make on that?

Senator LEVIN. In other words, the production is unclassified, [deleted]. Is that what you are saying?

Mr. SEWELL. Yes, that is correct.

Dr. TORRES. The specific dates are considered to be classified and they were marked as such by the Office of Classification and the Office of International Security Affairs. [Deleted.]

Senator LEVIN. But this was intended to be unclassified in terms of production?

Dr. TORRES. [Deleted.]

Mr. SEWELL. Wait a minute. Not from the budget.

Dr. TORRES. Not from the budget.

Senator LEVIN. I am talking about the budget.

Dr. TORRES. I am sorry.

Mr. SEWELL. That is all right.

#### INFLATION

Senator LEVIN. According to your testimony there was a 20-percent increase in the authorization increase.

Mr. SEWELL. Yes.

Senator LEVIN. What is the assumption on inflation? I am confused by 7.9 and 8.5. What exactly did you estimate as the inflation rate in your budget request?

Mr. SEWELL. In our budget request for the production part we estimated 7.9 percent. For the research, development and testing part, we estimated 8.5 percent.

Senator LEVIN. So that in any event you projected real growth of either 12.1 or 11.5 percent, depending on what part of the budget we are talking about?

Mr. SEWELL. That is right. As I indicated earlier looking at the world today, I am concerned that the actual numbers that we are likely to see in fiscal 1981 could be in the 15 to 20 percent range.

Senator LEVIN. Which would cut your real growth rate in about half.

Mr. SEWELL. That is right.

#### NUCLEAR MATERIALS

Senator LEVIN. On the question of the availability of nuclear materials there have been reports that the DOE will not be able to meet DOD's requirement in the future with employment of Tridents, with employment of cruise missiles. Is that true?

Mr. SEWELL. You are referring to the materials that are required to produce those? Is that the thrust of your question?

Senator LEVIN. Yes.

Mr. SEWELL. In looking at the President's stockpile memorandum, I have to remind you that there are certain of those weapons in the period from 4 to 7 years in the future that the President merely takes note of for general planning purposes rather than providing production approval, but if you take those as approved for production, then it would be necessary to convert the N- reactor, start up the PUREX plant, and start up the L&R reactors at Savannah River in order to be able to meet the needs of those programs as we understand the production schedules for them.

Let me ask if there are any other details that Dr. Gilbert would like to add.

Dr. GILBERT. Well, I can show you.

Could I have the first chart.

[Chart deleted.]

That shows the nuclear weapon stockpile through 1991. The period through 1987 is that as contained in the President's stockpile memorandum referred to earlier and then beyond that we, with the DOD, have made an extrapolation of those requirements in order to make an estimate of our need in terms of special nuclear materials. It takes a long time to produce special nuclear materials so we have to plan well in advance.

You will see that through the stockpile period there is [deleted].

Now what I would like to do is turn to the next chart which shows the plutonium requirements.

[Chart deleted.]

It looks very similar to the previous chart except it is in terms of plutonium equivalence. You see for these same weapons systems this is the plutonium that we will need for those systems [deleted].

[Chart deleted.]

Now I would like to turn to the supply/demand curve with those same systems. Now the dotted line is the requirements curve, the envelope of those weapon plutonium requirements, and the bottom solid line is the predicted output from our three Savannah River reactors. [Deleted.] In other words, we will be able to meet the requirements through that first period. Then as Mr. Sewell indicated, if we are to meet the requirements after 1985, then we would have to convert N-reactor and add L and R reactors and in addition do some blending of fuel-grade plutonium with [deleted] plutonium produced at Savannah River.

Senator LEVIN. When would those actions have to be taken if this course is followed? What is the timetable?

Dr. GILBERT. The question of when we would have to take these actions or when we should take these actions is really under review right now by the Administration.

Senator LEVIN. What is the earliest they might have to be taken?

Dr. GILBERT. Well, the earliest if all those demands hold firm, the earliest really would be the 1981 budget. However, as Mr. Sewell pointed out, there are some of the systems in the out years for which the requirements may not be firm, and this is one of the issues, of course, that the Administration is looking at.

Senator LEVIN. When will that decision be made?

Dr. GILBERT. I cannot answer that.

Senator LEVIN. Mr. Sewell?

Mr. SEWELL. The consideration, as Dr. Gilbert pointed out, is now going on and the indications are that within the next few months we should have a decision on what the stockpile should look like and therefore whether there is a need to start any or all of these production plants that we have discussed for producing plutonium and tritium.

Senator LEVIN. If there is such a need, will you be coming in for a supplemental request?

Mr. SEWELL. Certainly if the decision is made to produce everything that is in the Presidential stockpile memorandum, that would be a consideration. If that is not the case, then it would not necessarily have to come up with 1981, we could come in with the 1982 and 1983 budget to pick up the necessary production.

Senator LEVIN. In your ordinary course would you be notifying the subcommittee of the decision on that?

Mr. SEWELL. Yes. In normal course I will keep you fully up to date and informed.

## INERTIAL CONFINEMENT FUSION

Senator LEVIN. Just a few questions on inertial confinement fusion. What was the total budget for that for 1980?

Mr. SEWELL. In 1980 it was \$192 million.

Senator LEVIN. What was KMS's allocation in 1980?

Mr. SEWELL. The 1980 allocation for KMS—let me turn to Dr. Schriever—\$8.1 million.

Senator LEVIN. And you are requesting the same amount of money for KMS this year?

Mr. SEWELL. That is right.

Senator LEVIN. So there is no increase for inflation there?

Mr. SEWELL. There is no increase for inflation in that figure.

Senator LEVIN. Even though your total budget went up about—

Mr. SEWELL. Let me turn to Dr. Schriever and let him give you more details on that question.

Dr. SCHRIEVER. The budget as submitted to the Congress does not contain a specific number for KMS. We have provided backup material which identifies planning numbers which will be the basis for planning until we finish our technical program development in the next few months. That number is at the present time a total of \$8.1 million as it was before. There was \$7.9 million operating and \$0.2 million in equipment in 1980. That is the same as the \$8.1 million this year.

Senator LEVIN. How then do you take into consideration inflation in that particular budget for the planning figure?

Dr. SCHRIEVER. Those planning figures were based on a level of effort in the program. The overall inflationary growth is not distributed in the planning numbers.

Senator LEVIN. Let's just take the level of effort. Will that level of effort be continued at that planning number?

Dr. SCHRIEVER. We would intend to increase that once we finalize the program plans. That is when we review all of our technical plans, all our proposals, and finalize those numbers.

Now exactly what that increase will be and how that relates to inflation, I cannot tell you at this time.

Senator LEVIN. Was the 8.1 planning information for KMS formulated before the firm was fully integrated in the national ICF program under the lab/following lab approach?

Dr. SCHRIEVER. Yes; I think the number was prepared as a planning figure somewhat before, probably about a year ago this time.

Senator LEVIN. In other words, the answer would be yes?

Mr. SEWELL. The answer would be yes.

Senator LEVIN. If the answer is yes, shouldn't the subcommittee consider the 8.1 as a dated figure in light of that new integration?

Mr. SEWELL. Yes; I think that is correct.

Senator LEVIN. Is it possible that additional funds for KMS are going to be required to permit KMS to adequately support its lead lab?

Mr. SEWELL. Yes; that certainly is a possibility.

Senator LEVIN. We can pursue that further.

Thank you, Mr. Chairman.

## PUREX PLANT

Senator JACKSON. Secretary Sewell, one last question for you and Dr. Gilbert and that is the PUREX situation. Last year we were told that we would run out of plutonium by [deleted] if something was not done. As you know, we covered this problem of the N-reactor and PUREX in the authorization bill. That was my understanding although you, the Secretary of Energy, and the Secretary of Defense all approved a request for funds for the fiscal year 1980 supplemental current fiscal year and for fiscal year 1981 likewise a request was made but you were overruled by OMB. Is that a fair summary of it?

Mr. SEWELL. That is a fair summary of it, yes.

Senator JACKSON. In light of the problem that we face, how important is it that we go ahead on the PUREX program in the context of converting the N-reactor at Hanford to produce weapons-grade material and of course with it the necessity of starting up the PUREX plant?

Mr. SEWELL. Well, certainly if the decision is made to produce even some of those warheads that are in the Presidential stockpile memorandum out in the late eighties, it will be necessary to have additional plutonium production over and above the three reactors that are now operating at Savannah River. That issue is being reviewed and the evaluation of the weapons needs for the last half of the eighties is now under consideration by the administration. That is why I believe we will get a decision within the next few months on what weapons will be needed and then we can decide what resources will be needed to produce the plutonium and tritium to match the stockpile numbers.

Senator JACKSON. I guess we will just have to do what we did before. The appropriation, of course, is held up right now but we are going to probably add the money for PUREX in the supplemental, and it seems to me that it is very important that we get moving on that in view of the time constraints.

Dr. Gilbert?

Dr. GILBERT. Let me add one comment to what you said, and perhaps it may be supportive of your statement. What I did want to point out is that we would give the PUREX restart first priority among these various options for producing more material even though it in itself does not produce material, and I say that for three reasons.

First, it will allow us to convert N-reactor to weapon-grade by providing a means to extract that weapon grade-material. That is the first reason.

Second, it will allow us to process some of the fuel grade plutonium that is now in the basins at Richland. That material can be blended with higher purity material from Savannah River to add more total plutonium to our stockpile.

Finally, as you know, we are running out of storage space for irradiated fuel at Richland and that will cause us to turn the inventory growth curve around and reduce the fuel in storage at those basins in Richland.

Senator JACKSON. So for all three reasons it would appear to be the prudent approach plus the three reactors at Savannah River.

Thank you, gentlemen. We appreciate your testimony. We will submit for the record additional questions for your response so that we can complete the record.

Senator Thurmond and Senator Cohen will be submitting questions and there may be some others.

Thank you very much.

Mr. SEWELL. Thank you.

Senator JACKSON. We appreciate your cooperation.

We will turn now to the next panel. Dr. Roger Batzel, Director of the Lawrence Livermore National Laboratory; Dr. Donald Kerr, Director of the Los Alamos National Scientific Laboratory; and Dr. Morgan Sparks, president of the Sandia Laboratories in Albuquerque.

Gentlemen, who wishes to proceed first?

#### WEAPONS PROGRAM

Dr. BATZEL. I will go ahead if that is all right, sir.

Senator JACKSON. Very good.

#### STATEMENT OF DR. ROGER E. BATZEL, DIRECTOR, LAWRENCE LIVERMORE NATIONAL LABORATORY

Dr. BATZEL. Mr. Chairman, it is a pleasure to be here this morning. I want to spend my time going through the question of the status of nuclear weapons research and development as I see it. The role of the laboratory is to maintain the military effectiveness of nuclear weapons as a major component of the U.S. defense posture. Right now we are spending most of our effort to provide weapons for DOD systems.

A specific area which gives me pause is knowing what is possible and potentially possible in nuclear weapons technology. That is an area which is receiving very little attention at this stage of the game. We are operating under increased constraints. We now live with the threshold test ban treaty which limits our experimentation to less than 150 kilotons [deleted].

Over the last decade our resources in our nuclear weapons research and development has decreased approximately 40 percent. Our weapons testing rate also decreased [deleted]. As was pointed out, the Soviet Union has recently increased its test rate to a point where they are conducting approximately [deleted] more than the United States.

We are in a situation, as has been discussed, related to nuclear materials where we make special efforts to conserve nuclear materials in our nuclear designs.

Another constraint which is not so obvious is one of national acceptance. It is a problem we have with respect to keeping the morale and motivation within the laboratory. The consequences of this, I believe, are not good. We are not in a position now to maintain an adequate strong balanced program for the nuclear weapons technology area. As I say, we have given first priority to the weaponization. We are limited in the number of experiments.

What that means is we are trying to do more than I believe we should in each experiment. We are cutting corners necessarily. We are doing the best job we can within the constraints. We are limited with

respect to the research base on materials studies but what that means is that we are gambling again.

My view is that we face the potential of future stockpile problems as a consequence of the limitation on resources and test. As far as the technological base is concerned, there are a number of physics areas which we still don't understand from a first principles point of view. We have to normalize our calculations and we can do this only with experimentation.

This is an area which has been severely curtailed in terms of effort. The issue of new concepts in spite of the limitations, we still find some new concepts coming along. For example, [deleted]. There are other concepts around. We just don't have the resources to explore those kinds of areas and issues, so we don't know what is possible and what the potential is in significant areas of nuclear weapons technology.

Now one has to worry about the issue of what is possible. I cannot tell you what we are missing or not missing in this area. I do know that the Soviets have an active, vigorous program; you can see it in the fact that their total nuclear weapons complex continues to grow [deleted]. So I have significant worries about our relative posture as time goes on.

In summary, I believe the nuclear weapons effort—and that includes research, development, testing, nuclear materials production, and weapons production—has more commitments to meet than we have resources with which to meet them.

#### COMPREHENSIVE TEST BAN

I did want to say one word about the comprehensive test ban treaty. I still know of no way, and we have looked very hard, to assure the continued viability of the nuclear deterrent without nuclear weapons tests. Now we can hedge that situation by a vigorous program in terms of understanding nuclear weapons physics and technology. We are not doing that.

Another hedge is to make sure that we have alternate tested warheads for major strategic systems. Corollary to that, I believe, is that we want to avoid a common warhead on important systems. Now we are going to continue to work this problem very hard. If we try to minimize the probability, we are going to have problems in the stockpile but we cannot be sure.

That completes my statement.

Senator JACKSON. Thank you, Dr. Batzel.

Dr. Kerr?

#### STATEMENT OF DR. DONALD M. KERR, DIRECTOR, LOS ALAMOS NATIONAL SCIENTIFIC LABORATORY

##### WEAPONS PROGRAM

Dr. KERR. Mr. Chairman, I appreciate the opportunity to appear again before this committee, this time to represent the Los Alamos National Scientific Laboratory. As you are aware, the primary mission of our laboratory since its founding in 1943 has been the application of science and technology to problems of national security. The labora-

tory gives top priority to those programs authorized by this committee; namely, those which support the U.S. policy of nuclear deterrence through the application of advanced technology to new weapon systems.

Presently my concern is that in our military applications program we are operating from a marginal and eroding base. At Los Alamos, recruiting young scientists and retaining experienced weapon designers is becoming an increasingly acute problem in an atmosphere dominated by antinuclear debate and an uncertain relationship between defense and arms control policies. On a more mundane level, the difference between real inflation which we estimate for the coming year at roughly between 18 and 19 percent and the official inflation planning number of 8.5 percent that we use for our budgeting continues to erode our fundamental capability to carry out the weapons program.

Finally, the substantial decrease in test resources has significantly altered the balance between theoretical design and experimental verification. It is not simply that the number of tests are down. There is a fundamental change in the way we approach the program as a consequence of the diminished testing resources.

We try to mitigate some of these institutional problems by pursuing a mix of energy projects, nonnuclear weapons work for DOD and work on nuclear reactor safety for the Nuclear Regulatory Commission using the same scientific and engineering skills required for military applications, and following that approach we hope to recruit scientists who can shift between national security programs and energy programs or totally new fields as the need arises. This will provide some stabilization enabling the laboratory to remain creative and effective.

The military application programs face an uncertain future. The requested resources for fiscal year 1981 are not sufficient for the research, development, and production of weapons unless we assume that SALT II and SALT III perhaps might be in place and operative. Since the outcome of the SALT negotiations is in some doubt, I believe that our program should include an option that provides for rough equivalence with the Soviet Union in deployed forces supported by efforts to modernize existing capabilities, including nuclear warheads.

#### VERIFICATION AND CONTROL TECHNOLOGY

Verification and control activities have been of vital concern to our national defense for many years and have also been part of the Los Alamos mission for more than two decades. The nuclear explosion or false alarm of September 22, 1979, [deleted] highlights the need to improve U.S. verification capabilities, particularly since their objectives now include proliferation monitoring in addition to observing weapons tests conducted by nuclear weapons states. [Deleted] also provides an implicit policy precedent. [Deleted] into verification and identification. Under these circumstances it is essential to maintain the current schedule of the global positioning satellite program and possibly to add [deleted] capabilities.

Further, we should be developing the verification and control technology that will be required to monitor treaties and agreements now

under negotiation or anticipated for the future. Had the threshold test ban treaty and the comprehensive test ban negotiations been conducted on the basis of proven verification technology, we could have reduced the risk that asymmetries might be embedded in the final agreement. The best arms control initiatives would couple political desires with proven technical capabilities.

#### COMPREHENSIVE TEST BAN

With regard to the CTB negotiations now in progress, these presently support neither our defense posture nor rational arms control initiatives. If concluded, we could not continue to support nuclear deterrence in the manner that we have developed over the past 35 years nor would these negotiations, if concluded, have substantially reduced the risk to our population from deployed Soviet weapons.

#### NUCLEAR MATERIALS PRODUCTION

Finally, I am concerned that our capability to respond to rapidly changing defense requirements may be compromised by a [deleted] shortage of special material, namely, plutonium and tritium. As you have seen, most of the stockpile projections indicate that these materials may not be available when they are needed a few years from now.

Instead of talking about the possible need and what might be done, I thought I would take a few minutes and complete my remarks by showing you some things that have been done, a conceptual design that we are now pursuing that will result in a proposed construction schedule to the Department of Energy.

#### NATIONAL STRATEGIC-MATERIAL PRODUCTION REQUIREMENTS AND THE ADVANCED PRODUCTION FACILITY

##### A PLAN FOR STRATEGIC NUCLEAR MATERIALS PRODUCTION IN THE 1990'S

The first slide indicates the subject which is a plan for special nuclear materials production in the 1990's.

##### THE PROBLEM

The vital role of tritium in the U.S. nuclear stockpile demands a minimum of [deleted] be on line and available to meet steady state tritium makeup needs. Also, there will be a continuing drive to reduce low level radiation exposure that will place a high demand on low 240 content in weapons-grade plutonium.

##### SAVANNAH RIVER

DOE production reactors P, K & C are presently 25 years old. Planning needs to be initiated immediately to design, construct and place in operation suitable replacement reactors before end-of-design life of existing plants—this means by the early 1990's when P, K & C will be in excess of 35 years old.

##### RICHLAND

In addition to providing nuclear materials production needs, the northwest power grid desperately needs to maintain the >800 MWe of power supplied by the N-reactor. In the early 1990's N-reactor will be approaching its end of design life.

The problem is, of course, that at Savannah River we have three reactors presently 25 years old, they will be 35 years old at the end of

this decade. One could question whether they should not at least in principle be planned for phase down and replacement even with the best of maintenance.

There is no doubt that we will need tritium in the future, that is an essential element in our stockpile. So there will be production requirements for the foreseeable future.

Lastly, at Richland the N-reactor will be nearing the end of its design life in the 1990s. That is not a hypothetical lifetime, it is in fact dictated by the radiation damage to the graphite stack in that reactor.

#### PRODUCTION REQUIREMENTS

Produce [deleted]/yr/reactor of tritium.

Versatile to produce [deleted]/yr/reactor subtracted out of tritium production.

Dual purpose to provide process steam for electrical power generation.

Versatile to accept other target material for production of Pu-238, Am-241, Pu-242, Cm-245, Cm-247 and Cf-252.

We have looked at the production requirements and have constrained the design to one that would produce [deleted]. It would be dual purpose. My personal view is that, when you are running a reactor to produce weapons materials, you, of course, produce heat at the same time. This Nation cannot afford to throw away that heat. As a matter of political principle—it is almost a moral issue—you better make power with it if you have it. Lastly, we would want to produce other special isotopes with relation to other programs.

[Chart deleted.]

My recommendation is very simple. It is to design a [deleted].

[Chart deleted.]

In operation at a [deleted] which would of course be blended with the existing 12 percent material at Richland.

In the plutonium mode the targets for tritium production would be replaced by internal depleted uranium blankets [deleted].

[Chart deleted.]

In terms of the fuel cycle required in the plutonium mode, you will see that many of the facilities identified are those already in existence or under construction. In particular, the fuel assemblies could be fabricated in the FMEF facility now to be completed at Hanford in 1984. [Deleted]. The fabrication would be relatively simple and could be supported by the planned FMEF facility.

[Chart deleted.]

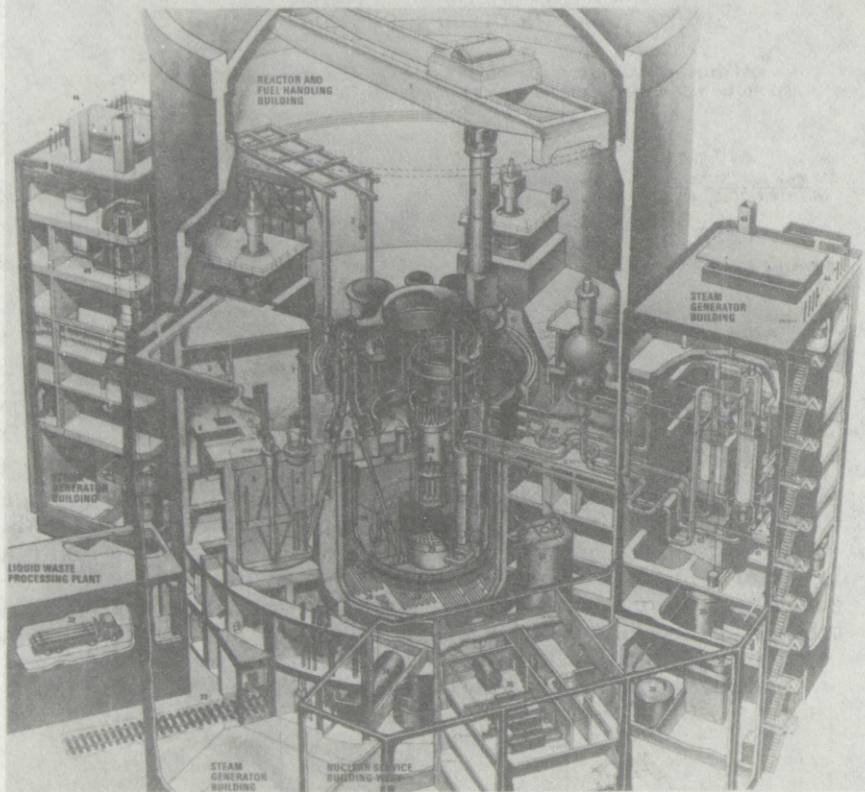
In the tritium mode, that same fuel cycle is augmented by a sub-cycle for handling the lithium oxide targets. That does not appear to be a major cost or facility problem at the present time.

[Chart deleted.]

To give you an indication of how it works in comparison with other reactors, I will direct your attention to the bottom line which is the grams of plutonium per megawatt-day or grams of plutonium equivalent. You will notice that for the advanced production reactor fueled with plutonium, that factor is [deleted]. That compares to [deleted] for the existing Savannah River reactors.

You will also note a column there for fuels with enriched uranium. That would be to demonstrate that one could start up on uranium if for one reason or another it were decided not to use reactor-grade plutonium as the startup fuel.

## PLANT LAYOUT



The next picture is just an illustration to take on the question of what is the technical risk associated with operating a liquid metal reactor plant. All I am talking about now is that central core area indicated in red. It is embarrassing to tell you this is the French super Phoenix reactor that will come online in 1984 and is 1,200 MWE. The point is everything I am talking about is technology that we either have on hand as a result of the FFTF or Clinch River effort or is commercial in other countries around the world.

Why sodium? Here I will try to give a very brief answer using for comparison purposes a thousand megawatt CANDU design and a thousand megawatt light water reactor [deleted]. You will note that in both the tritium and plutonium production modes, this fast reactor is more efficient than the CANDU or light water reactor. That is really no surprise. It is a breeder reactor, the others are really not, and to produce tritium or plutonium in the more conventional reactors, you

have to replace elements in the core with the breeding targets and consequently you reduce the number of neutrons present and you change the neutron efficiency. So, when you go to the grams of plutonium equivalent per megawatt-day, you see that the fast reactor in either the tritium or plutonium mode has a substantial advantage over the other two.

#### WHY A SODIUM COOLED PRODUCTION REACTOR

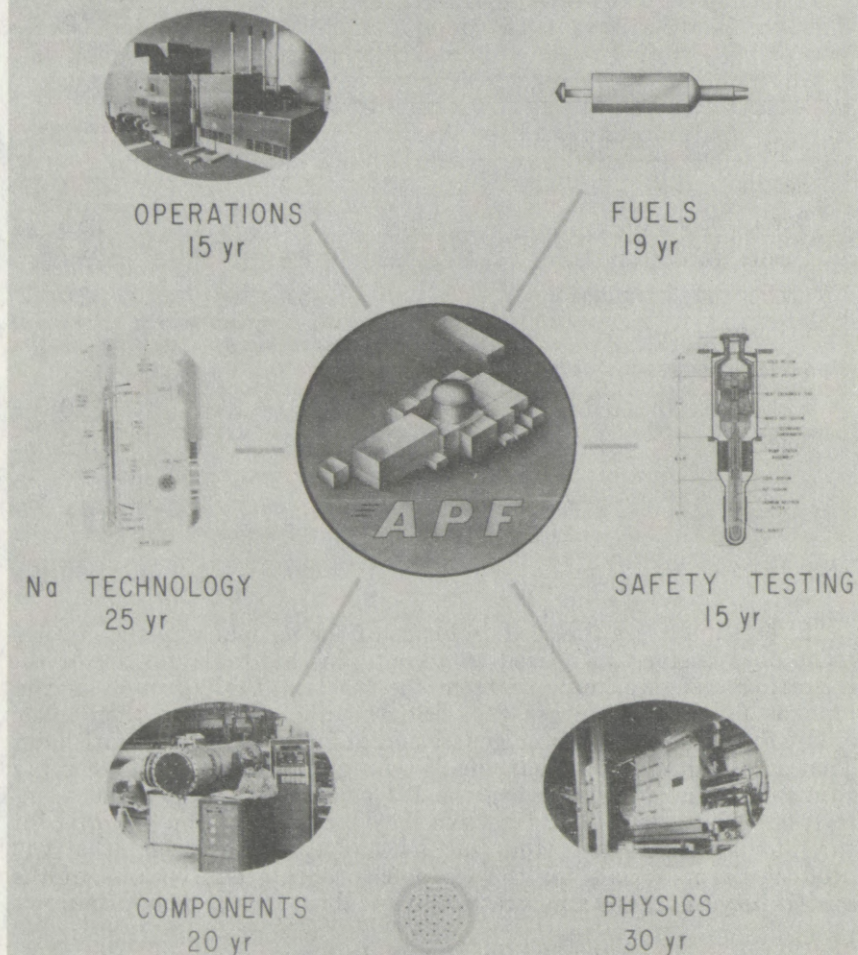
- COMPARED TO OTHER CANDIDATES (CANDU OR LWR) THE APR IS APPROXIMATELY MORE EFFICIENT IN PRODUCTION OF EITHER PLUTONIUM OR TRITIUM.

	ELECTRICAL POWER GENERATION
1000 MWe CANDU TRITIUM MODE	$3.29 \times 10^9$ KWH
PLUTONIUM MODE	$4.38 \times 10^9$ KWH
1000 MWe LWR TRITIUM MODE	$4.48 \times 10^9$ KWH
PLUTONIUM MODE	$3.94 \times 10^9$ KWH
1000 MWe APR TRITIUM MODE	$6.6 \times 10^9$ KWH
PLUTONIUM MODE	$6.6 \times 10^9$ KWH

Another more fundamental point is this country has a liquid metal fast reactor design team in place. It does not have a team to design a CANDU nor a LWR for the purpose of producing weapons materials.

[Chart deleted.] In terms of cost, we have done something that is a little different for a Government-owned facility. Namely, we have included the cost of amortizing the capital investment. Even though the top line of this chart includes a capital fixed charge rate of 10 percent or roughly \$150 million per year, you still find that in [deleted]. These numbers, of course, are substantially less than the LWR and CANDU systems.

## STATE-OF-THE-ART TECHNOLOGY



This is state of the art; I wish I were telling you about new technology invented just recently in the United States but you will for sure recognize that that is not the case. EBR-II, for example, has been running in Idaho for 15 years. The fuel design is identical to that which is in FFTF, now critical, at Hanford. The United States has 19 years of experience with oxide fuels and other components as you go through the rest of the plant. It is not a high technical risk. It may be a high policy risk but certainly in an engineering sense it is achievable.

**SUMMARY OF ANNUAL OPERATING COST AND  
NET REVENUE FROM ENERGY BONUS**

	Tritium Production Mode	<sup>239</sup> Pu Production Mode
Operating Cost, 10 <sup>6</sup> \$/yr		
Reactor O & M	25.3	25.3
Driver Fabrication	31.2	23.5
Blanket Fabrication	8.6	23.1
Control-rod Fabrication	3.4	2.0
Li-target Fabrication	19.2	-
Li-target-processing O & M	5.0	-
Fuel-reprocessing O & M	<u>29.0</u>	<u>29.0</u>
Total	121.7	102.9
Credit for Power Generation @ 20 mills/kWh	131.4	131.4
Net Revenue, 10 <sup>6</sup> \$/yr	9.7	28.5

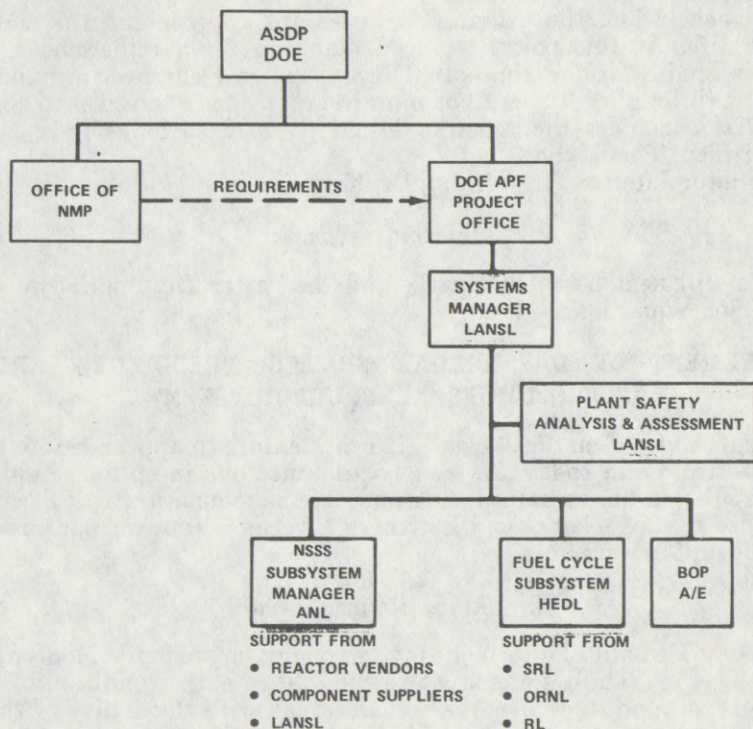
If you summarize the costs in terms of the normal way the government does business, we tried to account in this table for all of the operating costs we know of from the reactor O&M through driver, blanket fabrication, target fabs and the like. We have then taken credit for the electric power generation at 20 mills per kilowatt hour. That is about half of what the Washington Public Power Supply System will be charging when the WPPSS number 5 plant at Hanford goes critical in 1985. I believe they are planning on 42 mills for sure at that time. The bottom line is net revenue in the sense that you produce the materials for the weapons program and because of the availability of a 1,000 megawatts you are able to make money doing it.

**BUT PROMPT ACTION IS NEEDED**

Hanford and Savannah River production capability approaches end of life. Replacement is needed in late 1980's or early 1990's.  
Lead times demand action now!

Our recommendation is simple and direct. That is, we believe that it is time that this country looked seriously at the problem of future weapons material production facility. It certainly is important to maintain those we have but at the same time to recognize that plants that are 35 to 40 years old may need to be replaced and, with the urgent need for materials and current lead time, even in this case with proven technology we think 10 years would be pushing things very hard to

bring a new facility on-line. So it is a case where our recommendation is to move sooner rather than later.



Why choose this? I am sorry; I should tell you who is doing the work and not mislead you into thinking this was all done at Los Alamos. In fact, the design team for the reactor part of the system, the nuclear steam supply system is Argonne National Laboratory—a team that has been working the FFTF physics design and also the Clinch River reactor.

The fuel cycle subsystem is led by HEDL while the balance of the plant design clearly would be done by a commercial architect engineering firm. Los Alamos has entered, at least in the proposal form, as the system manager and also has responsibility for some of the safety assessment work—work we currently do for the NRC.

Our recommendation to DOE is that it be a defense program from the start, that it not be confused with civilian energy interests other than the possible benefit to liquid metal fast breeder technology by bringing on a hardware project rather than continuing the present innumerable paper studies that we have seen. So it has been proposed as a construction project to Mr. Sewell as Assistant Secretary for Defense Programs and of course Dr. Gilbert's office would be the ultimate beneficiary if such a project were finally built.

To summarize the advantages we see in it, it has the highest production efficiencies of any of the reactor types now available, low operating costs, a 25-year-old technology base, existing support facili-

ties, particularly at Hanford, and inherent features to satisfy safety and environmental concerns that have grown since we built our last materials production reactor.

In conclusion, the existing facilities are approaching the end of their life. At this point, we need planning for a replacement, not paper studies at the conceptual level, but real engineering studies, and with long leadtimes 10 or more years, it is not too soon to begin.

That concludes the remarks I had planned to make today, Mr. Chairman. Thank you.

Senator JACKSON. Thank you, Dr. Kerr.

#### WEAPONS PROGRAM

We will next hear Dr. Sparks and then after Dr. Sparks we will have some questions.

#### STATEMENT OF DR. MORGAN SPARKS, PRESIDENT, SANDIA LABORATORIES, ALBUQUERQUE, N. MEX.

Dr. SPARKS. Senator Jackson, it is a pleasure to appear before this committee again today. As you recall, since our inception, Sandia's basic mission has remained the same: To make nuclear explosives developed by Los Alamos and Lawrence Livermore into weapons usable by the military services.

#### STOCKPILE MODERNIZATION

Today I would like to focus my testimony on stockpile modernization. One of Sandia's ongoing responsibilities is the condition of the nuclear weapon stockpile. We are concerned with the ability of those weapons to function properly if called upon. They are controlled to prevent unauthorized use and to assure their safety, particularly in the case of an accident. Because of these interests, we are pursuing a major stockpile modernization program.

I would like now to summarize briefly the principal elements in the progress that has been made in improving the safety and control of nuclear weapons. An exclusion region has been introduced into the fire set design which electrically isolates the components which are required to detonate the weapon. Rugged components called strong links have been developed which control the electrical signals into the exclusion region.

Deliberately designed weak links are incorporated which are essential in detonating the weapon but which will fail safe under any accidental environment long before the protective strong link switches could fail. Further, unique coded signals have replaced direct current signals to actuate the strong links. Additionally, Los Alamos and Lawrence Livermore Laboratories have introduced insensitive high explosives into some of their new designs. The insensitive high explosive minimizes the risk of detonation of the chemical high explosive due to impact or fire, thereby reducing the risk of scattering plutonium. Now these several new developments that I have just described taken together provide a predictable safe response in case of an accident. In the control area, we have developed more secure and more versatile

permissive action links with a larger code population, a limited try feature, and multiple release codes so that a selective release can be accomplished easily. We have also developed active protection systems which automatically disable the weapon when unauthorized use is attempted.

Now let me tell you about our progress in getting these new safety and control techniques incorporated in the stockpile. New production, of course, incorporates most of these new features so I will concentrate on the older weapons. Many of the nuclear weapons now in the stockpile were designed to requirements which foresaw long periods of storage and only brief exposure to transportation environments.

Changing conditions in the early sixties dictated different operational practices, including ground- and air-alert operations. So starting in 1968 new weapons requirements have increasingly responded to this change in the weapon usage by providing more stringent accident safety requirements.

For roughly the first two decades of the U.S. nuclear weapons program—that is, from 1948 to 1968—rapid advances in nuclear weaponry and in weapon delivery systems caused such a high rate of turnover that the deficiencies of earlier designs were not a continuing concern because they were quickly replaced. To illustrate the rate of turnover, in early 1968, among the 26 types of stockpile nuclear weapons the oldest was 11 and the average age was 7 years. However, by that time changing military, political and economic realities resulted in a much lower rate of turnover, drastically reducing opportunities to upgrade the capabilities. So by early 1979, among the 27 types of nuclear weapons deployed, the oldest was 22 and the average age was 13 years, double the earlier stockpile retention period.

To further aggravate the situation, a few of the old weapons are scheduled to remain in the U.S. stockpile into the 1990's. Certain important features of these weapons should be brought up to today's more stringent standards. Now I don't want to mislead you. The old weapons are as safe as they have ever been and they are very, very safe, but we now have new design capabilities and new requirements.

The findings of several DOD and DOE analyses were integrated in the 1978 DOE study of all the nuclear weapons in the inventory. This study resulted in recommendations for hardware improvements and the associated funding requirements. The purpose of the study was to tell us how we might modernize the existing stockpile over the next decade both by building new weapons and by improving some of the old ones, all within the expected funding limitations.

With these objectives in mind weapons were placed in three priority groups according to their military use and related deficiencies, their exposure to potential accidents, their susceptibility to accidents and the degree to which national policy might be constrained by any shortcomings in these areas.

Limited numbers of priority 1 systems, [deleted] and the [deleted] were recommended for immediate modernization because their nuclear detonation safety was not up to today's technology. Limited quantities of [deleted] other weapons types, assigned priority 2, were recommended for modernization over the next decade. This proposal was sent to DOD, who responded in early 1979 with clear endorsement of a modernization program.

Based on this DOD response, DOE planned to commence modernization of B28, F-1, and early deployment of strategic and theater forces.

[Chart deleted.]

The first Vu-Graph shows the B28, F-1 modernization on the left and the components removed, and on the right the replacement of those with a new safer technology.

[Chart deleted.]

A similar Vu-Graph for the early version of the B61 is shown in this Vu-Graph, again with the components to be removed on the lower left and their replacement on the lower right.

The modernization of the Nike Hercules and Genie warheads was endorsed in principle by the DOD although further study was required. The Nike Hercules study was completed by a joint Army/DOE working group which recommended going ahead, the Genie study is still in process.

Accordingly, DOE requested funding for the B28F1, the W31, and the B61 modernization in fiscal year 1981, but the requested funding was not included in the budget. We continue to believe that this program is valuable and we hope that it will be funded in the fiscal year 1982 budget.

Mr. Chairman, that concludes my testimony.

Senator JACKSON. Thank you, Dr. Sparks.

#### SYSTEM SURVIVABILITY

Sitting up here listening to your important testimony, I can't help but think of the larger problem we face and that is with all of your fine design work that you are doing and you have done a tremendous job, all of the labs, we are confronted, however, with the enormous problem in the eighties of making our strategic nuclear systems survivable. I wish we had a lab where they could come up with some answers.

This is not to denigrate the think tanks and all the things that all the other groups involved do but, unless we solve that problem—we are now involved with the M-X, we have got Trident coming on. But the fundamental problem that we face with the constraints that are being imposed by SALT II voluntarily, what can you say about the various possibilities of coming up with a more survivable system? Is there anything new?

Would any of you want to address that issue?

Dr. BATZEL. It is clear to me, and it is generally agreed, that our land based systems are at risk. I have personal worries about M-X as it is now configured because of the complexity and cost but since we need a replacement for Minuteman II and III, I think some kind of a multiple aim point system is probably the right way to go. However, the United States ought to reexamine its position with respect to ABM, antiballistic missile defense. I think one should reexamine the question of whether hard point defense mixed with some variation of a multiple aim point system might not turn out to be a more viable, affordable, and reliable system, for example.

Senator JACKSON. The combination?

Dr. BATZEL. A combination, yes.

Senator JACKSON. Of ABM and the multiple aiming point system?

Dr. BATZEL. Yes.

Senator JACKSON. In other words, that would provide some survivability for the ICBM system but at the same time address the issue of an ABM defense.

Dr. BATZEL. Yes. I have a question as to whether setting aside any possibility of defense against ballistic missiles is in the long term stable. I personally think we should not leave ABM out as a possibility.

Senator JACKSON. Are you talking or thinking of an ABM system in the context of lasers?

Dr. BATZEL. Probably not lasers. I think the chances are that it would involve nuclear warheads.

Senator JACKSON. Much different than what we had before?

Dr. BATZEL. Something like sprint or a modification—a close in hard point.

Senator JACKSON. What is your feeling about [deleted] which allegedly could have a hard target capability [deleted].

Dr. BATZEL. [Deleted.] I think that the triad as now conceived, including land based, air based, and sea based system still makes a lot of sense.

Senator JACKSON. It still is.

Dr. BATZEL. Yes.

Senator JACKSON. Fundamentally sound in your view?

Dr. BATZEL. It is still fundamentally sound in my view. Frankly, I have some questions about whether one should in fact lower the number of boats which will be the consequence of the deployment of Trident. I think there is a question as to whether you should make more attractive possible ASW options for use against the Soviets. I have a question as to what is best there. It is difficult to see into the future of ASW and what the technology will permit in the future.

Senator JACKSON. Dr. Kerr?

Dr. KERR. I would like to add to what Dr. Batzel has said with respect to ABM and in particular I think the question ought to be what has changed since 1972 when the United States began giving up its then current ideas of ballistic missile defense. I think there are three areas that one needs to highlight.

The first is the development of [deleted] devices, [deleted] program being an example of that. The second is the thing that has made it possible; namely, the [deleted] terminal defense area, which Dr. Batzel has mentioned, there, one is constrained to use nuclear devices [deleted]. All of those tied together by the substantial advances in computer technology, data processing, and radar technology of the past 8 to 10 years. So it is time for a new look at ABM's.

You asked also about the possibility of lasers [deleted]. In fact, all three of our laboratories are working on those things, generally as reimbursable work for the Department of Defense. They are not the kind of thing you talk about in a military planning sense at this point, they are speculative, high technology endeavors using electron beams, the free electron lasers and the pulsed-power sources that go with them. If they prove out in this decade, one might be thinking of them in an engineering sense for perhaps post-year 2000 deployment for ballistic missile defense but I would not think any sooner than that.

You asked the question about whether the follow-on to the present Trident missile, whether the C-4 going to the D-5 added to survivability. I don't think it really addresses the question of survivability of our weapon systems. That change would, of course, add to our offensive capabilities. I think the question of survivability at sea, on land, just as it is, has to do with a reexamination of the multiple aim point proposal in conjunction with some active defense [deleted] I think one could make a strong argument, [deleted] for more deployed platforms than the United States is currently planning on and perhaps platforms deployed at different ranges from the target they are assigned so that you in effect create a larger aim point problem [deleted] than we are going to present in the next 10 years.

With respect to the penetrating bomber force or the standoff force that goes with cruise missiles, there is clearly a lot of work to be done there. At this point in time it is my understanding, for example, [deleted] which is not our most modern system and not one slated for replacement in the near future.

That is about all I can add at this point.

Senator JACKSON. What about Dr. Sparks and then I will ask each of you to comment about the near term. I think the next 4 or 5 years is a period of enormous danger and temptation on the part of the Soviets to take risks that they would not otherwise take—not that they would start a nuclear war, I don't think the game is played that way.

We are into the period of ultimate blackmail, a period already underway, Finlandization, hegemony, primacy, whatever you want, in terms of the application of a strategic advantage and a general purpose, force advantage of certain areas of the world.

Dr. Sparks?

Dr. SPARKS. I agree with the comments that Dr. Batzel and Dr. Kerr made. I know your question referred to the strategic forces. I just would like to add that there is also a question of survivability in the theater nuclear weapons and that problem is being worked pretty carefully just now and we do have some approaches with better ways [deleted] having to do with [deleted] security, a combination of security [deleted].

Senator JACKSON. [Deleted] you say?

Dr. SPARKS. Yes, [deleted].

Senator JACKSON. With the cruise missile which is a second strike capability being especially the ground launched systems that can be dispersed over a wide area, particularly in Western Europe. Aren't there certain opportunities for survivability there with this rather unique system as compared with other systems [deleted] the ability to disperse a cruise missile away from airfields?

Dr. SPARKS. Yes.

Senator JACKSON. We have airfields, whatever number, in Western Europe that are now obvious targets for the Soviets. The fact that we do deploy the cruise missile in various areas, whether they are in fields or what have you, moving them around, it creates a moving target and complicates the adversary's problem. In other words, you would free up a lot of tactical nuclear bombers or they can be strategic bombers, whatever you want to call them.

Dr. SPARKS. I think that is right. There is the problem of the range. There is now restricted range on cruise missiles which—

Senator JACKSON. 600 kilometers but even under the protocol and I think you know my views about SALT II, I don't need to go into that. But even if the protocol would expire in 1981, in terms of addressing the issue which you brought up in Western Europe, it seems to me that there is a tremendous opportunity here to use the cruise missile with a longer range than 600 kilometers to offset the SS-20 which will complicate the Russian problems. The Russians historically through the ages have been heavy on defense, that when they see an offensive system they really invest in a defensive system.

#### DEFENSIVE INVESTMENT STRATEGY

I think the great value of the B-52—some of us felt it would be wise to force the Russians into investing a lot of money in air defense, [deleted]. Do you have any comment?

Dr. SPARKS. I certainly agree with those comments.

Senator JACKSON. I think we have to look at more than hardware. It is the kind of hardware that will cause the Russians to react in a certain way which can be to the interests of the West that we have to look at, as well as the type of systems that we are working on. Some systems complicate their problem and will cause them to react in a different way. That is what I am trying to throw out on the table.

Dr. SPARKS. Our technology has tended to lead in electronics communications and things of that nature whereas the Russians tend to feature brute force approaches to their defense. I think what you have said applies here, too, because the kind of sophistication we can introduce into the guidance of newer and more modern offensive weapons will require an even greater answer in their terms of the cost of defense against them.

Senator JACKSON. I am trying to think now in the interim period—the long leadtime. There are long lead items that we have to face, but it occurs to me that various applications of the cruise missile in the short term can play a role here to offset the perception and realities of Soviet strategic power in the early eighties. It is on us.

Dr. KERR. From a design point of view, we are certainly in the position of supporting the more rapid deployment of either the air-launched or the ground-launched cruise missile since the development of the warheads is either complete or nearly complete in both cases. [Deleted.]

A final point that we could address in the near term might be the proposal [deleted]. Again that is something that could be carried out on what you call a near time scale which I am afraid these days is something more than 5 and hopefully less than 10 years.

Senator JACKSON. That is the problem, but it occurred to me that with the cruise missile we can get the kind of deterrent response that we would like to get from them.

Right on that point, Dr. Batzel, what about MIRV'ing the cruise warhead? Is that feasible?

Dr. BATZEL. I think in principle one could MIRV it. It is not clear to me that that is the way to go. I think that multiplicity of cruise missiles, given their flexibility and relative cost, adds a lot to the system

and the multiplicity makes for additional targets for the defense. Certainly multiplicity of targets complicates defense and it seems to me that application of cruise missile technology which we now have is an excellent way to go.

I still have a worry about another factor in our defensive posture and that is our command, control, and communications. We could put ourselves in a better posture to use the forces we now have. That is a complicated area, but one where I think additional effort is certainly worthwhile.

Senator JACKSON. That is fundamental. I mean without a solid command and control system—redundancy—I think we needed a little bit of that in the last 3 days. It occurs to me that there is, however, an opportunity in this near term to complicate the Soviet problem. I don't think they make an awesome move unless they are convinced that they have an ability to achieve their objective without unnecessary risk. I just don't think the Russians are about to pop off and start something except in those situations where they have overwhelming superiority in which the confidence factor is very, very high.

I think our task in this immediate period in order to bring some stability is to complicate their problem. They see the complications that they face strategically. That becomes a pretty effective deterrent, don't you agree?

Dr. BATZEL. I agree.

Dr. KERR. I think that may be a good point to make in terms of Dr. Batzel's earlier answer on MIRV'ing the cruise missile. If you MIRV it, you don't complicate their defense problem to the same degree that you do if you just have more missiles in the sense that the defense problem is really a traditional aircraft defense problem made more difficult by the small size of the vehicle and its low altitude, but if you only have one going through to deliver 10 warheads, that is an easier problem in terms of the anti-aircraft defense than having 10 vehicles going through at different times and different directions.

Senator JACKSON. But what if you have all the vehicles with 10 warheads each?

Dr. KERR. Then you are really in the tradeoff between range, yield, and weight, how much you want to spend on each vehicle.

Senator JACKSON. I hope you gentlemen will be addressing this as much as you can as you work with this in your area of responsibility. Also I hope you will help us try to come up with some innovative approaches on how to get your good work to the target should it ever be required. I think we have a terrible job now ahead of us, restoring our credibility in the strategic area and to be able to address this problem effectively in the near term as well as in the longer term. We are going into a period of great instability and your role in the efforts that you are making to continue to improve your product is vital, but we want to be sure that your product is usable and that is my biggest worry right now as I listen to the testimony on strategic systems.

#### SEPTEMBER 22 EVENT

Just one question. Do we know any more about the September 22 event? Who wants to respond?

Dr. KERR. I will try to answer in brief. Dr. Batzel and I as well as many of Dr. Sparks' people have spent a great deal of time on

that subject. In summary, the VELA satellite appeared to be working, [deleted]. We have been able to match the observed data from the satellite by a calculational step that has been proven in the past to properly represent the operational time history.

So on the one hand you have a strong case to be made for a nuclear origin to that effect. On the other hand, as you are aware, there is no other hard evidence to support that conclusion. Thus far there has been no human intelligence nor confirmatory information that unequivocally allows you to determine that it was a nuclear explosion. [Deleted.] We have very few new interesting designs of meteorite. There is no new data to give you at this time.

Senator JACKSON. Does anyone else have anything?

Dr. BATZEL. We have looked at the same data. I come to the same conclusion.

Senator JACKSON. Dr. Sparks?

Dr. SPARKS. Same conclusion.

Senator JACKSON. Now if we only knew who was in the area stirring up this confusion, we would have the rest of it.

Gentlemen, thank you very much. Your testimony has been very helpful. We will submit some interrogatories for you.

#### STRATEGIC SYSTEMS

I will probably suggest to the chairman of the full committee that we should have hearings on this whole question of strategic systems and the ability to cope with this interim period as well as the longer term and we will be calling on you for the benefit of your views. We will give you ample notice.

Thank you very much.

Dr. KERR. Thank you.

Senator JACKSON. Admiral Rickover?

#### STATEMENT OF ADM. H. G. RICKOVER, DEPUTY ASSISTANT SECRETARY FOR NAVAL REACTORS, DEPARTMENT OF ENERGY

Admiral RICKOVER. Good morning, Senator Jackson.

Senator JACKSON. Admiral, we are delighted to welcome you once again to the subcommittee. It is a special pleasure for me to invite you here as one who has been watching you testify for 31 years, going back to the Joint Committee on Atomic Energy when I was a Member of the House.

Admiral RICKOVER. You don't look that old, Mr. Chairman.

Senator JACKSON. How about yourself? I would say you are the youngest chicken around here.

Admiral RICKOVER. Well, I don't mind you calling me young but I object to you calling me a chicken.

Senator JACKSON. Well, you're not chicken when it comes to giving opinions.

Admiral RICKOVER. Mr. Chairman, I would like to say that it has been one of the greatest pleasures of my life to have known a person such as you who is not only an outstanding legislator but also equally outstanding in his human qualities. I appreciate that very much

because were it not for you I probably would not be testifying here today, so if I do a lousy job it is your fault, not mine.

Senator JACKSON. I will assume full responsibility.

Admiral, you have a comprehensive statement. Why don't we place the entire statement in the record at this point as if read and then you proceed to comment and summarize as you may see fit. Would that be agreeable?

Admiral RICKOVER. Yes, sir; I think that would be an excellent idea. I would hope that sometime during the hearing you would ask me relevant questions about our defense insofar as I see it and about what we are doing in the nuclear program. Perhaps I could do you even more good if you had questions about the nuclear industry.

Senator JACKSON. That would be helpful. I think we would be better off maybe if you just made your key points—not just on your statement but what you want to say.

Admiral RICKOVER. The complete statement will be in the record for those who care to look at it.

Senator JACKSON. Your complete statement is now in the record.

Admiral RICKOVER. Thank you, sir.

[The prepared statement and related material follows:]

PREPARED STATEMENT OF ADM. H. G. RICKOVER, DEPUTY ASSISTANT SECRETARY FOR  
NAVAL REACTORS, DEPARTMENT OF ENERGY

Mr. Chairman, I deeply appreciate this opportunity to state my views concerning the programs for which I am responsible as well as other issues of importance to the future of our country.

NAVAL NUCLEAR PROPULSION PROGRAM

The Naval Nuclear Propulsion Program is a joint program of the Departments of Energy and Navy. I serve both as the Deputy Assistant Secretary for Naval Reactors in the Department of Energy, and the Deputy Commander for Nuclear Propulsion in the Naval Sea Systems Command. The combination of the responsibilities of the Departments of Energy and Navy for naval nuclear propulsion under one organization eliminates duplication of programs and resources and provides close coordination of technical work.

The Department of the Navy is responsible for the military application of nuclear propulsion including constructing, operating, and maintaining nuclear powered ships, and for developing the non-reactor portions of the nuclear propulsion plants. The naval nuclear propulsion work funded by the Department of Energy provides for the research and development of nuclear reactors for warships. In this regard, I am responsible for reactor plant research, design, development, construction, operation, maintenance and proper control of radioactivity pertaining to naval nuclear propulsion plants and for all related reactor plant safety aspects. My responsibilities also include selection, training and qualification of personnel for operating and maintaining these plants. Within the Department of Energy, I am also responsible for the Water Cooled Breeder program; a civilian reactor development program.

NUCLEAR POWERED WARSHIPS

In the more than a quarter century since 1953, when the Nautilus land prototype first operated, the number of nuclear powered warships has grown to a present total of 125 representing more than 40 percent of the Navy's major combatant ships. This figure includes 41 ballistic missile submarines (SSBN's), 73 attack submarines (SSN's), three aircraft carriers (CVN's), and eight cruisers (CGN's). There is also one nuclear powered deep submergence research vehicle, the NR-1. These ships have steamed a total of more than 43 million miles; yet there has never been an accident involving a reactor nor has there been any release of radioactivity which has had a significant effect on the environment. There are also eight Trident ballistic missile submarines, 25 Los Angeles Class high speed attack submarines, two Nimitz Class carriers, and one Virginia Class cruiser authorized by Congress or presently under construction.

The Naval Nuclear Propulsion Program is responsible for more operating reactors than the total of all U.S. civilian nuclear power reactors.

#### NAVAL REACTORS DEVELOPMENT PROGRAM

The goal of the Department of Energy's Naval Reactors Development portion of the Naval Nuclear Propulsion Program is to design, develop and test improved nuclear propulsion plants and reactor cores having long fuel life, increased reliability, improved performance, and simplified operation and maintenance requirements and, ultimately, to develop reactor cores that will last the lifetime of a ship.

Particular emphasis is placed on obtaining advanced long life cores necessary for increased ship performance and availability. Extending the operating lives of these cores will materially benefit the Navy from the standpoint of both cost and operations. A longer nuclear core operating life increases the percentage of time the nuclear fleet units are available for operational duties. This allows greater operational flexibility and provides additional assurance of availability and endurance to fight a war. This is a most important consideration, because any future naval war will have to be fought with the ships available at the start of hostilities.

An additional benefit of developing long life cores is that as core lives increase, the number of refuelings will be reduced thereby reducing costs and minimizing radiation exposure and radioactive waste. As an example, the first core for the USS Nautilus propelled the submarine 2 years and 62,000 miles, while a modern core is good for 10 to 15 years and over 400,000 miles.

The Naval Reactors Development program's Department of Energy budget request for fiscal year 1981 is as follows.

	<i>Budget authority (millions)</i>
Operating funds.....	\$250.4
Capital equipment funds.....	39.0
Construction funds.....	16.0
<b>Total Naval Reactors Development.....</b>	<b>305.4</b>

An unclassified description of the fiscal year 1981 Naval Reactors Development program budget request is attached as Appendix I.

This budget request is an increase of \$27 million over the fiscal year 1980 budget. The funding increase is primarily necessary to offset the continuing increase in material and labor costs due to inflation.

During fiscal year 1981, work will continue on a number of developmental efforts. These efforts are directed toward specific applications or to determine the potential advantages of various technological concepts. The major efforts are:

An advanced design nuclear propulsion plant, which represents a major reactor plant advance, for installation in the Trident strategic ballistic missile submarines.

A Submarine Test Core which will test significant improvements that may lead to increased core lifetimes.

An advanced design, higher performance reactor plant for application to future classes of attack submarines.

An advanced reactor concept which is potentially applicable to future submarines and surface ship designs and has the potential of permitting installation of a higher power reactor in a given hull size.

The D2W reactor which is installed and presently being tested in a prototype reactor plant. This reactor is expected to have increased reliability and longer life than present type cores and should provide about 15 years of ship operation before refueling.

The Advanced Fleet Core which will utilize new concepts in fuel element manufacture that are expected to extend fuel element performance.

Materials development and corrosion testing efforts aimed at extending the life of reactor plants and components beyond the original 20 year design lifetime in support of the Department of Defense's policy of extending ship lifetime.

In conjunction with these efforts, the Naval Nuclear Propulsion Program operates and tests land prototype nuclear propulsion plants. Eight land prototype propulsion plants are now in operation which are used to evaluate reactor and propulsion plant designs, and to train and qualify Navy personnel for operating and maintaining naval nuclear propulsion plants.

The budget request also includes funds for plants and capital equipment in support of the above programs. This includes an advanced scientific computer sys-

tem which will permit the solution of increasingly complex nuclear reactor problems in the areas of nuclear thermal and hydraulics, safety analysis, and materials and structural mechanics. Also included is a project to modify and make additions to several prototype facilities to upgrade plant system capabilities. This project has a total estimated cost of \$103 million spread over several years.

#### THE SOVIET NAVAL THREAT

The work that is being carried out in the Naval Reactors program relates rather specifically to some recent world events. Soviet aggression in Afghanistan has brought renewed realization of Soviet intentions for world hegemony and justifiable concern for the adequacy of our own defense posture. What many may not realize, however, is that the Soviet threat in naval power, as in other areas, has been growing more and more ominous for some time. Past warnings to this effect by many of us in the military and by many members of Congress have been greeted by indifference. The fact is today we are faced with a naval threat more serious than any since World War II; a threat which directly challenges our freedom of the seas.

Twenty-four years ago, Admiral Gorshkov, the Commander-in-Chief of the Soviet Navy, had a navy which was little more than a defense oriented extension of the Soviet Army. Under him, the Soviet Navy has been transformed. Since 1958 the Soviets have built over 1,800 new ships and combatant craft in 137 different classes, a program of naval expansion that surpasses the efforts of any other naval power. From a defensive fleet in World War II, it has evolved into a major blue-water navy that challenges the U.S. for control of the seas almost everywhere in the world. The Soviet momentum for superiority in all phases of naval warfare continues while U.S. naval plans have been far from certain and fluctuate every year. Never in peacetime has there been anything comparable to the growth of Russian naval power and this certainly raises deep concern over the Soviet desire to maintain the peace.

Over an extended period the Soviet Navy has increased in numbers of ships and in capability. For example, the number of nuclear powered submarines in the Soviet fleet has increased from 69 in 1969 to about 160 today, surpassing us in this area in 1970. During this period, the number of Soviet major surface combatants, including aircraft carriers have increased from 220 to 271 while our major surface combatants and aircraft carriers have fallen from 301 to 182. While the Soviet fleet has increased in size, ours has experienced decline.

For submarines specifically, the comparison is ominous. Currently the Soviets have about 357 submarines; we have 120. They have about 160 nuclear powered submarines; we have 114. They have 197 diesel powered submarines, all built since World War II; we have 6.

The 33 nuclear powered submarines authorized through fiscal year 1980 but not yet at sea are expected to be delivered by 1986—with an average delivery rate of about five a year. Starting in fiscal year 1978, however, the Defense Department has reduced the submarine shipbuilding budget submitted each year to a level of only one attack submarine and one Trident per year. If we were to continue to budget at this low rate, our deliveries would drop from five to about one nuclear attack submarine and one Trident submarine per year after 1986. At the same time, increasing numbers of submarines will have to be retired from service due to age. For the past 10 years the Soviets have been delivering at the rate of ten nuclear submarines a year. Thus the nuclear submarine gap continues to widen rapidly.

#### *Soviet ballistic missile submarines*

In the area of strategic submarines, the Soviets have built about 70 nuclear powered ballistic missile submarines, compared to our 41.

They have 30 Yankee Class submarines which are equivalent to our Polaris and Poseidon submarines, but their Yankee class submarines are all newer than ours.

The Soviets also have at sea 32 ships of their more modern Delta Class ballistic missile submarines, and more are under construction. These carry missiles with a 4,200 mile range. This means that from their operating areas in the Barents Sea and Northern waters, they can target the entire United States, Canada, and most of Mexico. In total, the Soviets have almost twice as many nuclear powered ballistic missile submarines as we, and they continue to build more. Our first Trident submarine will not be delivered until early next year. Even then, the building rate for Trident submarines will only be about one a year.

*Soviet attack and cruise missile submarines*

In the area of attack and cruise missile submarines the Soviets have a total of 270 to our 79. Of their total, about 90 are nuclear powered, of which about 40 carry cruise missiles in separate launchers in addition to torpedoes. The U.S. has only 73 nuclear powered attack submarines. The Soviets continue adding to and modernizing their cruise missile submarine force. In contrast, the U.S. has only begun introducing into the submarine fleet the Harpoon cruise missile which can be fired from torpedo tubes. The following table compares the submarine fleets.

COMPARISON OF CURRENT UNITED STATES AND SOVIET SUBMARINES

Submarine type	Soviets	United States
<b>Attack:</b>		
Nuclear.....	50	173
Nonnuclear.....	155	6
<b>Cruise missile:</b>		
Nuclear.....	40	0
Nonnuclear.....	25	0
<b>Ballistic missile:</b>		
Nuclear.....	70	41
Nonnuclear.....	17	0
<b>Subtotal:</b>		
Nuclear.....	160	114
Nonnuclear.....	197	6
<b>Grand total.....</b>	<b>357</b>	<b>120</b>

<sup>1</sup> Approximately 20 units thus far are equipped with the Harpoon cruise missile which can be launched from torpedo tubes.

<sup>2</sup> Ballistic missile submarines include 30 Yankee's, 32 Delta's and 8 older units. Not all are capable modern launcher platforms.

Note: Numbers are approximate.

*Soviet submarine construction capability*

The Soviets have the largest and most modern submarine yards in the world, having a nuclear submarine production capability of 20 ships a year working on a one-shift-per-day basis. While not fully utilizing this vast building capacity, they have since 1968 completed almost 100 nuclear powered submarines. For many years they have been outbuilding us in nuclear powered submarines at an average rate of three to one. As late as 1966, the Russians had only two new construction yards for building nuclear submarines; today they have five. To give you an idea of how large these construction yards are, you could fit all the U.S. nuclear submarine construction facilities into just one Soviet submarine facility. Yet, even with this far superior capacity, they continue to expand their submarine facilities. The logical question one must ask is: Why are they increasing this submarine building capacity when no other nation has so large a capacity?

During the peak years of our submarine building program we were constructing nuclear submarines in seven shipyards—five private and two public yards. The most submarines we were able to deliver to the fleet in any one year since World War II was 17. Thirteen of these 17 were of the Polaris type which had the highest national priority and unlimited funding. At present, the maximum U.S. capacity to build nuclear submarines is about one fourth that of the Soviets, and our capacity may be further reduced if the current low construction rate recommended by the Defense Department causes one of our remaining two construction yards still building submarines to get out of the business.

*Large Soviet submarine design effort*

Of greater concern than total numbers is the emphasis the Soviets place on innovation in submarine design. Since 1970 they have introduced more new submarine designs than have ever been put to sea during a comparable period in all of naval history. During this period the Soviets have introduced at least 10 new submarine designs, or major modifications in design, besides converting older submarines to improve their capabilities. They have introduced significantly improved versions of their attack, cruise missile, and ballistic missile nuclear submarines. Also, they have a new, deep running, very fast nuclear attack submarine. In contrast to these wide ranging developments, the U.S. has introduced only two new submarine designs during this time.

### *Soviet submarine program priority*

The Soviet submarine program enjoys strong support and virtually unlimited funds. They have a centrally controlled program that provides continuity and uniform direction over many years. They have built up a huge array of facilities, tried out many designs and learned from their mistakes. They continue new developments in parallel with producing their best available current models in a well structured, consistent way. They have trained a large number of technical people committed to submarine work who now have decades of experience. That experience is obvious in the improvements we see in the new ships they are building. They are exploring many areas of submarine research and development.

We, on the other hand have a fluctuating, uncertain approach to our submarine efforts. Today we are struggling to keep even a modest technical and industrial base for submarine work. We also have submarine research and development programs that constantly change due to budget changes and transient management.

The Soviets have made their nuclear submarine program of highest national priority because they know it has the greatest potential for defeating the United States in any war that is not quickly decided by strategic nuclear weapons. The capabilities of modern nuclear submarines are awesome; no one has yet experienced what they can do in an unrestricted war at sea. Soviet attack and cruise missile nuclear submarines would be able to devastate our ocean commerce unless we are prepared to counter them and carry the war to their own waters.

### *Soviet surface warships*

The trends in the Soviet surface navy are also of great concern. Today, the Soviets have more major surface combatants than the U.S. and are introducing new ships at an alarming rate. Their ships are new, modern, and well-armed. Many carry surface-to-surface missiles, which are just being introduced into the U.S. fleet. They presently have 271 principal surface combatants and aircraft carriers compared to our 182. Since 1969, the Soviets have built over 900 major and minor surface combatants, mine warfare, and amphibious ships, while the U.S. has built 100, or just over 10 percent as many. The Soviets have recently shown that they have a place in their Navy for aircraft carriers. The recent operation of the Kiev and Minsk along with construction of a sister ship shows that the Soviets are prepared to challenge the naval aviation capability which has been a major strength of the U.S. Navy.

### *Four new Soviet cruiser classes, one probably nuclear powered*

The Soviets are building four new classes of cruisers, one of which will probably be nuclear powered. At about 25,000 tons, it would be the world's largest nuclear powered cruiser. Our largest nuclear powered cruiser, the USS Long Beach, displaces 17,000 tons. The new Soviet cruiser will be larger than the nuclear powered Strike Cruiser, once proposed by the U.S. Navy, and will carry a formidable array of weapons. The table that follows compares the Soviet and U.S. surface fleets.

COMPARISON OF CURRENT UNITED STATES AND SOVIET ACTIVE SURFACE SHIPS

	Soviets	United States
Aircraft carriers.....	2	13
Surface combat type:		
Aviation cruiser.....	2	0
Cruisers.....	35	27
Destroyers.....	71	75
Frigates.....	161	67
Subtotal.....	271	182
Other type ships/craft:		
Patrol combatant type.....	120	3
Coastal patrol craft.....	425	0
Amphibious ships.....	91	63
Mine warfare ships/craft.....	385	3
Auxiliaries.....	760	82
Subtotal.....	1,781	151
Total.....	2,052	333

## NEED TO MAINTAIN A VIABLE U.S. FLEET

Any comparison of the Soviet and U.S. navies must be viewed in the context that we are a maritime power dependent upon being able to maintain sea lines of communication necessary to conduct military operations overseas and to support our allies. The mission assigned to our Navy is a far more difficult task than the Soviet Navy mission of denying us free use of the seas.

The United States has long since given up any chance of matching the Soviet Navy in numbers of ships. Therefore, the quality of our ships must be superior, if we are to be able to withstand attacks, protect our sea lines of communication, and carry the battle to the enemy. It is axiomatic in war that a nation dependent on the quality of its weapons must design its forces around an offensive strategy if it is to prevail over numerically superior forces. It cannot afford to fight a defensive war of attrition. If we expect to be able to prevent defeat in a non-nuclear conflict, then we must be able to penetrate the opposing forces and strike their bases and sources of supply.

*Need for flexible and capable ships*

A few years ago, there were few people who gave much thought to deploying naval forces to the Indian Ocean to protect vital U.S. interests. Today that is a reality. I doubt that many appreciate just how difficult it is to maintain a significant naval force half way around the world. The supply line, particularly for oil fired, ships is very tenuous. I think there may be a new realization that war of attrition at sea is a real possibility as is a land war fought with conventional weapons. In these circumstances, our naval forces would have to be able to defend the sea lanes and to carry the battle to the enemy as well. But in a real wartime situation we will not have time to build the complex ships we need the way we have done in past wars. Thus, the ships we build in peacetime are those we must rely upon in the event of hostilities.

If we miscalculate and do not build ships adequate to meet the threats we face, we may find ourselves faced with the choice of either giving in or resorting to nuclear war. The price of investing in adequate strength to ensure peace is small compared to the cost of war.

*Advantages of nuclear power*

A major factor in the quality of our naval forces has been the use of nuclear power for propulsion. Nuclear power made possible the first true submersibles. Nuclear submarines have an enormous advantage over conventionally powered submarines, which are actually surface ships capable of submerging for relatively short periods. Although the significance of nuclear power for submarines has been demonstrated for over a quarter of a century, there are those who still advocate diesel power, usually in the context of a limited mission submarine. We do not enjoy the luxury of having enough attack submarines to consider building them with limited capabilities tailored for only one use.

The significance of nuclear propulsion for surface ships is just as real, though possibly less obvious. It lies in the freedom of action allowed the Commander of a nuclear powered warship not dependent on the oil umbilical cord. I will explain the importance of this later when I discuss the need for nuclear powered surface ships.

*Importance of Congress for obtaining nuclear powered ships*

Congress, not the Defense Department, has recognized the value of nuclear power. Three decades ago, Congress authorized the first nuclear submarine and since then, Congress has stepped in on many occasions to force the Defense Department to build nuclear powered ships. In recent years, Congress overrode Department of Defense objections and authorized the high speed Los Angeles Class submarines. These submarines have proven to be highly capable ships that have fully justified this action by Congress. Now the Defense Department wants to build slower submarines and Congressional action will again be required to avoid such a mistake.

Frequently, newcomers to the Defense Department do not understand that the Constitution vests in Congress, not the Defense Department, the responsibility for our defense.

During the past fifteen years, Congress has also been instrumental in adding the Nimitz Class nuclear powered carriers and the nuclear powered cruisers to our fleet. Only last year, for example, Congress overrode opposition from the Department of Defense and authorized the CVN 71.

*Defense Department opposition to nuclear power*

One can logically wonder why has the Defense Department opposed nuclear powered ships so often. I do not know of anyone who can answer that completely, but I believe that many Defense officials do not realize how long a new warship must remain in service or the difficulty, if not impossibility, of predicting the threats this warship must face during its lifetime. Remember, it will take eight years before a new warship authorized today goes to sea and this ship will have to last well into the 21st century. No one knows what a potential enemy will have in ten to twenty years, or what missions will be demanded of our warships. Five years ago, no one would have projected the Soviets would put to sea a very fast, deep diving attack submarine, but they have.

We have not fought a war at sea since 1945, and, if and when we do, there will no doubt be many changes in strategies and tactics of naval warfare. For example we have never faced an enemy in war using nuclear submarines, nor have we ever used our nuclear submarines in a real war time situation.

*Dangers of systems analysis*

As a method of studying a problem or issue in a disciplined orderly fashion, systems analysis has its place. However, instead of being a useful tool, systems analysis can be easily abused and become an end unto itself. The Defense Department frequently has abused the systems analysis process to prove a preconceived position that cheaper is better. Throughout the past 25 years, one or more groups in the Defense Department or Navy civilian hierarchy or in one of their associated "think tanks" has been working on a study to find the ultimate in a bargain basement warship—whether submarine or surface ship.

The motivations and circumstances surrounding their studies have varied but the objectives are usually the same. They either want cheap ships for limited missions, or they want smaller, lighter, cheaper ships which will provide the same or improved capability, or they are attempting to prove that conventional power is more economical than nuclear power. Systems analysts carry out study after useless study which succeed only in diverting the attention of those of us who have the responsibility to design, build and operate warships. They issue their reports, make their recommendations, move on to other jobs, and leave the rest of us to live with the confusion created by their efforts.

Systems analysts have fostered the idea that any tabulated information becomes, automatically, scientific. The fallacy in their work generally is that they assume a far greater degree of order and regularity in things than really exists.

DOD systems analysts rely heavily on simulated war games and models. These games by their very nature are superficial. In working out these scenarios, the systems analysts rely heavily on data that can be quantified and mechanically processed and tend to exclude subjective information that often is more important. This approach tends to focus attention on optimizing something within initial assumptions rather than examining the assumptions. Very often, the results of systems analysis are based upon unexamined false premises and therefore divorced from reality.

No one, regardless of how smart he may be, can come up with calculations that prove, in a theoretical and mathematical sense, that we can afford to do without certain capabilities which our ships now have or which they could have. Yet this is what is going on. As you are well aware, studies can be used to "prove" almost anything.

Several examples serve to highlight the danger of mindlessly applying systems analysis. About a decade ago, the DOD systems analysts tried to predict the outcome of a war with the Soviets. Out of this study came the remarkable conclusion that the U.S. would be able to sink 25 Soviet submarines for every one of ours lost. Based on this study, they concluded there was no further need to build nuclear powered submarines. At about the same time, the systems analysts also seriously suggested that we consider sinking 10 of our Polaris submarines to save money. Just think where we would be today if Congress had accepted their proposals.

The Chief of Naval Operations recently has spoken out regarding over-reliance on the systems analysts. In a speech given at the Naval Academy in the Fall of 1979, he said:

"I would first observe that the world of systems analysis has not always served us well in bettering our understanding of future requirements. This is

as much our fault as it is the analysts' to the extent that we have tolerated the misuse of analysis and allowed it to become a substitute for sound strategic thinking. Over the past several years, for example, we have become more and more wedded to the use of 'scenarios' as the way by which to evaluate major investment decisions. I find that regrettable because in doing so we have gradually lost sight of our broad national objectives and the strategies which must necessarily flow from them. This is especially so when designing a Navy around a specific scenario, for it requires one to look too far into the future to be realistic. Ships are platforms—more like capital investments than specific weapons, designed for specific scenarios. Over 70 percent of the ships that will be in the fleet in the year 1990 already exist or have been authorized. The carrier—in the 1980 budget will spend over half of its service life in the 21st century.

"We have no better idea today what specific war scenarios or crises we are going to have to deal with between now and the year 2012—33 years hence—than we did in 1946—33 years ago—about the crises of today. What makes anyone even remotely confident that the national security problems of the 21st century are any clearer to us today than the forces that drive naval planning in 1979 were in 1946? As some have suggested, designing a Navy is much more like forming up the Lewis and Clark expedition: we only dimly perceive where we are going and what we will find en route; we must be ready for the unexpected; we must design for flexibility."

#### *Nuclear ship construction capability*

An essential element in building a strong naval force is the maintenance of a viable industrial shipbuilding base. In the past, we have had as many as seven shipyards—two naval and five private—build nuclear powered warships. All seven built nuclear powered submarines. Three built nuclear powered cruisers; and one, Newport News, built and continues to build nuclear powered aircraft carriers. At the peak of the nuclear warship building program in the early 1960's, 14 nuclear ships, both submarines and surface ships, were authorized in one year.

However, the decline in the number of nuclear ships authorized each year and the desire to minimize costs, has caused the Navy to concentrate its present nuclear warship construction in two yards, the Electric Boat Division of General Dynamics in Groton, Connecticut, and Tenneco's Newport News Shipbuilding and Dry Dock Company in Newport News, Virginia. With these two new construction yards, there is enough capacity to build five nuclear attack submarines and a limited number of Trident's and surface ships each year.

At the low building rate of attack submarines envisioned by the Defense Department, there is a risk that the U.S. could lose one of these two remaining shipbuilders. Although the present projected submarine workload could be handled by one shipbuilder, it would be a great mistake to allow one yard to corner the market on submarine construction. Congress helped reduce the possibility of having only one submarine shipbuilder last year by authorizing and appropriating a second attack submarine in fiscal year 1980.

This alleviates the situation only on a temporary basis since the Department of Defense projected building rate reverts to only one Los Angeles Class attack submarine in each of the next two fiscal years. The Navy plans to award one of the fiscal year 1980 submarines to each of the current shipbuilders with the one fiscal year 1981 attack submarine to be included for the low bidder.

Sustaining two nuclear shipbuilders is important to the U.S. for a number of reasons:

- (1) to allow mobilization for national defense,
- (2) to avoid reliance on a single source supplier,
- (3) to allow for expanded building rates needed to maintain minimum force levels without prolonged startup time, and
- (4) to maintain a competitive environment, both business and technical.

The adequacy of the industrial base needed to produce nuclear propulsion plant components is also of concern. The fiscal year 1980 input of new work is approximately 25 percent of the capacity and the projected fiscal year 1981 input is about 16 percent.

Sustained underutilization of the industrial base at these low levels makes it difficult for these suppliers to attract and maintain an experienced workforce and, therefore, increases substantially the risk of their leaving the business.

If the amount of new business continues at present levels, the nuclear industrial base will shrink to the point where it may not be adequate for the long term support of the nuclear Navy. Once lost, rebuilding the industrial base will be

costly and time consuming and could adversely affect options for future shipbuilding programs.

I am not advocating a welfare program for shipyards or other industrial concerns. I am pointing out that once this capability is lost it will be difficult to restore and will not be available if in a few years the shipbuilding program is accelerated.

The best method of obtaining and maintaining the necessary design and construction capacity is to develop a consistent construction program at a rate high enough to sustain required force levels and then stick to that program. This will give the United States the ability to keep a modern nuclear powered fleet and avoid block obsolescence. In this regard, Congress remains the only hope of ensuring that the United States maintains an adequate construction program of nuclear powered attack submarines and surface warships.

#### NUCLEAR POWERED SUBMARINES

##### *Analysis of nuclear attack submarine development*

As was discussed earlier in the statement, attention is being given to the prospect of building cheaper and less capable nuclear attack submarines. A number of studies and proposals are being made and they are continuing in pursuit of the elusive goal of cheaper but "operationally adequate" ships. The first of this series of studies was directed by the Secretary of the Navy and was called the "Submarine Alternatives Study". This study was initiated as a result of a request in the Senate report on the fiscal year 1979 Defense Authorization Bill that the Navy evaluate the use of lower cost nuclear submarines.

The objective of the Submarine Alternatives Study was to "define and analyze alternative nuclear submarine forces to satisfy the Navy's near-term objectives". The Secretary of the Navy stated that "attention should be directed to options which offer the prospect of significantly reducing costs while retaining operational adequacy". The Executive Summary of the Submarine Alternatives Study included the following statement in its plan of attack: "The basic thrust of this study is the establishment of an approach that would lead to the identification of lower cost submarines with acceptable military capabilities." The study was prepared under the direction of the Assistant Secretary of the Navy for Research, Engineering and Systems and was conducted by personnel from the offices of the Assistant Secretary and the Chief of Naval Operations with assistance from outside contractors.

The Submarine Alternatives Study has been approved by the Secretary of the Navy, and the Secretary of Defense has forwarded copies to Congress. Although the study concluded that the Los Angeles type submarine is the most cost effective of all the options considered for the realistic wartime conditions, that did not settle the matter.

In conjunction with the Submarine Alternatives Study, the Chief of Naval Operations requested that a Fleet Attack Submarine Study be conducted to further expand and improve upon the analysis contained in the Submarine Alternatives Study. The results of the Fleet Attack Submarine Study again showed that an improved Los Angeles type submarine was the most cost effective of the options considered. In reporting the results of this study to the CNO, the Deputy Chief of Naval Operations for Submarine Warfare stated that the cheaper, less capable option was unacceptable and recommended that development of an advanced design Los Angeles type submarine be pursued. The Chief of Naval Operations has now requested yet another study—this time with more types of ships and more advanced weapons being considered.

##### *Decision on cheaper, slower attack submarine already made by DOD*

While these studies are still going on, the Department of Defense has in effect already decided on the attack submarine that should be built in the future. The Secretary of Defense has gone on record stating he wants to build cheaper, slower submarines. The Department of Defense fiscal year 1981 shipbuilding budget includes \$14.7 million for long lead procurement of equipment for a cheaper, slower submarine and the Five Year Defense Plan identifies full funding for the first of these submarines in fiscal year 1983, another in fiscal year 1984, and four more in fiscal year 1985.

##### *Importance of speed*

Invariably, the first idea for reducing the cost of submarines is to reduce speed by reducing the size, power, and cost of the propulsion plant. This has been the

fundamental issue in all these recent studies. Therefore, the current idea is to consider building submarines with a speed capability in the range of the slower Sturgeon Class which the Los Angeles Class was designed to replace. Even today some people, who are supposed to be knowledgeable in this area, do not fully appreciate the substantial tactical advantage the Los Angeles Class enjoys over slower submarines.

With extra speed, a submarine captain has a far better chance of closing to within a target range of every ship he detects so he can achieve the best position for attack. Speed enhances his ability to evade counterattacks, and to reattack the remaining units, even if they attempt to escape at high speed.

By sprinting ahead and then slowing to listen, he can effectively search greater areas than a slower submarine. He can respond more quickly to urgent requirements around the world. If he fires a weapon or otherwise divulges his presence, speed gives him a far better chance of clearing the area before the enemy can respond and deliver his weapons. Conversely, the faster he can close on a reported target, the better chance he has of finding it when he gets to the target area.

In the various missions which an attack submarine must perform in war, success or failure often hinges on tactical advantages provided by high speed capability. Moreover, even when a mission does not call for high speed operation, the high speed capability provides an important margin to recover from the inevitable human mistakes, errors in judgment, or incorrect choice of tactics which may have placed the ship in danger of enemy attack or caused the ship to lose its tactical advantage.

The higher speed capability of the Los Angeles Class is essential to provide effective escort support to high speed U.S. surface task forces. The speed of these submarines enables them to search well forward of the task force and to provide early detection and warning of enemy submarines. This gives the task force an early advantage in prosecuting and attacking their targets. After prosecuting an attack or after a task force course change, the high speed capability of the Los Angeles Class submarine enables them to regain position ahead of the task force. A slower submarine could not carry out this mission effectively without slowing down the entire task force. This, of course, would defeat the purpose of a fast surface ship task force. This superior capability of the Los Angeles Class in the direct support role has been well established in fleet exercises.

The Submarine Alternatives Study concedes that the Los Angeles Class speed is required for the direct support role yet the study excludes the direct support role from its numerical analyses. The study also excludes from its analysis some other missions for which speed is an essential factor. When these important attack submarine missions are taken into consideration, the superior cost effectiveness of the higher speed submarine would be much greater than shown by the cost effectiveness calculations in the study which excluded consideration of these missions.

*Impact of a 5-knot reduction in speed for new attack submarine compared to Los Angeles class*

It has been suggested that a relatively small reduction in the speed of a new attack submarine as compared to what we have with the Los Angeles Class would not be important. Yet, in submarine warfare, speed is vital. As time doubles, the area in which a target can hide increases by a factor of four. For example, in ten minutes, a 25-knot target could be anywhere within 54 square miles; in twenty minutes he could be anywhere within 213 square miles; and so on. If the same target were traveling five knots faster, in 20 minutes the area in which he could hide would be 314 square miles or roughly a 50 percent increase. Thus, whether one is the target or the attacker, every minute counts and every knot loss in speed means more time for the opponent to gain a better position.

Reducing the speed of a new submarine by five knots below the attainable speed of a Los Angeles Class submarine would mean that:

The slower U.S. submarines would be unable to keep up with and attack most Soviet nuclear attack submarines.

The slower U.S. submarines would be unable to stay with and attack high speed surface ships.

The slower U.S. submarines would be unable to escort U.S. surface ships in high speed operations.

The slower U.S. submarines would require an extra day and a half to transit the Atlantic. In a day and a half, a nuclear attack submarine could search an area

roughly the size of New England or an area larger than either the States of Florida or New York.

*Los Angeles class effective in actual operations*

The Los Angeles Class has been involved in a number of operational exercises, tactical development program exercises, and actual operating experiences which have clearly demonstrated the effectiveness of a modern high speed submarine when used against both submarine and surface targets.

Soon after her delivery, the USS Los Angeles (SSN688) completed an exercise in which she and a Sturgeon Class submarine were acting as anti-submarine escorts patrolling ahead of a simulated high speed surface task force.

The exercise results showed that Los Angeles was superior in ability to detect and attack the enemy submarines. During the exercise, although the performance of the Los Angeles Class exceeded that of the Sturgeon Class at all task force speeds, the superior performance of the Los Angeles was especially the case at high speeds. Thus also increases the effectiveness of the entire task force since it gives the task force commander the option of using greater overall task force speeds without increasing the risk of attack from enemy submarines.

In another exercise, both a Sturgeon Class and a Los Angeles Class submarine were assigned the function of defending against an enemy submarine. The Los Angeles Class demonstrated superior ability to conduct a more efficient search and detect more submarines faster and at a longer range. The higher speed again demonstrated the Los Angeles to be a superior class of attack submarine.

*DOD does not understand the importance of submarines in ASW*

The exercises I just discussed have proven the superior quality of the high speed Los Angeles Class submarine in an anti-submarine warfare role. Many other exercises and missions have demonstrated that nuclear attack submarines are superior to all other weapons systems in ASW. Clearly, the rapid building of the formidable Soviet nuclear submarine fleet shows that the need for ASW capability is increasing. Yet the Defense Department has continued its steadfast refusal to recognize the nature of the Soviet submarine threat or to acknowledge the increasing importance to the U.S. of the high speed attack submarine in combating this threat. Moreover, there is ample evidence in recent press reports of attitudes on the part of some in the Defense Department and elsewhere that recent advances in U.S. ASW technology have made the Soviet submarine threat go away. I know of no breakthroughs in the technology of anti-submarine warfare or in any other situation which has made the Soviet submarine threat disappear or decrease in any significant manner.

There is also prevalent in some places in the Pentagon the thought that U.S. surface ships are now capable of solving the ASW problem because of recent improvements in submarine detection capabilities.

While these improvements are useful, I am not aware of any exercises that demonstrated they have solved the ASW problem.

In an exercise conducted in March 1979, a Los Angeles Class submarine was pitted against a non-nuclear aircraft carrier task force transiting the Atlantic. This exercise approximated actual operating conditions. The Los Angeles Class submarine demonstrated the advantages of her high speed in conducting a high speed approach and launching an undetected attack on the task force.

In another recent exercise, the USS Los Angeles and two other nuclear submarines attacked a task group centered around the conventional aircraft carrier USS Ranger. During this exercise, Los Angeles frequently used her high speed capability to maintain contact with the surface task group, even at task force speeds which caused the other nuclear submarines to fall behind and lose contact. The Los Angeles successfully launched numerous attacks against the Ranger and her supporting ships.

These exercises graphically illustrate that those Defense Department systems analysts who only fight wars on paper do not realize the true nature of the ASW problem or the need for the attack submarine to combat the problem.

*Building less capable submarines is not the answer*

The argument has been made that we should stop building the Los Angeles Class nuclear submarines and build some less capable submarines to perform less demanding missions. Of course, there are missions one can think of which do not require advanced capabilities. But in the complexities of a real war,

which will not be fought on paper, how can we possibly know in advance which missions a given submarine will be called upon to perform?

In the course of a single deployment, a nuclear attack submarine may well be called upon to transit at high speed to reach its station, to conduct an area search in advance of a task group, or to provide ASW direct support during transit of that task group. It may be vectored off at high speed to intercept high speed enemy submarines or it may be sent into home waters of the Soviet fleet.

Unlike other weapons, the attack submarine fights its battles alone against an adversary which it encounters and with little external support. Under such circumstances, limited mission submarines cannot win and thus are not suited to our needs. If we were to have a submarine program of the scope of the Soviets, we might be able to build some limited mission submarines since we would then have more than enough to take care of the primary objectives. But we do not have enough. Since we do not try to match the Soviets in numbers, we must build the most capable ships possible.

It is also important to realize that we already have, and will continue to have, a mix of less capable attack submarines. At present, these less capable ships are the six diesel and the early nuclear attack submarines. They were not built to be less capable. Each ship in its day was built as a fully capable unit based on the technology then available. However, with the passage of time and technological advances, the ships gradually became outdated. The same thing will happen to the newer ships in our fleet. If we now, in addition to this natural obsolescence, purposely build new submarines with reduced capabilities, we will have a force of predominantly limited mission submarines—some new and some old. Such a strategy would make the Soviet goal of achieving supremacy of the seas much easier.

Many have made the point that, in going back to Sturgeon type ships, we will not be building inferior ships. They point out that the Sturgeon Class is presently a very capable submarine and is the mainstay of our attack submarine fleet. They are correct. However, they are ignoring the realities of a world in which those who fail to seize the opportunity to advance their capabilities will be left behind. The Los Angeles Class submarine is superior in all respects to the Sturgeon Class. The advanced design features now available for incorporation into an improved Los Angeles Class submarine offer the opportunity for yet another improvement in our attack submarine capability. We cannot afford to pass up such an opportunity in a shortsighted attempt to save a relatively small sum of money.

I have also heard the argument that by building cheaper nuclear attack submarines the Defense Department will be able to build more of the cheaper units and thus help the numbers problem. In other words, we should trade ships' capability for some future unknown construction program. However, it is a fact that the shipbuilding program changes all the time and is as unpredictable as anything in government. The absence of a firm shipbuilding program is a major problem for this country. I have no faith in any pledge by anyone that by building a cheaper nuclear attack submarine, more will be built. Past experience does not bear this out because no one can make such a commitment the way our government deals with ship construction.

It should be obvious that the Navy is perfectly capable of designing and building cheaper submarines. To make a submarine cheaper all you need to do is tell the designer to remove certain capabilities. Each capability deleted or reduced, makes the submarine smaller, lighter, and thus cheaper. If you decide you do not want a certain speed capability or a certain depth capability, you can eliminate or reduce the requirements and the submarine will be cheaper. Those pushing cheaper submarines inevitably fail when they try to prove that by reducing one or all of these capabilities, you end up with a cheaper submarine that will still do the job. In submarine design, as in other aspects of life, you never get something for nothing.

If the Congress and the Administration want the Navy to build cheaper submarines all they have to say is "Do it." But no one should be fooled into believing that they will be as effective as the Los Angeles Class, nor should the Navy be forced to say it supports building cheaper submarines instead of the Los Angeles Class. If the Navy is given the option of having no submarines or some less costly, less effective submarines it will obviously choose the latter. But that does not mean the submarine operators will consider them adequate to carry out the mission they may face in a future war.

*President's response to submarine questions*

In my opinion, this entire issue could be settled in a relatively short period of time and without more studies. If objectively done, the studies will continue to arrive at the same conclusions. In addition, if common sense were used we would save everyone a lot of time. I think the President summarized the situation very well in a statement he made on March 30, 1979, in response to a press question as to whether the Navy should spend the available money for smaller, less expensive submarines rather than the current SSN688 Los Angeles Class and Trident submarines. The President stated:

"Well, it costs so much to change designs, as you know, that I am not sure even a slightly smaller or different design would give us, in the long run, more submarines or more effective submarines.

"As an ex-submariner, one who was in the initial program, I think I am personally biased. But I think that if there ever has been any one single weapon system that has insured our nation's integrity and security, it has been the nuclear submarine with a strategic weapon capability.

"It is a great insurer of the peace. And I think the TRIDENT and the 688 combination, as far as their immediate future is concerned, are the best that we have to offer. And, of course, we are exploring new technologies and they will always be available for future designs.

"But to change from these two designs because there have been cost overruns, based primarily on national inflation that has occurred, and an improvement in design during the construction phase, I think would be an error. So I don't think we will terminate those programs and change the design. I think they are very adequate, and I am very proud of what they will do in the future."

I find it hard to improve on the President's statement. I wish it would result in these studies being stopped so we can get on with our real work of building submarines. But these studies have a life of their own and they will continue. Ultimately the burden will fall on the Congress, as it always has.

*Congressional committee investigates and recommends upgraded attack submarine program*

The Subcommittee on Seapower and Strategic and Critical Materials of the House Armed Services Committee has already taken an indepth look into the nuclear attack submarine issue. It held extensive hearings on this subject last fall and issued a 17 page report on December 12, 1979.

After weighing all the evidence they developed specific recommendations as to the direction the U.S. nuclear attack submarine program should take. It recommended that:

(a) The rate of authorization of nuclear-powered attack submarines be increased to at least three, and preferably four, per year. The building rate should be at a level sufficient to attain and maintain a force level of no fewer than 90 of the most capable nuclear-powered attack submarines, taking into consideration the planned retirement of submarines of older classes. The submarine building program should be managed so as to retain two viable attack submarine construction shipyards in order to retain competition in contracting and an adequate production base for expansion.

(b) The Navy proceed with design of an improved Los Angeles Class submarine on an urgent basis. This ship should incorporate advancements in design and technology that would most enhance the capability of our future attack submarines to counter future Soviet submarine advances. Of particular importance is that the maximum speed be achieved with the existing reactor design. This will provide our Navy with the most cost-effective nuclear powered attack submarine we can build to meet the threat in the 1980's and beyond.

(c) SSN 688 Los Angeles Class attack submarines continue to be authorized until the design of an improved version of this class ship has been developed sufficiently to start construction.

(d) A vigorous research and development program be pursued to ensure that the United States provides improved capabilities in our future nuclear powered attack submarines. Emphasis should not be placed on securing less capable submarines until the recommended minimum of 90 of the most capable nuclear attack submarines is reached and maintained.

Unfortunately, the Defense Department has ignored these recommendations as evidenced by the budget and five year defense programs before the Congress now. I strongly support the recommendations made by the Seapower Subcom-

mittee and I hope the Congress will take the necessary action to implement them.

#### TRIDENT

Turning now to the ballistic missile submarines, the shipbuilding program proposed by the Department of Defense for fiscal year 1981 includes funds for the ninth Trident submarine. The Trident submarines will have increased survivability compared to our existing Polaris and Poseidon submarines because they are being built with all the latest technology. They will be more difficult to detect than existing Polaris and Poseidon submarines because the Trident submarines will be quieter and their longer range missiles will give the submarine 10 to 20 times more ocean area in which to hide. Our existing Polaris and Poseidon submarines are noisy compared to our current standards. They were all built with the technology of the 1950's. Quieter submarines are necessary to decrease the probability of detection and to ensure the survivability of our seaborne strategic deterrent.

The Polaris and Poseidon submarines are wearing out and we must plan now for an orderly construction program to provide replacement. Unless we do so we will be confronted with block obsolescence. Our current force of 41 ballistic missile submarines was commissioned during the seven-year period from 1959 to 1967, and were built to specifications based on a 20-year life. These ships have been operated under hard conditions with two crews, to allow them to be on station the maximum possible period of time. It is unreasonable to expect them to operate for more than 20 years without the possibility of breakdowns.

The longer range of the Trident missiles will permit basing our ballistic missile submarines in the United States—no foreign basing will be required. This will eliminate the vulnerability of our ballistic missile submarine force to international political action that could deny us the use of foreign bases. This is extremely important because we are always in danger of losing our foreign bases.

I consider the Trident program vital to our national survival and thus recommend the Congress continue to support it.

#### NUCLEAR POWERED SURFACE WARSHIPS

An examination of the relative strengths of the Soviet Navy and the United States Navy quickly reveals that the only category of combatant ship in which the United States is clearly superior in numbers and individual ship combat capability is the aircraft carrier.

For the foreseeable future, the aircraft carrier will be the principal offensive striking arm of our Navy in a non-nuclear war. The number of overseas air bases available to us has declined. In these circumstances, carriers provide our only means of projecting tactical air power beyond the range of provisioned and protected land bases. These are the ships we turn to in time of need—as in the current Middle East situation, which has resulted in a U.S. Navy buildup to two aircraft carrier task forces and their supporting ships in the Indian Ocean and Arabian Sea areas.

No other weapon system under development can replace the long-range, sustained, concentrated firepower of the carrier air wing.

Torpedo firing nuclear submarines, cruise missile firing nuclear submarines, nuclear cruisers with anti-air, anti-surface, and anti-submarine capabilities—all are needed to supplement and augment the capabilities of the nuclear carrier. But without the tactical air power provided by carriers, all of our other surface forces would have greatly increased vulnerability.

Aircraft carriers and Aegis fleet air defense ships and their escorts are the major combatants which will make up our surface strike forces. These ships are needed to fight in the areas of highest threat and will be the backbone of our first line naval strike forces for years to come.

Considering the difficulties of providing logistic support in the areas of highest threat, it is essential that our first line warships be given the mobility and flexibility that only nuclear propulsion can provide. The United States has given up any possibility of matching the Soviet Navy in numbers of ships; therefore, our only hope to be able to carry out our naval mission in the areas of highest threat is superior ships. In my opinion, in the 1980's and beyond, in any area where the Soviets challenge us with their best naval forces, we will need all-nuclear carrier task forces if we are to be able to conduct sustained offensive operations. The

decisions facing the Congress for the next several years concerning whether to build new carriers and Aegis ships, their size and capabilities, and to what extent nuclear propulsion will be provided, will determine to a great extent the future effectiveness of the U.S. Navy.

The justification for providing nuclear propulsion for major combatants in order to attain a great improvement in their military capabilities has been documented in detail through analysis, the military judgment of senior naval commanders, and experience in the Fleet. On the other hand, in opposing nuclear propulsion, Department of Defense systems analysts rely on the argument that since nuclear propulsion costs more, conventional ships should be built instead. Nowhere in their arguments do the analysts address the difficulty the Navy can expect to encounter in delivering oil to its major combatants in high threat areas. They assume that propulsion fuel will be available, whenever and wherever needed. Generally, the analysts' decisions are made on the basis of initial procurement cost rather than life cycle cost, and without considering the value of the increased military capabilities provided by nuclear propulsion.

#### *Comparisons of nuclear and conventional carrier task groups*

It is true that nuclear surface warships cost more than conventional ships, particularly the initial procurement cost. I don't know why anyone would expect to get the tremendous increase in military capabilities provided by nuclear propulsion without having to pay something for it. However, cost studies performed by the Navy over the years have shown that the overall lifetime cost of an all-nuclear carrier task group is about the same as that of an all-conventional task group with similar weapons and sensors.

In comparing an all-nuclear carrier task group to a conventional task group, it should be recognized that the entire conventional force would be dependent on a vulnerable source of propulsion fuel. With four conventional escorts, about 10 percent of the time one of the escorts would be off station for refueling by the carrier, or refueling from an oiler if one accompanies the force. During refueling the whole conventional force becomes more vulnerable due to restrictions on course and speed. If the carrier has to fuel the escorts, the carrier operations are restricted while an escort is alongside. If an oiler accompanies the force, then the whole force is restricted to the speed capabilities of the oiler, and the carrier escorts must also protect the oiler.

The all-nuclear carrier task group is independent of the need to resupply ship propulsion fuel. In addition, a Nimitz Class carrier carries 50 percent more ammunition and almost twice as much aviation fuel as a Kennedy Class conventional carrier. Thus, an all-nuclear group has much greater tactical flexibility and mobility, and greater capability for sustained combat without replenishment. Therefore, the nuclear force would not have to replenish until its larger capacity of aviation fuel and ordnance had been expended; whereas, the conventional force would have to replenish ship propulsion fuel even if it had not expended its smaller amount of aircraft fuel and ordnance. In this regard, of the total fuel expended by a conventional carrier task force, one-third is used by the carrier, one-third by the escorts, and one-third by the aircraft during intense operations. The conventional carrier and its escorts, of course, continue to use up their fuel and require replenishment even when aircraft fuel and ammunition are not being used up at a high rate.

When replenishment is required, an all-nuclear group can steam at high speed to meet replenishment forces in low threat areas and then return to the high threat combat area at high speed without concern for conserving propulsion fuel. In a real combat situation, a sophisticated enemy would make a determined effort with nuclear submarines and other forces to interrupt our supply lines and sink our replenishment ships. Under such circumstances, the ability of nuclear warships to retire at high speed to replenish in areas of lower threat and then return to the strike area at high speed could mean the difference between victory and defeat in the strike area.

#### *Nuclear fuel provides 15 years of operation*

With existing designs of naval nuclear propulsion plants it is possible to provide enough energy for 15 years of warship operation without the need to refuel. In contrast, oil-fired naval warships must be refueled every few days. The initial nuclear fuel for a Nimitz Class aircraft carrier contains the energy equivalent of 11 million barrels of fuel oil, or enough oil to fill a train of railway tank cars stretching from Washington to Boston. At the current price being paid by the

Navy for Marine Diesel Fuel of \$54.18 per barrel, it would cost almost \$600 million just to buy 11 million barrels of oil without considering the cost to store or deliver it.

When a nuclear carrier is substituted for a conventional carrier, the range of a carrier task group, with four conventional escorts, is doubled. When two of the four escorts with the nuclear carrier are nuclear, the range of the carrier task group is doubled again. When all the escorts are nuclear, the range of the carrier task group is essentially unlimited.

*Nuclear task force 50 percent more effective*

For these reasons, a nuclear task force is at least 50 percent more effective than a conventional task force; in fact it is probably much greater than 50 percent. Each nuclear ship added to the fleet also makes an additional unit available to the Fleet Commander for assignment to independent operations where logistic support may be nonexistent or difficult to provide. Examples are quarantines, shows of force, rescues, protection of minesweeping operations, prevention of aerial minelaying, and submarine trailing and holddown operations.

Each nuclear escort substituted for a conventional escort also increases task force flexibility and mobility through advantages which are difficult to describe in numerical form. For example, none of the comparisons of the relative effectiveness and cost of the nuclear and conventional escorts cited in current Navy cost studies takes into consideration losses due to enemy action. One Navy study on "Nuclear Power for Surface Warships" showed that:

Losses of underway replenishment ships can be expected to be greater when supporting conventional warships than when supporting nuclear warships.

Under several of the threat conditions studied, the number of replenishment ships lost supporting conventional warships was more than twice the number lost supporting nuclear warships; and that,

The greater the threat to the underway replenishment ships, the larger is the loss differential to be expected—owing to the larger replenishment force required for the conventional warships.

I am sure you know the maxim learned through the bitter lesson of war that: "The art of war is the art of the logistically feasible."

The facts I have just mentioned represent a tremendous increase in military effectiveness. In my opinion, this effectiveness far outweighs any small additional lifetime cost which might exist for the all-nuclear carrier task force. No matter how many tradeoffs we study of other ways to spend the money we need to pay for nuclear propulsion, we will always be faced with comparing unlike things; none of the tradeoffs accord the freedom from logistic support for propulsion fuel provided by nuclear propulsion. Defense capabilities such as the number of AAW missile batteries, the number of sonars and ASW weapons systems, and the number of escorts needed to protect the great investment in a carrier task force cannot properly or logically be traded off for nuclear propulsion.

These defense tradeoffs provide additional protection for the task group, but none of them increase the offensive capability of the CVN as does nuclear propulsion in the escorts. To compare a larger number of conventional escorts with a small number of nuclear escorts at equal cost is not to compare alternate ways of achieving the same capability; it is merely to compare two different capabilities that can be achieved with the same amount of money.

*Demonstrated value of nuclear power*

There are many examples where the value of nuclear propulsion for surface warships has been demonstrated in real terms in everyday operational missions of the Fleet. For example in January, 1980, an all-nuclear-powered battle group comprised of the aircraft carrier Nimitz and the cruisers California and Texas completed an 11,500-mile transit from the Mediterranean Sea around Africa to the Indian Ocean in 19 days and 8 hours with an average speed of 25 knots. If this battle group had not been nuclear powered, support ships would have been required to accompany the battle group or to have been repositioned along the transit route to provide replenishment of fuel. Either method of providing propulsion fuel would have slowed the battle group speed of advance and delayed arrival on station. The Atlantic Fleet Commander estimated it would have required over seven million gallons of fuel for the Nimitz alone to make this transit if the ship had not been nuclear powered.

It is the elimination of the requirement for a continuous supply of propulsion fuel that makes nuclear powered warships so valuable. During a war, it is

necessary to have the oil at hand where it is needed, before it can be used. Of what value is an oil-fired warship if it is unable to get oil? The need for a reliable worldwide fuel distribution system is the Achilles Heel of our oil-fired Navy. The difficulty in assuring foreign oil supplies to support operations in the Mediterranean Sea and the Indian Ocean during crises in recent years amply shows this vulnerability.

During World War II, lack of oil was instrumental in the defeat of Japan. The Strategic Bombing Survey conducted after the war in a report entitled "oil in Japan's War," concluded:

"In every phase of the war, oil determined Japan's strategy and governed the tactical operations of its Navy and Air Forces. The collapse of the Japanese war effort was the consequence of their inability to maintain their supply routes to the Southern Zone.

"The effect of oil shortage on Japanese Naval strategy became devastatingly apparent in the campaign for the Marianas and the Philippines. Japanese Fleet units had to be dispersed between the Japanese Inland Sea and Singapore, owing to limited fueling facilities, and failure to achieve satisfactory coordination between the fleets contributed substantially to the Japanese defeat. Fuel shortage in the Home Islands deprived the Japanese naval forces fighting off the Philippines of the services of at least three battleships, which together with several aircraft carriers, were taken out of service and assigned to duties as port and anti-aircraft vessels because they consumed too much oil."

#### *Need for nuclear powered Aegis cruisers*

For the past several years, Navy witnesses have testified that the Aegis system is needed to protect our surface ships against the projected Soviet air threat in the 1980's. These ships would be key elements in providing sophisticated air defense for our aircraft carrier strike forces against enemy missiles. Current Navy plans are to build a number of oil-fired, gas turbine-powered Aegis fleet air defense ships, the CG 47 Class.

The Aegis ships should be nuclear for the same reasons carriers should be nuclear. Aegis is planned as our most capable anti-air warfare weapons system. Because Aegis ships will be expensive, regardless of their means of propulsion, there will never be a large number. In a naval war against an enemy employing sophisticated weapons systems, all Aegis ships will be needed in the areas of highest threat. Under just such circumstances, the advantages of nuclear propulsion are most urgently needed to maximize mobility and minimize logistic support. The nuclear powered carriers will be sent into high threat areas in time of war, and they will need nuclear powered Aegis ships to accompany them.

It is highly unlikely that oilers can survive in areas where the threat is great enough to require our first line naval strike forces. When a non-nuclear Aegis ship runs low on fuel, it will have to retreat to an area of lower threat to meet the oiler, losing the Aegis system's protection just when it is most needed. Unless nuclear powered Aegis cruisers are built, our nuclear carriers will have to be accompanied by CG 47 Class Aegis ships when they enter the highest threat areas. This would constrain the task group to the propulsion fuel logistics requirements of the oil-fired gas turbine-powered Aegis cruisers, thereby sacrificing the significant military advantages of the all-nuclear carrier task force in the very areas where these advantages are most needed.

As I previously noted, studies have shown that each time a nuclear ship is substituted for a non-nuclear ship in a carrier task group, the capability of the force as a whole will improve, even if all the other ships are oil-fired. This provides an incentive to have nuclear propulsion in missile-firing ships, whether or not the carrier they accompany is nuclear powered. Furthermore, a nuclear powered guided-missile ship has the unique capability for independent operations not available to oil-fired ships. Of course, the greatest gain is made when all the ships in a carrier task group are nuclear. The all-nuclear carrier task group having essentially unlimited high-speed endurance, carrying more combat consumables which permits longer periods between replenishments, and with the capability to retire at high speed for replenishment in low threat areas, has far greater capability to conduct sustained combat operations than any other naval surface force we know how to build.

Studies made of the issue of nuclear propulsion for surface warships have cost millions of dollars and countless man-years of effort, including that of many high level people. Every aspect of the advantages and cost of nuclear surface

warships has been exhaustively studied in minute detail over a period of many years by numerous analysts, civilian and military. These studies have brought out time and again that a nuclear surface warship has a higher initial investment cost than its conventional counterpart; but that when overall costs are taken into consideration, the nuclear ships provide greatly increased military capabilities and are not much more expensive.

Life cycle cost comparisons made of nuclear and conventional warships compare peacetime costs and assume that carrier task forces can be safely replenished wherever they may be. I believe that if the cost of providing carrier task forces the ability to conduct replenishment operations in areas subject to the projected Soviet naval threat of the 1980's were used, the total cost of nuclear powered surface warships would be shown to be less than that of non-nuclear ships.

In my opinion, in the 1980's and beyond, in any areas where the Soviets challenge us, we will need all-nuclear carrier task forces if we are to be able to keep our sea lines of communication open. Aircraft carriers and Aegis Fleet air defense ships will be the principal elements of these first line naval strike forces which will have to be capable of fighting in areas of highest threat. Considering the difficulties of providing logistic support in such areas, in my view it is essential that our aircraft carriers and Aegis warships be given the mobility and flexibility that only nuclear propulsion can provide.

#### *Congress must decide*

The justification for providing nuclear propulsion for major combatants is obvious. Yet, time and again, Congress has realized the importance of nuclear propulsion in a military situation far more readily than have the systems analysts and the senior civilian officials of the Defense Department. It was Congress that insisted on building our first two nuclear submarines, Nautilus and Seawolf. The Atomic Energy Commission was authorized by the Joint Committee on Atomic Energy to fund and procure the nuclear propulsion plants for these two ships because the Department of Defense could not envision the worth of nuclear propulsion. Over the years Congress has had to intercede repeatedly to ensure that the Defense Department is buying the ships needed to properly provide for the National defense. Just last year Congress authorized our fifth nuclear powered aircraft carrier, CVN 71, over opposition from the Department of Defense. The past record proves conclusively that Congress cannot afford to defer in these matters to the analysts of the Defense Department.

I do not claim to know how many aircraft carriers or Aegis ships the Navy needs to properly provide for National Defense. The responsibility for determining these requirements rests with others. I do know, however, that the ships authorized should be nuclear powered.

#### ENVIRONMENT AND RADIATION

I have testified previously on the record of this program in controlling radiation exposure. In 1979, the total occupational radiation exposures to personnel operating ships and to the employees in the shipyards was about one sixth the amount in the peak year 1966, even though the number of nuclear powered ships had nearly doubled. No civilian or military personnel in the Naval Nuclear Propulsion Program have exceeded quarterly or annual radiation exposure limits since 1967. The average annual exposure of shipyard workers in 1979 was one eighth of a rem. The average annual exposure of ship operators in 1979 was less than one tenth of a rem.

Likewise the record of the Naval Nuclear Propulsion Program in handling radioactive waste shows that the total gamma radioactivity discharged to all harbors in each of the last nine years has been less than two thousandths of a curie. This is the total from our 125 operating nuclear powered ships, as well as the 14 tenders, 3 bases and 9 shipyards supporting these ships. This is not only far below standards issued by Federal Agencies, but is too small to have an effect on the environment. As an example, if one person were able to drink the entire amount of radioactivity discharged into any harbor in 1979, he would not exceed the annual radiation exposure permitted by the Nuclear Regulatory Commission for an individual worker.

The facts I have discussed and supporting details are contained in two Navy reports that are issued each year. The 1979 reports NT-80-1 and NT-80-2 have just been published and are provided as Appendix III. [Appendix III retained in committee files.]

These two reports provide a detailed account of the Navy efforts in controlling radioactivity and radiation exposure. They have been prepared to convey the great effort we expend to ensure these matters are dealt with properly. They give perspective to what we do which is something I find too often lacking in the general press treatment of matters associated with nuclear power. For example, most of the press coverage on radiation has been biased and has not provided a balanced view.

A proper perspective on radiation is essential if we are to continue to achieve the benefits of nuclear power, medical diagnosis and medical treatment using radiation. Last year, I expressed my thoughts on this matter at the 1979 annual convention of the International Platform Association. A copy of my speech, "Environmental Perspective", is included as Appendix II to this statement.

#### APPENDIX I

#### FISCAL YEAR 1981 DEPARTMENT OF ENERGY BUDGET FOR THE NAVAL REACTORS DEVELOPMENT PROGRAM

The fiscal year 1981 Naval Reactors Development budget request is \$305.4 million. The funding increase is necessary to provide for the continuing increase in material and labor costs and for equipment to replace worn out or obsolete laboratory equipment. The major areas of this budget request are as follows:

#### OPERATING FUNDS

The fiscal year 1981 operating budget for the Naval Reactors Development program is \$250.4. During fiscal year 1981, developmental efforts will remain at a high level. General engineering and development areas encompass: designing and developing new and advanced reactors and reactor concepts incorporating the latest in nuclear reactor technology; designing and developing improved reactor instrumentation and control equipment; evaluating equipment operating in land prototypes and test facilities with alternate materials and controls to maximize component lifetimes; following, testing, and supporting the reactor plants in operating warships to improve operating techniques and to obtain performance evaluations and data as a base for developing new and improved reactors and equipment; and operating eight land prototypes which are used to test and evaluate reactor and propulsion plant designs.

Major efforts include: an advanced reactor which offers the potential of increasing on line reactor reliability; an improved higher power and longer life core for application to guided missile cruisers; a submarine test core to test advanced reactor fuels, poisons and control materials with improved performance and increased lifetime; an Advanced Fleet Core which utilizes new components resulting in a longer lifetime; a reactor and propulsion plant for installation in the OHIO Class, Trident strategic ballistic missile submarines; an advanced design plant that will provide significantly higher performance than any other submarine plant now in use or under development for application to future classes of higher speed submarines; efforts to determine the actual useful life of shipboard cores; and materials and corrosion testing aimed at extending the life of reactor plants and components beyond the original 20 year lifetime in support of the Department of Defense's policy of extending ship lifetime.

The breakdown of the fiscal year 1981 operating funds is:

	<i>Millions</i>
I. Submarine propulsion reactors.....	\$163.0
II. Supporting research and development.....	20.0
III. Surface ship propulsion reactors.....	57.0
IV. Personnel resources.....	10.4
Total, operating funds.....	250.4

#### *I. Submarine propulsion reactors, \$163 million*

The purpose of the Submarine Propulsion Reactors program is to develop and support nuclear propulsion plants for submarines through the operation of six land prototypes and the continued engineering and physics design, follow, testing, and operational support of the reactors in 114 operating submarines and 33 submarines authorized by Congress or under construction. This work is

accomplished through four ongoing programs: Attack Submarine, Improved Submarine, Submarine Advanced, and Submarine Basic Nuclear Propulsion Plant programs. During fiscal year 1981, effort will continue in all programs. The major developmental areas in these ongoing programs and the work anticipated is summarized below.

1. *Advanced reactor concept.*—The advanced reactor concept developmental effort consists of an advanced core designated the S7G. This has the potential of permitting installation of a higher powered reactor in a given hull size. The concept is potentially applicable to future submarine and surface ship designs. This advanced reactor is currently in operation at the Modifications and Additions to Reactor Facilities in West Milton, New York. In fiscal year 1981, Naval Reactors will: operate the S7G prototype plant; conduct periodic tests of the instrumented core; perform nuclear analysis to confirm the design is capable of long life operation; continue evaluating core nuclear performance; conduct periodic maintenance shutdowns; manufacture various equipment; and design new electrical system instrumentation and control equipment to improve the reliability of prototype systems.

2. *Submarine test core.*—The Submarine Test Core (TSC) is being developed and will be installed in a prototype reactor plant. The core will consist of modules containing advanced materials. The TSC is expected to provide significant improvements leading to increased core lifetimes. During fiscal year 1981 Naval Reactors will: continue STC nuclear, thermal/hydraulic, fuel systems and mechanical design analysis to define final STC design and loading recommendations; develop core vendor modified fuel process capability required for STC; continue testing of STC cell configurations; and continue qualification of alloys to determine ability to improve lifetimes. Irradiation test programs for the STC advanced systems and new material will continue to assess materials properties and confirm design assumptions.

3. *Nuclear propulsion plant for the Los Angeles class attack submarine.*—Work on the S6G reactor plant used in the SSN 688 Class submarines will continue in fiscal year 1981. This plant provides substantially greater performance than those used in earlier attack submarines. Included in this program are design and development efforts for a new core to extend fuel lifetime and materials development efforts to increase the capability of reactor plant systems and components to make them compatible with extended core lifetimes.

In fiscal year 1981, Naval Reactors will continue support operations of and provide support for testing and improving the reactor and propulsion plant for SSN 688 Class submarines. Design and fabrication of prototype servicing equipment needed to support the reactor plant will continue. Work will also continue to clarify characteristics of the shipboard reactor. Advanced designs of reactor plant instrumentation and control systems and detectors will be evaluated for application to increase the performance and life of the S6G plants. Compatibility testing of advanced core instrumentation and control equipment will be conducted to support follow ship application.

4. *Advanced design nuclear propulsion plant for future classes of submarines.*—An advanced design reactor plant is being designed and developed for application to future classes of attack submarines. This reactor plant will provide significantly higher performance than any other submarine propulsion plant now in use or under development thus providing the option of developing various improved submarine configurations incorporating new weapons systems, advanced sonars, and other features. This effort includes designing, procuring, and installing a prototype of the advanced core in a prototype reactor plant at the Naval Reactors Facility located in Idaho.

In fiscal year 1981, Naval Reactors will install the advanced core in a prototype reactor plant. Initial physics and thermal/hydraulic acceptance testing will be completed to support release of the reactor for power operation. Initial tests of the prototype reactor will be performed. Prototype plant acceptance testing will be conducted to evaluate plant performance, modifications, and operational requirements.

5. *Nuclear propulsion plant for the Trident strategic ballistic missile submarine.*—The major emphasis of this category is on designing, developing, testing, and evaluating a propulsion plant for installation in the Trident strategic ballistic missile submarines. This S8G design represents a major reactor plant advance. In fiscal year 1981, Naval Reactors will: operate the S8G prototype reactor plant including test programs such as periodic hull containment tests, emergency shutdown valve testing, control system testing, and special trouble

shooting; conduct and evaluate periodic physics tests of the S8G prototype plant; complete evaluation of prototype power range and design confirmation testing to verify operating procedures; perform hydraulic analyses as required to support prototype and ship operation; perform irradiation tests on various materials; and continue reactor plant testing in the lead Trident submarine, USS Ohio. Core design modifications will be developed and evaluated to identify potential design improvements. Corrosion-fatigue testing of high strength materials for use in new reactor components will also continue.

## *II. Supporting research and development, \$20 million*

Supporting Research and Development effort is provided in three areas: examination and analysis of expended cores and irradiation tests at the Expanded Core Facility; operation of a High Temperature Test Facility for obtaining reactor physics information; and developing advanced concepts and techniques that can be used in the Naval Reactors programs.

During fiscal year 1981, the examination of expended cores and fuel element irradiation test samples and assemblies will continue at the Expanded Core Facility. This effort is an essential part of the research and development effort necessary to develop longer lived naval reactor cores. Valuable technical data is obtained in such areas as fuel element performance, and the long term effects of irradiation on materials. This data design of new cores and for confirmation of current core designs.

Furnishing basic data on materials performance is also part of the effort. Testing programs including gamma scanning, ultrasonic testing, visual and leak evaluations of integrity, dimensional measurements, and other examinations will be conducted. The data obtained is used to aid in determining the design, methods of fabrication, and operational procedure for cores and components.

Operation of the High Temperature Test Facility will continue to provide valuable data regarding physics characteristics of materials needed to design and analyze longer lived cores.

The Naval Reactors Design Studies effort will continue developing analytical methods and models to improve predictions of material properties and structural responses. Work will continue to improve naval fuel performance prediction capability through modification of the naval fuel elements performance computer program. This is required for design of longer-lived and higher performance cores. Developing and applying improved methods of analysis will continue.

Irradiation experiments will be conducted in the Advanced Test Reactor, including irradiation testing and evaluation which will provide data of value to operating ships as well as additional confirmation of the adequacy of core designs.

## *III. Surface ship propulsion reactors, \$57 million*

The purpose of the Surface Ship Propulsion Reactors program is to support and develop nuclear propulsion plants for combatant surface ships, operate and test two land prototypes, and provide testing, engineering follow and operational support for the reactor plants in 11 operating ships and three ships authorized by Congress or under construction. This work is accomplished through three ongoing programs: Aircraft Carrier Dual Destroyer Dual, and Large Ship Nuclear Propulsion Plants. During fiscal year 1981, effort will continue in all programs. The major developmental areas and anticipated work in these ongoing programs are as follows:

*1. Nuclear propulsion plant for the Nimitz class aircraft carrier.*—The two reactor nuclear propulsion plant for the Nimitz Class aircraft carriers is capable of developing enough shaft horsepower to propel the ships at high speeds and supply adequate auxiliary power for operation of advanced weapons and electronics systems. Fuel life is expected to provide at least 15 years of normal ship operation. As part of this effort, a prototype reactor core has been installed and is operating in an existing prototype reactor plant.

During fiscal year 1981, Naval Reactors will: follow operations and periodic testing of the A4W/A1G prototype core to confirm core design characteristics; continue reuse evaluations of various components, conduct testing in the Advanced Test Reactor to obtain data on fuel element performance; design, develop, and fabricate reactor servicing systems required for the prototype and contingency operations on a ship; develop advanced reactor plant instrumentation, control, and monitoring equipment; complete advanced planning for refueling the prototype in the mid-1980's, continue design and fabrication of a replacement core

for the prototype plant as well as physics studies and analysis associated with the replacement core. Efforts to determine the actual useful life of Nimitz type shipboard cores will also continue.

2. *D2W reactor for cruisers.*—Emphasis will continue to be placed on the design, development, test and evaluation of the D2W reactor. The D2W core is expected to have increased reliability and a longer life than present type cores and incorporates the latest proven technological advances in nuclear system and component design. This core is expected to provide about 15 years of ship operation before refueling. A D2W core is installed and being tested in a prototype reactor plant.

In fiscal year 1981, Naval Reactors will: continue operating the long life D2W prototype core; prepare for D2W core inspection required to confirm core adequacy to design criteria; complete development and procurement of D2W prototype inspection equipment; and perform periodic testing of the prototype reactor to monitor characteristics to support engineering evaluation of its design and operation. Engineering support will be provided for the backfit of the D2W reactor in nuclear powered cruisers.

3. *Advanced fleet core.*—The Advanced Fleet Core is being designed to utilize new concepts in fuel element manufacture. This is expected to extend fuel element performance resulting in a longer lifetime. Due to the extensive design, development, testing and manufacturing phases associated with this new core, efforts need to be initiated many years in advance of when the core will be available for shipboard use. During fiscal year 1981 support will be provided for the continued development of the Advanced Fleet Core. The program will evaluate instrumentation types and performance characteristics for potential AFC prototype application, and continue final mechanical design and thermal/hydraulic evaluations.

#### IV. Personnel resources, \$10.4 million

The 252 personnel requested for the Division of Naval Reactors, including the Pittsburgh Naval Reactors Office and the Schenectady Naval Reactors Offices are necessary to meet anticipated programmatic requirements including support of the expanding Navy nuclear powered fleet and the ongoing Water Cooled Breeder effort.

Naval Reactors maintains a minimal personnel level and has been able to operate with austere staffing through careful management of personnel to meet work requirements. Existing personnel have been used to the greatest extent practicable in staffing new programs and expansions to existing programs. Improvements in work force productivity have been achieved over the years by maximum use of available staff to carry out increasing workloads. This approach has resulted in limited changes in the personnel level.

Naval Reactors' personnel maintain close program management and technical direction of the Bettis and Knolls Atomic Power Laboratories and associated facilities, with a combined employment in excess of 6,500. These laboratories are Government-owned, contractor-operated facilities solely devoted to the Naval Reactors program.

The 17 additional positions requested in fiscal year 1981 are needed to support the increasing demands of the Naval Reactors Development Program. These demands will include advanced materials and components testing for corrosion and materials evaluation; increased prototype refueling efforts; increased plant support work reflecting the growing age, numbers and diversity of operating ship and prototype reactor plants, and sophisticated core development work aimed at developing long life, high powered cores.

#### PLANT AND CAPITAL EQUIPMENT FUNDS

Capital equipment funds (\$39.0 million) are requested in fiscal year 1981 to support continuing research and development activities. The following major items of capital equipment are included in the fiscal year 1981 request: (1) Class VI computer with computing capability three to five times that of the current system installed at the Knolls Atomic Power Laboratory. This advanced scientific computer system will permit the solution of increasingly complex nuclear reactor problems in the areas of nuclear, thermal and hydraulic, safety analysis, and materials and structural mechanics. (2) Prototype plant components that are necessary to replace aging components to ensure satisfactory operation and testing of the prototypes on a long term basis.

To accomplish the objectives of the program, the following additional types of capital equipment are necessary: quality assurance equipment, process development equipment, irradiation design engineering equipment, analytical, spectrochemical and corrosion laboratory equipment, fabrication and inspection equipment, and radiation and safety equipment. Improved and replacement components and systems, such as, reactor plant control and instrument detectors and systems are required for the prototype reactor plants to continue to provide substantial improvements in reliability and increase plant efficiency. Additional capital equipment is also needed to provide for the analysis and examination of spent fuel assemblies and other components operated in nuclear propulsion plants. This includes: handling, processing, assembly and storage equipment, and various support equipment components.

#### CONSTRUCTION

Major construction funds (\$12.7 million) are requested in fiscal year 1981 for the Modifications and Additions to Prototype Facilities (MAPF), project number 81-T-112 and the Fuel Materials Examination Area Upgrading (FMU), project number 81-T-113.

The MAPF project provides for modifying the engineering safety features of several prototype plants. The work primarily involves upgrading the emergency fluid and electrical supply system capabilities and includes construction of necessary support buildings at the S3G, S1C, and the D1G prototypes located at West Milton, New York and Windsor, Connecticut. Safety features will be upgraded based on the latest Code of Federal Regulations and to take advantage of continuing advances in the state of the art in reactor safety.

The Fuel Materials Examination Area Upgrading project provides for upgrading the nuclear air cleaning and filtering system located in the nuclear materials testing facilities at the Bettis Atomic Power Laboratory. Upgrading of the system will reduce radioactive effluent, and increase reliability and maintainability in this examination area.

General plant project funds (\$3.3 million) provide for minor plant improvements, alterations, additions, and minor new construction at Naval Reactors' laboratories. In general, these projects consist of land improvements, building alterations, utility improvements, and additions to or upgrading of existing facilities. The work contemplated under these projects will provide continuity of present and planned operations contributing to operating efficiencies, eliminate potential health, fire, and safety hazards, reduce maintenance and operating costs, and provide facilities to take full advantage of technological advances.

The estimate for fiscal year 1981 general plant projects is based on experience in prior years, and takes into account new plant and other facilities which are coming into operation and certain special non-recurring projects which, because of their nature, fall within the criteria for general plant projects.

## APPENDIX II

"ENVIRONMENTAL PERSPECTIVE" BY ADM. H. G. RICKOVER, U.S. NAVY, AT THE 1979 ANNUAL CONVENTION OF THE INTERNATIONAL PLATFORM ASSOCIATION

I am greatly honored to be the recipient of the Winston Churchill Award. I had the privilege of meeting this great statesman when I visited the House of Commons in the early 1960's. I admired him greatly for his achievements and because he was a singularly warmhearted human being.

I want to thank the members of the International Platform Association for this award and for inviting me to speak here this morning.

Long before the term environmentalist became a household word, I was concerned about our environment. Early in my career I became concerned that our natural resources were being consumed too rapidly; that the world's finite supply of petroleum would eventually be depleted; that the hydrocarbons we were burning for energy would be desperately needed by future generations as raw materials. Back in 1936, I had computed that the oil used in all history was one cubic mile in volume. By 1979, the total oil consumption had reached 17 cubic miles (463 billion barrels), a cube about 2.6 miles on a side. These figures show how small this precious resource is.

For too many years every new highway or invention was welcomed as an indicator of progress without taking into account the long range consequences. Mankind has been prodigal—as if we were owners rather than trustees of this planet.

Today, there is a greater awareness of these problems, but not the recognition of the limits that nature imposes. From many quarters there are pressures to come up with a "safe" source of abundant energy. But each alternative has its limitations. Some, such as nuclear power, are opposed by single interest groups that often vie to be the loudest to cry doom. As more aspects of everyday life are being characterized by one group or another, as involving high risk, ordinary citizens are finding it increasingly difficult—perhaps impossible—to get the issues into perspective.

Within some special interest groups are those who favor returning to the simpler style of 100 years ago. Their objective is clear; they tend to be against most forms of energy.

The great majority of people, however, want to sustain today's advanced life style. For them the problem is one of evaluating alternatives—of comparing risks and weighing them against benefits.

The media, in search of exciting news, and special interest groups, encourage embellishing and sensationalizing facts. Since tough facts are often bland and hard to market as "news," the public gets a distorted picture of environmental matters. We face a danger that public policies in technology will be determined, in effect, by the media and by single interest groups.

While the problems we face today are immense, the increased public interest in energy and environmental matters offers an opportunity for progress toward solving these difficult, long range problems. But these will have to be dealt with intelligently, not on an emotional basis. Scientists, engineers, businessmen, medical people, lawyers, and others with professional knowledge and training are being called upon for facts and advice. It is essential that all involved take to heart their professional responsibilities; that they feel duty bound to convey what they know and what they do not know, with balance and perspective. That is not the case in many areas of society and is why, as the President recently said, America is suffering a crisis of confidence. The American people simply do not know what or whom to believe.

Our society now abounds with so-called experts who deal in halftruths and play on human fears or suspicions to further their own special interests. And a half-truth is like a half-brick—it will go farther. In so doing, they abrogate their professional responsibility to the public and cloud important issues. Those knowledgeable in the various disciplines have an obligation to see that these issues are kept in perspective, so they can be addressed intelligently by our leaders and understood by ordinary citizens. Consistency is needed in evaluating risks, and in providing proper perspective.

## ENVIRONMENTAL RISKS

Nothing we do is without risk. Risk is an inherent and accepted part of daily life. The problem lies in determining how great are the risks and what should we truly be afraid of. For this, it is important to acquire a sense of perspective. Should the falling of Skylab have been a major concern? It was estimated that there was only one chance in 150 that Skylab debris would hit one person in the entire world. Nevertheless, in some areas emergency preparedness centers were activated and airplanes grounded. A more meaningful risk to me was that I had one chance in six hundred billion of being hit. This risk was worth worrying about for about one billionth of my time, which translates to about one second.

The risk from Skylab was inconsequential. The environmental risk having the greatest effect in the United States today is smoking. Smoking causes us about 325,000 deaths each year, half these are from heart disease, and about one-quarter from lung cancer. Sixty years ago we had little lung cancer. Today more are dying from it than from automobile accidents.

Each cigarette has been estimated to shorten life expectancy by five minutes. Another method of estimating the risk shows that of a group of 10,000 who continue smoking, 1600 die from the effects.

Another major health problem in the United States is caused by overweight. Our affluence and use of television contribute to this. Each ounce above normal weight is estimated to reduce life expectancy by two days.

We accept the inevitability of automobile accidents. Chances are that ten people in this room will be seriously injured this year from automobiles. By building safer cars or further reducing speed the risk could be reduced. But even a parked car is not risk free. You could choose not to drive, yet pedestrians and bicyclists also are injured by cars. Reducing the risk of injury from automobiles to zero requires moving to a place where there are none.

These comparisons should give some idea of the risk involved in things you are familiar with. They give a basis for judging what smoking, or eating, or watching Skylab fall, could mean to your health and safety. This is the kind of perspective to which people can relate. Everyone knows life is risky. If he has the basis for judgment, he can decide what to do or not do.

## RADIATION RISK

While accepting the many daily risks of living, many seem to be getting the idea that their demands for energy should be met on essentially a risk-free basis. Since this is impossible, attention should be focused on taking reasonable steps to safeguard the public, on developing realistic assessment of the risks, and on placing them in perspective. One of the most widely distorted risks is radiation.

At the start of the Navy's Nuclear Propulsion Program in 1946, I realized the need for careful attention to radiation. It was clear to me that if nuclear ships were to be viable, there would have to be assurance that workers and crews not be subjected to excessive radiation. To emphasize this, I designed the shielding for our Naval nuclear plants to be many times more stringent than required by the standards then in effect. As a result, the shielding built into the first nuclear submarine, the Nautilus, was so conservative that it continues to be far more than adequate to meet the considerably lower radiation levels permitted today.

My approach to radiation shielding design was not agreed to in some places. For example, in 1957, the Chief of the Bureau of Ships—my boss—asked me to reduce the shielding in our submarines in order to save weight. Likewise, in 1965, a Congressional Committee launched an investigation to determine whether my conservative approach to shielding was unnecessarily increasing the cost of submarines. In both cases I held to my determination to keep radiation levels as low as I could reasonably get.

Insofar as the environment is concerned Naval plants have been so designed and operated that in each of the last eight years the total gamma radioactivity discharged to all harbors of the world has been less than two thousandths of a curie. This quantity is for the operation of over 100 ships and of all their support facilities. To give you an idea what this means, if one person were able to drink the entire amount of this radioactivity discharged into any harbor in all of 1978, he would not exceed the annual radiation exposure permitted by the Nuclear Regulatory Commission for an individual worker.

The word "radiation" has come to connote danger. It is often described as so dangerous that any amount is unsafe—as if the only question worth addressing is "how fast will radiation harm you?" Because you cannot see, feel, taste, hear, or smell radiation, it has an aura of mystery. But this same mystery appears to be absent from other potentially hazardous things for which we have a lack of sensory perception, such as radio waves, carbon monoxide, and small concentrations of numerous cancer-causing substances. These do not generate the same degree of fear as radiation.

The fear instilled by radioactivity today is akin to the fear of electricity following the invention of the electric light bulb one hundred years ago by Thomas Edison. Public fear of electricity was inflamed. Wall plaques had to be installed in rooms with electric lights, assuring people that "the use of electricity for lighting is in no way harmful to health, nor does it affect the soundness of sleep." Yet electricity has helped to transform man's life from a short one of drudgery to one where long life and higher aspiration can be realized.

Scientists have stated for decades that radiation can cause harm. However, all of us have been subjected to radiation throughout our lives from time of conception and, in fact, even prior to conception. The entire human race has been subjected to radiation, as has every living thing, throughout the entire evolution of our earth. The average person in the United States receives each year about one-tenth rem from natural radioactivity in the earth, in his body, and from cosmic radiation.

The unit of radiation, rem, ought to be required knowledge in all technical societies. It is defined in terms of energy absorbed in body tissues. Receiving one rem of gamma radiation is equivalent to absorbing 100 ergs of radiation energy for each gram of body tissue. There are 454 grams in a pound. An erg is the amount of energy required to lift a mosquito weighing one thousandth of a gram about one centimeter. In terms of energy the rem is a small unit. A dose of one rem would raise body temperature only two millionths of a degree centigrade.

We are not accustomed to fear background radiation; after all it is part of our natural environment. Yet in scientific terms it can be shown that its risk is not zero. More is known about radiation than almost any substance that can affect humans. More money has been spent to learn the effects of radiation on humans than for any other hazard in our modern society. The main effect is cancer. Effects other than cancer have not been found for low-level radiation exposure to adults. While genetic effects from radiation can occur, they are so small that none have been found in 35,000 children conceived after the nuclear explosions, by parents irradiated in Hiroshima or Nagasaki in 1945.

The combination of one-tenth rem per year background radiation, together with nearly the same average amount from medical diagnostic radiation, is estimated to cause almost one percent of cancer deaths in the United States. In an average group of 10,000 people, 1,600 will die of cancer. Sixteen of these deaths will be from background and medical radiation. If the lifetime radiation exposure of 10,000 people is increased by an average of one rem per person—a total of 10,000 rem—it is estimated that one additional fatal cancer may occur.<sup>1</sup>

This estimate of risk gives perspective on what radiation exposure means in the following ways:

Of all industrial and medical radiation workers in the United States, about 15,000 die each year from cancer. The total radiation exposure from their work adds an estimated 25 cancer deaths per year.

Radiation from the nuclear accident at Three Mile Island may add one fatal cancer death to the public within fifty miles. Of the two million people living within this fifty mile radius, 325,000 are expected to die of cancer from causes other than the radioactivity released from this accident.

The perspective on radiation can be improved by comparison. For example, I know an apparently healthy person who forty years ago received more radiation from medical chest X-rays than the total exposure all 15,000 radiation workers at nine shipyards received in 1978 from Naval nuclear power plant work. Others have had similar radiation exposure, and years later are alive and well.

<sup>1</sup> This risk estimate was made in 1977 by the United Nations Scientific Committee on the Effects of Atomic Radiation and by the International Commission on Radiological Protection. It is within the range of estimates in the 1979 draft report of the U.S. National Academy of Sciences Committee on Biological Effects of Ionizing Radiations, and in the 1972 report of this committee

Another example: for years rumors have persisted that radiation-induced cancer has killed the crew of the first nuclear-powered ship, the Nautilus. In 1978 the Navy traced each of the 96 officers and enlisted men of this first crew. Despite the rumors, all the men associated with operating the nuclear propulsion plant were alive and well.

With this perspective you are in a position to better answer the question, "Is radiation safe?" If safe means zero effect, then you have to conclude radiation is unsafe. But to be consistent, you should also conclude that background radiation and medical radiation are unsafe. Or more simply, that being alive is unsafe.

"Safe" is a relative term. Comparisons are necessary for actual meaning. For a worker, *safe* means the risk is small compared to other risks accepted in normal work activities. Aside from work, *safe* means the risk is small compared to other risks routinely accepted in life. From what I have said, it should be clear that the radiation encountered in our daily activities should not be the scary subject it is proclaimed to be.

#### EXTRAPOLATIONS

In radiation, as in other areas, a most effective way to frighten people is to proclaim that no one knows what the effects are. This has been repeated so often that it has become an article of faith that no one knows the effects of low-level radiation on humans.

One could well state, "No one knows the risks of smoking a few cigarettes," but the risks of smoking a large number of cigarettes are well known. If 10,000 people smoke an average of four cigarettes a day, about 100 deaths will result; data are not available for lower smoking rates. For radiation, doses of 100 rem to each of 10,000 people would be required to cause an equal number of deaths. The effects of radiation on humans at doses of 100 rem are well known. The major controversy over radiation risks today is how to extend the risk estimates to even lower levels. As we get to lower levels, it becomes more and more difficult to detect the effects, and this becomes a problem. Would it be possible to determine the effect on the death rate of doing one situp or one pushup a day?

Using the figures I just presented you can extend the numbers to show that one rem has about the same risk of death as smoking one cigarette per month. I make this comparison only to show that finding out the effect on the death rate of one rem of exposure is about the same as trying to find out the effect of smoking one cigarette a month.

The point is that the effect of one rem is extremely small. There are physical limits to how far we can go to ascertain precisely the size of this risk, but we do know it is small. Those who sing the refrain of how little we know about low-level radiation do a disservice. Instead, they should explain how much we *do* know about the small actual effects.

#### STUDIES

Today, the universal answer to a claimed lack of knowledge of environmental effects is to conduct a study—nearly always at Government expense. I am not against studying environmental or health effects per se. But studies must be high quality; they have to cover tens or hundreds of thousands of people, and they must extend for many years, to have any chance of validly detecting effects as small as those from low-level radiation. One wonders whether this is a proper expenditure of taxpayer money. Are there not other areas more deserving of this kind of attention?

The compulsion to study is often used to quell public fears. It is also a way to show that something is being done. At Three Mile Island, epidemiological studies are being launched. One study has been commissioned to investigate the radiation effects on all pregnant women in the area—there were only a few hundred. These pregnant women received less extra exposure to radiation as a result of the Three Mile Island accident than they would have received had they moved to Denver, Colorado for a few months. If we must have a new study, it would make more sense to study radiation effects in Denver, with its higher background radiation due to the high altitude. Or members and staffs of the U.S. Congress could be studied because there are places on Capitol Hill with radiation levels above normal background due to natural elements in the building stone. If the idea of conducting studies on Congressional groups strikes you as strange, you may understand why I have reservations about the real need for some of the studies underway.

A study is often the way to forestall taking meaningful action or making a decision. Doing a study is usually doing nothing. DeMontaigne said "Too much study suffocates the active part of understanding." Studies are frequently used

to quiet an outcry. The study takes time. During this period the clamor dies down. The study is issued, filed and forgotten. Meanwhile a new issue has aroused the public. Another study is authorized. The report is filed in the archives, and so on, and so on.

#### INJURY CLAIMS

Another aspect of radiation where scare stories are contributing to the problem is in the realm of radiation injury claims. Here, as in other areas, our approach to life is to turn from self-sufficiency to excessive reliance on Government. Many have come to presume that any risk, no matter how small, warrants indemnification by the Government. I am not against the payment of legitimate claims where the cause can be substantiated and it can be clearly shown that the Government was at fault. But when the risks are minimal, common sense should prevail.

In 1978, a worker in New Mexico was awarded \$75,000 in worker's compensation because he feared radiation. No physical injury was claimed. No excessive exposure to radiation was claimed. In 1979, the Connecticut State Supreme Court awarded compensation to a municipal employee for injuring his ankle playing ping pong before his work shift started. A compensation claim was approved for a Navy worker for headaches allegedly caused by sitting at a desk with his head down. Such abuses are becoming common. The implications of these awards are far-reaching—not simply for the money involved but in the attitudes being inculcated into large numbers of Americans.

There are about 65,000 employees in Government-owned Naval shipyards. About 22,000 past and present employees have filed claims for damage to their ears from noise. These Government workers are being paid an average of \$12,000 per claim. No distinction is made for normal loss of hearing with age. No effort is made to differentiate hearing damage caused on the job from that caused by modern music played at deafening volume.

Secretaries whose only exposure to noise was a typewriter or copy machine are receiving awards. Workers apparently feel it is their right to receive these awards for normal work. In the last ten years, over \$75,000,000 has been awarded to Naval shipyard employees for alleged hearing loss. The General Accounting Office has studied this area and found it riddled with fraud and abuse.

Since risk from radiation cannot be proven to be zero, suggestions have been made that the Government should pay all shipyard workers who get cancer just to be sure that none which might be related to radiation are missed. At a typical shipyard, about 10,000 workers have received radiation exposure from Naval Nuclear Propulsion work since the beginning of the program. Their radiation exposure from such work may add one or two cancer deaths to the 1600 normally expected in a group this size. To pay compensation to 1600 individuals so that one or two possibly deserving ones are not denied is absurd and unaffordable.

Demands have been made that all veterans who develop cancer be compensated because the cancer might have been caused by radiation from nuclear weapons tests. This would result in the Government making payment to almost 100,000 men who, according to normal incidence, will die of cancer, so that an estimated twelve possibly valid claims are not missed. Many claims have already been filed by these veterans.

The Navy's experience with hearing loss claims demonstrates that as long as there is money in the U.S. Treasury and Government agencies are willing to hand it out, there will be plenty of claimants. Many are urged on by unscrupulous lawyers who promote frivolous claims for a fee or a percentage of the award. Ordinary citizens, if they knew what was going on in some of these programs would demand a halt to such generosity with their taxes.

To those who get paid, this kind of cancer payment program may seem like getting something for nothing—like chain letters, the Pyramid Club, or the Circle of Gold confidence games. But the taxpayer foots the bill. In my view, environmental issues are badly out of perspective when we end up with a system that pays tax money to all who get cancer, merely to take care of a few for whom the real cause was radiation.

#### NEWS MEDIA

The news media have contributed substantially to getting environmental issues out of perspective. In their efforts to generate interesting stories that help sell newspapers, many members of the press have distorted the facts and the issues.

In complex areas like energy and environment, bare facts are unexciting. To spice up otherwise dull articles, there is at times a tendency to be selective in the facts used or in the topics covered. At times conclusions are shown as facts. I understand that in some publications, the advertising department has a say in what gets printed as news.

Too often, facts have lost their proper separation from opinions. Merely by choosing what stories are reported, the media express opinions. Publishing a statement without reservations lends authority to that statement. Serious articles are often written by those who lack the technical background to understand even the available facts. And sometimes news is contrived. Let me give you examples:

During the Three Mile Island emergency, residents and local officials commented how useful the local news reports were, but that the national news reports were distorted. For example, one national television crew requested that an entire street be cleared so that their film could show, by the empty street, how frightened the people were.

A so-called documentary television report on radiation was strongly anti-nuclear. It led to a conclusion in which the reporter was said to have been killed by radiation. However, nowhere in the report of his death from lung cancer was it mentioned that he was a long-term heavy smoker.

In areas such as nuclear power, even innocuous events are frequently blown into issues by a zealous reporter or editor. Not long ago, a hose broke, spilling a few gallons of pure water into one of our most polluted rivers. Because this happened on a nuclear-powered submarine, the story appeared the next morning in the newspaper.

The failures of the media—its preoccupation with the sensational and its lack of balance and perspective—are understandable to some extent. News is like fish—it must be sold quickly. But these stories can have a harmful effect on the public. Doctors report that following a series of news stories which fan the fear of radiation, the risk of death increases for people who will not take x-rays they should take.

Our country's growth has been fueled by technology. The bulk of the information on this subject is in the news media. It, therefore, has a special obligation to educate, through responsible reporting. Given the facts in proper perspective, the public can understand environmental issues. The tendency of the press to omit facts interferes with understanding these issues. For proper perspective, the news media must exercise self restraint, and make available enough information so the public can understand the significance of the events reported.

I have no simple solution for this problem. The media are not really accountable to anyone. Freedom of the press belongs to the person who owns the press. The only way I can see a change is for the public to demand more enlightened and factual reporting; perhaps the media will respond. Loss of sales or viewer interest is something a newspaper or TV network understands immediately.

#### GOVERNMENT

In environmental matters, there is a tendency to view Government officials as if working for the Government were in itself evidence of incompetence and bad intentions, therefore guilty of the charges leveled at them.

Some self-proclaimed public interest groups tend to focus on a single issue, demanding an immediate solution regardless of cost. But when Government agencies are pressured into solving one problem in a narrow fashion, this often leads to exacerbation of other problems. In some cases companies have been forced to switch from coal to gas for environmental reasons only to have to switch back a few years later because of energy considerations.

The Government agencies involved in these issues have an almost impossible job. Faced with problems that would challenge the wisdom of Solomon, Government agencies are increasingly plagued with other demands on their limited resources. The flood of injury claims is but a small part of the problem. Today we in Government can be tied in knots by frivolous law suits, Freedom of Information Act requests, investigations, and studies. These demands, individually, seem reasonable and necessary safeguards over the activities of Government officials. But faced with limited resources, the cumulative effect of these demands diverts attention and effort from their primary functions. It is analogous to the case of Cyrano de Bergerac who had to compose a sonnet while fighting a duel.

To be sure, we do have problems in Government. Some Government agencies themselves have become a sort of special-interest group. In this way the Government itself has been unable to provide the perspective to balance the problems inherent in new technologies. Those who criticize Government's inability to respond effectively to the challenges it confronts, should work equally hard to promote within the Government an atmosphere in which it is possible for us to devote our attention to important issues.

#### "EXPERTS" IN SCARE STORIES

Many have come to realize they can make names for themselves by scaring the public on radiation and other environmental risks. This approach creates reputations because the news media play them up. It creates research grants—with the Government, of course, paying—to explore the newly discovered problems. Time and again a so-called "expert" makes a startling "discovery" followed by a not-so-startling conclusion that he is the one who should conduct further research at Government expense.

To illustrate the trouble one self-proclaimed expert can cause, I will recount a situation I have followed closely. Two years ago a young medical doctor with little if any experience in radiation or epidemiology research started investigating the effects of radiation on workers at the Portsmouth, New Hampshire Naval Shipyard. Studies in this field are complex, and require considerable talent and effort to find answers and avoid mistakes. In conducting the study he enlisted the help of an investigative reporting team from the Boston Globe.

In February 1978 the front page of this paper carried results of the investigation. This was not the case of a newspaper reporting something out of a technical journal; it was a report by the paper itself. No technical reviews were printed with this story. Reservations were stated in the story, but in a manner that made the reservations appear doubtful or readily dismissed. In the name of investigative reporting the newspaper itself had become an advocate for a highly questionable study, thereby dropping any vestige of objectivity. This was a classic case of limited information being blown into sensational news.

The story was printed in many newspapers here and abroad. The summary featured in many papers was that cancer deaths were six times higher for radiation workers at Portsmouth than for other workers. The news accounts spread fear among the workers, their families, and neighbors. Others here and abroad wondered if being near a nuclear-powered ship was dangerous.

The articles and concerns of constituents generated immediate Congressional interest. Within a week, a Congressional hearing took place. But little was done at this hearing to explore the validity of the study's conclusions.

White House officials used the results of this private study to order a Government-wide investigation of radiation. Millions of dollars will be spent carrying out these investigations.

For the past year and one-half I and key people in my organization and at the shipyards have been tied up with this issue. It has consumed our time and interfered with our proper work. Ironically, it has diverted attention from an important technical aspect of our job, which is to ensure safety of workers.

Throughout the controversy, the news media headline writers found it difficult to resist inserting the word "deadly" in front of "radiation." They rarely reported the Navy's achievements in radiation control, and the careful attention paid in this area. Those promoting the stories did not bother to explain that, despite a doubling in the number of nuclear-powered ships, radiation exposure had been reduced to one-quarter what it had been fifteen years previously; that no one involved in the program had exceeded the Federal radiation exposure limits in a dozen years; that no one in the program had received more than one-tenth the radiation exposure allowed for radioactivity inside the body.

Official risk estimates indicate that about 1,600 cancer deaths are expected for every 10,000 people. Among the 10,000 radiation workers who have worked at the Portsmouth Naval Shipyard, exposure received on the job might add two cancer deaths. Many scientists believe the true effects of radiation will be much smaller.<sup>2</sup> These facts are in sharp contrast to the exaggerated statements made in the Boston Globe.

<sup>2</sup> The National Academy of Sciences 1979 Report of the Advisory Committee on the Biological Effects of Ionizing Radiation is in contention over the views of a majority of the committee members on how much smaller the true effects will be.

Eventually the facts began to come out. In a Congressional hearing one and a half years after his report was published, the investigating doctor entirely changed his results. He repudiated his earlier conclusion that the cancer death rate for radiation workers at Portsmouth was double the death rate of their co-workers. He testified he could not longer support his earlier conclusion that the leukemia rate was six times higher for Portsmouth radiation workers than for non-radiation workers.

I do not intend to denigrate those who are addressing valid public health issues in a responsible fashion. But a true professional does not publish until he knows the facts and acknowledges the significance of potential errors. Those who do not follow this path of credible scientific inquiry are acting irresponsibly. Not everyone who proclaims himself an expert, is an expert. Not everyone with the title of "doctor" merits public esteem. Not everyone who claims to be acting in the public interest, is actually doing so. We must guard against those who in the name of public interest pursue fame through exaggeration. It is easy to use statistics improperly to predict large problems or to emphasize risk, out of context. Those who do so cause great harm by preventing a balanced assessment of the risks, thereby distorting proper preventive and remedial actions.

Since the doctor's new testimony, the Boston Globe has been comparatively silent. To my knowledge, the publishers have made no move to return the award they received for their earlier investigative reporting. There has been no apology to the workers and families they scared. The publishers have sold newspapers and have now moved on to other issues. I doubt if this experience will have any impact on their future reporting.

When a newspaper teams up with a doctor and then rushes preliminary, unsubstantiated results into print, it develops a vested interest to show that its reports are correct. Thus, it discounts or does not report information which conflicts with its own stand. That is the apogee of irresponsibility.

Such irresponsibility is a failure of newspaper management—not of the reporter. Much of the blame for other problems in the media also lie with management, who set the standards, style, and tone, and create the pressure for instant sensational reporting.

#### NUCLEAR POWER

I have spent considerable time discussing how public understanding of the true risks of radiation has been distorted in the name of protecting the environment. I have concentrated on radiation, although the problems I have mentioned are common to other environmental issues as well. The public perception of radiation has a direct bearing on the use of nuclear power in this country.

Nuclear power is not easy to deal with in this country because it has become a highly polarized issue. It involves individuals' concerns for themselves and their families, and it is a highly technical, sophisticated technology. Ultimately, the decision whether we should have nuclear power is a political one—in the true sense of the word—that is, one made by the people through their elected representatives. It is essential that the decision be made on the basis of fact, not rhetoric, nor conjecture, or hope; nor as a result of the widespread tendency to sensationalize or ignore the true limits and risks of the alternatives.

According to the estimates I have already stated, the actual radiation exposure to workers and to the public from today's use of nuclear power can be estimated to result in about eleven extra cancer deaths per year out of a total of 360,000. In this basis, to eliminate nuclear power here would then potentially save an estimated eleven lives per year, but reduce the energy available. This loss of energy itself, might well result in loss of life.

If the saving of eleven human lives were the sole objective, better results could be obtained from the following, than by eliminating nuclear power:

Reduce cigarette consumption for each smoker by one cigarette per year.

Reduce medical radiation exposure by one percent.

Move the population of the Denver region to coastal areas which have lower background radiation levels.

Eliminate stock car racing.

Reduce the overweight condition of those in this room by an average of three pounds.

Some analysts have reported there may be greater radiation exposure from operation of a coal-fired central power station than from a nuclear power station. Whether this assertion on radiation is or is not true, accidents in mining and transporting coal, and the effects on the public from sulphur and other pollutants, result in a demonstrably higher death rate from use of coal than from nuclear power.

Concern over a nuclear accident is often cited as a reason for prohibiting nuclear power. Obviously, a repeat of the Three Mile Island accident cannot be lightly accepted and corrective actions are called for to prevent recurrence. I have provided my views to Congress and to others responsible for assessing what might be done in the commercial nuclear power program. The record and risks of this source of energy should be put into perspective, as compared with other risks we face.

Here are some examples of accidents far worse than anything resulting from Three Mile Island, yet without comparable repercussions on public policies:

In 1947, a ship loading ammonium nitrate fertilizer exploded, killing 561 people and leveling much of Texas City, Texas.

Many fires, explosions and wrecks have occurred in which more people than this were killed.

Forty-eight earthquakes, floods, tidal waves, and storms have been recorded in each of which 10,000 or more people were killed.

The DC-10 airplane which recently crashed, killed several hundred people. No one is considering abolishing aviation—it is too important to our way of life.

I am not aware of anyone advocating relocating cities such as Los Angeles or San Francisco away from geological faults which might cause earthquakes or away from risk of flood or storm damage.

As another example, there are approximately one hundred million shipments of hazardous material annually in this country. Hundreds of people each year are killed or seriously injured by hazardous materials in accidents. More scrutiny is being given to the approximately two million radioactive shipments than to the others, yet not a single death or injury has occurred from radiation or radioactivity in the material being transported.

I am not an expert or particularly knowledgeable in the areas of environmental effects of other forms of power generation. However, I am aware that many knowledgeable people conclude that the total risk involved in the use of nuclear power is no greater than that of any alternate source which can meet our needs in the next few decades.

Today many are optimistic about the possibility of widespread use of solar and other so-called "natural sources of energy." However, in their enthusiasm they often disregard the limitations and environmental effects of these sources. Others advocate exploitation of shale oil deposits without mentioning the vast amounts of water and earth removal required.

Any large-scale generation of energy—whether nuclear or from other sources—involves major engineering difficulties and potential environmental impacts. It is incorrect to assume that technology and increased Government spending can overcome limits nature imposes.

I remember the optimistic projections made for nuclear power when it was first being developed. It was predicted that electricity from nuclear power would be too cheap to meter. These predictions sprang from hope, from ignorance of the engineering problems that would be encountered in using nuclear power.

In similar vein, many advocates exaggerate the benefits and ignore the problems of the energy sources they are promoting. The solution to our energy needs is not just over the hill at the end of the rainbow. Nature always demands its price; providing adequate amounts of energy will exact its proper price.

#### CONCLUSION

The technical problems involved in developing additional sources of energy are great, and will require our best talent.

I am not a proponent of nuclear power or of any other energy source. All alternatives have their own limitations; none are without risk.

In addition to the technical problems of generating the energy, environmental concerns must be factored into the equation. Whether these can be solved on a scale enabling us to sustain our present standard of living is not clear at this time.

One thing is clear. These problems cannot be dealt with effectively—from a technical or political standpoint—if those responsible are not set free to work on

the problems. We cannot make progress unless those truly interested in solving these problems act responsibly.

Too many so-called technical, medical, and scientific people have been abrogating their professional responsibility to present facts accurately and objectively and in a context which enables others to evaluate them.

Too many in the media are sensationalizing the news in an attempt to attract readers, generate controversy, and make a name for themselves.

Too many self-proclaimed public interest advocates are pushing single interest ideas in ways that make it increasingly difficult to place the issues in true perspective.

Too many, in exercising their so-called rights, are exploiting environmental issues to obtain grants from the Government; through study contracts, improper injury claims and other methods.

These conflicting pressures have left the public uncertain, distrustful, confused, and in need of help. I consider this audience can provide a signal service by answering this call for help. Environmental issues must be put into proper perspective. Balancing risks and benefits must become a standard approach to evaluating environmental matters. The significance of environmental data must be explained to the public, so it can reach its own conclusions.

The present crisis in confidence over energy requires this approach to environmental issues. The Chinese word for crisis combines two ideographs, *wei chi* (pronounced weigh gee) literally dangerous opportunity. A time of crisis is also a time of opportunity. We should take advantage of this opportunity to achieve a proper perspective in environmental matters.

#### NAVAL REACTORS PROGRAM STATISTICS

Senator JACKSON. You might touch on any points that you feel need to be emphasized and any statement that you wish to make beyond your prepared statement.

Admiral RICKOVER. Thank you, sir. I will briefly give you a few statistics, about one page, and then we can get off to the more general aspects, if it is satisfactory to you.

Senator JACKSON. All right.

Admiral RICKOVER. We now have 114 nuclear submarines in operation. This consists of 41 Polaris and 73 attack submarines. There are, in addition, 25 attack submarines and 8 Tridents authorized. We have three nuclear carriers in operation and two more authorized or under construction. There are eight nuclear cruisers in operation, and one more authorized.

We have now steamed, since the inception of this program over 43 million miles with our nuclear ships. Now that is a tremendous accomplishment and I believe that the operation of these ships has been more trouble free than those in the conventional Navy.

We have 152 nuclear reactors in operation which is probably—

Senator JACKSON. 152?

Admiral RICKOVER. 152.

We have over 1,900 years of reactor operation so we have had considerable experience with nuclear power—certainly more than anyone in this country and probably more than anyone in the world. As you are aware it has been pretty much trouble free. A major question is how was this brought about, what was the system used, and how can some of this knowledge, if necessary, be applied to the civilian nuclear power industry where we are having some trouble?

In the quarter of a century since the inception of this program, since the first prototype started operating, there has never been an accident involving a reactor nor has there been any release of radioactivity which has had any significant effect on the environment. That is in 25 years of operation.

During 1979, for example, the total radioactivity in liquids, less tritium, discharged within 12 miles of shore from all nuclear power ships, supporting tenders, naval bases and shipyards was less than two-thousandths of 1 curie. If one person were able to drink the entire amount of radioactivity discharged into any harbor in 1979, he would not exceed the annual radiation exposure permitted by the Nuclear Regulatory Commission for any individual worker. To emphasize, if one person drank all radioactivity discharged into any harbor, he would not exceed the limit for a single individual as allowed by the proper regulatory group.

In the area of radiation exposure, the total occupational exposure to personnel on board ship and in shipyards was about one-sixth of the amount in the peak year 1966. So you see, even though the number of ships has nearly doubled since that time, the annual amount of radiation exposure has been reduced.

Now that is a brief statement. I made the point about how many ships we have. The ships are operating without accident and we have not affected the environment as you well know from your experience with the shipyard in your State.

Senator JACKSON. That is right.

Admiral RICKOVER. There is one other important point. The total number of officers and enlisted personnel trained to date is over 47,000. We have supplied the nuclear industry with many people. You might ask, if that is the case, why does the nuclear industry have problems? The difference is the supervision, direction and checking up.

#### CIVILIAN NUCLEAR POWER INDUSTRY PROBLEMS

You cannot have any group of people, any more than you could have 100 Senators, each one operating all by himself. Somebody has to be in charge. You have to have committee chairmen and you have to have somebody as head of the organization, and this is the one area where the civilian nuclear industry seems to differ from the naval program. In the naval program, one person is in charge and is responsible.

It is not enough to have someone in charge, you must also have that person assume the full responsibility. Otherwise, it won't work. There is no such thing as overall responsibility by one person in the civilian nuclear program. From my standpoint, that is the major point I would like to make.

Senator JACKSON. Management—addressing for a moment the civilian side of the nuclear power program—that is the key area of trouble; is it not?

Admiral RICKOVER. Well, sir, what do you mean by management? Management in the civilian program is by the heads of utilities. These heads are generally not technical people. They are nearly always financial and legal people so that the top man in the organization does not really know what is going on in these—

Senator JACKSON. That is what I mean by management.

Admiral RICKOVER. I am trying to make it more specific.

Senator JACKSON. Yes. The failure of the nuclear power industry is to learn the lesson of the Navy in the operation of 152 reactors where we have not had an incident of any kind. Whereas in the civilian

nuclear power program while there have been no fatalities, there have been a series of incidents that have alarmed the public which has the effect—an adverse one indeed—on the evaluation of nuclear power.

Admiral RICKOVER. Yet, nuclear power is essential, we have got to have it due to the energy crisis. We have to use nuclear power and I am sure you agree with me that if we have to have it then we better start looking around and seeing how to properly operate it.

Senator JACKSON. That is right, and in the various energy programs we have had a lot of management problems, whether it is nuclear or nonnuclear. One hundred thirty lives were lost on that oil rig in the North Sea. Not a life was lost at Three Mile. Yet they have two things in common. The technical management, the overall management, just management period of Three Mile was not up to what it should be; was it?

Admiral RICKOVER. No, but there were enough safety factors introduced into the reactor design to avoid a catastrophe. Were I to make a comparison between the civilian and the naval program, I would note that their instrumentation system is far more complex than ours. Whenever you have excess instrumentation you introduce weaknesses because every one of these instruments can go wrong. You can over-design something, too. This is one area where I believe that the civilian plants are overdesigned.

Senator JACKSON. Can you have too much redundancy or backup?

Admiral RICKOVER. They have too many instruments. When you start having a large number of instruments, more things can go wrong. I depend mostly on people and not on instruments. There is a basic difference between the naval program and the civilian program. We depend on people, on the knowledge of people, and not solely on instruments. Furthermore, we have constant supervision from many sources. The civilian nuclear power industry doesn't have that because they do not have the qualified people nor do they have an SOB like me at the head of it who knows what goes on all the time in every plant. I know what happens on the ships. I get reports constantly on the amount of training that is done and how the plants are being operated. I require regular reports and that is a backbreaking job, but it has to be done. Somebody has to be in charge. You don't have that in the civilian industry.

Senator JACKSON. That is what I am leading up to. That does address the management.

Admiral RICKOVER. How to approach it is another matter. They are trying to set up groups of people but groups of people in themselves cannot do that. It is just like in the Senate you have chairmen of committees. Not every Senator can run around and do everything he wants. There is somebody with authority. That is the point. The civilian nuclear power industry doesn't have someone in charge. They are trying to overcome this by setting up groups, committees. I don't know how that is going to work out.

Senator JACKSON. But it is a management problem as I was saying. In the energy situation—whether it is coal, oil, drilling in hazardous areas like in the North Sea, obviously the facility there was not designed right, it was a management failure. I am addressing the need for a better management in the whole area of civilians.

## PUBLIC MISCONCEPTIONS OF RADIATION

Admiral RICKOVER. But, Senator Jackson, you have another problem. The instant you mention the word "radiation" it conjures up something horrible. I have advocated we stop using that word and use instead of it "equivalent chest X-rays." Now that is something that every person can understand. If you say a person has had as much exposure as he would get in a tenth of the chest X-ray, the public would understand that, but that word "radiation" has a negative connotation. I recommend we stop using that word and use "equivalent chest X-rays" and that will mean something more.

When you say two-thousandths of a curie, that indicates to the ordinary person some unknown amount of radiation or two-millionths of a curie and he thinks about millions of some possibly horrible figure. I recommend we stop using those esoteric words and use simple words that any ordinary human being can understand. I came up with the idea of using so many chest X-rays.

Senator JACKSON. Or a fluoroscopic.

Admiral RICKOVER. Yes, or something of the sort.

Now I have here a statement which I made to the President's Commission on the Accident at Three Mile Island and with your permission I would like to put it in the record because it has my considered views on this matter.

Senator JACKSON. Without objection, it will be included as part of your statement.

[Retained in committee files.]

Admiral RICKOVER. I am happy that you are raising these general questions because—let me go back to the purpose of my testimony. I am asking you to approve a certain amount of money, and I might add that it is not any more than it was last year. I think you know that what I asked for is not excessive. I think I can do more for your committee and more for the country by addressing questions you may have in these other areas. I remember the first conversations we had on this subject was in 1952 when the people of the State of Washington were so wise as to elect you as their junior Senator.

Senator JACKSON. I will extract that from the record but it will be in the public print at the proper time. [Laughter.]

Admiral RICKOVER. What was that last comment? I didn't hear you, sir.

Senator JACKSON. But that has been repeated publicly, too, so it won't be necessary. It was just a little bit of nonsense.

Admiral, would you go ahead and address any of the key points that you feel should be emphasized in your statement? I don't think there is any problem at all with your budget, but what do you see as the problems that we face as far as the nuclear Navy is concerned looking at the immediate and longer term?

## ATTACK SUBMARINE DEVELOPMENTS

Admiral RICKOVER. I want to talk from a more personal standpoint. The official at the head of Research and Development in the Navy Secretariat from whom I am supposed to derive my inspiration, has advocated we go to slower nuclear submarines.

Senator JACKSON. Slower for the attack submarines?

Admiral RICKOVER. Yes, sir.

Senator JACKSON. And slower for the strategic?

Admiral RICKOVER. He believes the attack submarines ought to be slower. I think the Congress will change that around, but I am giving you some concept of the leadership which is being supplied to the military. We are supposed to depend upon the civilians, you know. They are the smart people, they have the experience in the civilian life and they are put in charge because they have imagination. You know I could not make a statement like that unless it were true. It reminds me of something that happened in 1930 when I first came into submarines. Following a collision between two diesel submarines one of the officers stated, so the story goes, that "I heard a crash forward so I ran aft." His nickname in the fleet became Dummy.

Senator JACKSON. What do you see the Soviets doing in this period ahead? We know what they have done in the last many years as far as their navy is concerned and specifically insofar as attack and strategic submarines are concerned.

Admiral RICKOVER. They are building about three to four times as many submarines as we are building. They are marching ahead of us very rapidly. They are getting better all the time. They, of course, as you know, have their people on board ship serving for much longer periods than we are able to do. What we are doing is constantly getting people for short periods of time for training and out they go because they acquire skills which are marketable in civilian life. They can go out very quickly and get more money than they can in the Navy and that raises another point. I hate to be a protagonist for increased pay and I certainly would exempt admirals from any increase, but I think for enlisted men and engineering officers where there are skills, I think we have got to increase pay if we want to keep our people. If something is not done, ultimately the Navy will get to a dangerous point where it is unprepared if people only stay 3, 4, or 5 years. The work is too demanding and requires too much knowledge.

#### PROBLEMS IN RETENTION OF SKILLED PERSONNEL

As you know, much of the nuclear commercial industry is manned by ex-Navy people. Thus, we are contributing quite a bit to the general economy. I believe for each person that they have to train it costs about \$100,000 to \$140,000. There have been some estimates made that we have contributed to the general welfare a substantial portion of the cost that was paid for training the Navy people in the first place.

I am generally opposed to advocating higher pay for Government people and as I said I would certainly exclude high-ranking officers. But in the case of critical skills, something has to be done. One thing you can do is to give them some pay equivalence. This is what I would recommend. Look what they have to do in the Navy. In civilian life they work a 40-hour week while the average workweek on a nuclear ship is some 70 hours.

They have to go to sea for long periods of time. Many of them marry young and would prefer to stay home with their wives and family. We deny them that because they must go out to sea for long periods of time. That must be faced. I repeat, I am not normally for increasing the pay of military people or anyone else in Government. I think too many have pretty cushy jobs—but this is an exceptional situation.

Senator JACKSON. We have, as you know, the Nunn-Warner amendment that has been approved in the Senate that does address the issue of retention. It is not entirely comprehensive, but it does provide for some incentives to stay in. I think that is what you are saying.

Admiral RICKOVER. Yes, sir.

Senator JACKSON. And we do not provide for the larger salary increases which would be from top to bottom, but we cover a number of areas that are essential—housing, travel allowances, change of duty station, enlistment bonuses—which I think the maximum now under the new bill that was passed goes up to \$15,000 for some skills.

Admiral RICKOVER. What is not taken into account is the debits caused by people who are not adequately trained. The technical things which have to be repaired because of improper care. For example, if a piece of equipment that cost \$60,000 must be replaced that cost comes out of some other fund. That is the sort of thing I am talking about. If you look at it from the overall standpoint, it is cheaper to retain trained personnel, than to go on with the present system. In Russia they can do it cheaper; they can get people in their navy and require them to stay for many years. We cannot do that. They can have them at low pay, we cannot. The Soviet military lives in a certain milieu and apparently they are content with that. Our Navy can't retain skilled people by offering low pay. I hope that is something that you might use your influence on, it has to be done pretty fast.

Senator JACKSON. There is not any question the turnover, for skilled personnel especially, has been a costly thing and it is wrecking havoc in the armed services. I don't think there is any question about it. I hope the House will act speedily on your bill. If they want to make some changes, fine, but as yet they have not acted and we hope we can.

Admiral RICKOVER. I don't know what the country will face. It could be facing all sorts of serious problems in view of the world situation. I believe it is very important that we try to get this important part of our defense—and I believe you agree it is a pretty important part of our defense—to a point where we can retain skilled people. It is absolutely essential.

#### SOVIET SUBMARINE THREAT

Senator JACKSON. Admiral, let's go back to the original comment on speed. The Soviets have really moved with their ALFA submarine, have they not?

Admiral RICKOVER. Yes, sir.

Senator JACKSON. What do we do to counteract that growing capability? It is clear they are going to emphasize speed and [deleted].

Admiral RICKOVER. [Deleted.]

Senator JACKSON. I wanted to raise that question.

Admiral RICKOVER. I am glad that you did. In my judgment for the expense involved, for the greater danger involved and for the fewer ships we would have because of the cost. We have to take limited funds in competition with other defense programs and do the best we can. In my judgment we are doing all right.

It may be if you get somebody else you would come out with a

different concept but as you know I have always testified and given you my frank opinion as I see it from an overall standpoint. I think we have pretty good ships and I think we have well trained officers and men on them, too. I think they are doing a good job. The fact is that they have relatively small numbers of deficiencies in their operation even though there is rapid change among the crews.

#### SLOWER, CHEAPER SUBMARINES

Senator JACKSON. Let me ask you, I have heard it said some time back that you can have slower subs as you improve your standoff systems; in other words, that you can deal with your adversary with modern technology over greater distances, whatever the systems might be.

Admiral RICKOVER. But the trouble is the other guy does not get the word. The faster submarines don't get the word. If a faster Russian submarine doesn't get the word, a slower American submarine will be in trouble.

Senator JACKSON. But are there systems available so that you can reach out and get the faster moving systems that we have that they don't have?

Admiral RICKOVER. I have heard that talked about theoretically but from a practical standpoint I doubt very much that you are going to be able to pinpoint a submarine somewhere in the ocean from a long distance. Furthermore, the submarine, unless you have a missile that can absolutely hit it, can maneuver and escape. Mind you, when you start getting into the water you have a different set of circumstances, too.

Senator JACKSON. What is the difference in cost? What do they claim they will gain by it? Will we have more submarines that are slower on a cost-effective basis?

Admiral RICKOVER. What they are advocating is a 4 to 3 ratio. They could have four slower submarines for three fast ones. I would rather take the three fast ones any time because one fast one is more effective. Mr. Chairman, that is the sort of feel that you get by being involved in this business. The system analysts come up with different answers because they have no practical knowledge whatsoever.

What you get is some mathematicians who have taken one of these college courses in systems analysis and they can solve all of your problems. You don't find any practical people making these decisions. That would be just like someone taking a systems analysis course on how to be a good Senator.

You are laughing, sir. But that is what we are up against. Are we any better than Senators?

Senator JACKSON. Well, you have to be a lot better than Senators.

Admiral RICKOVER. With systems analysts we are better than no one.

Senator JACKSON. If we relied on Senators to run your program, we would have all kinds of problems. They would have a committee debating on the next move.

#### NUCLEAR WASTE MANAGEMENT

Admiral, I wanted to mention one other thing and that is, you know we are running into a real problem on waste management of nuclear

waste, both military and civilian. We approved the WIPP project, the waste isolation project in New Mexico, after long debate and as you may know they requested that the money that we appropriated be rescinded.

Admiral RICKOVER. Who was recommending the rescission?

Senator JACKSON. The White House sent it up. It is contrary to the views of the Department of Energy and the Department of Defense as far as I know. I don't think they approved it. It is a budget problem and it is also a problem on the whole management issue on nuclear waste.

My understanding is that Idaho Falls takes care of all of the Navy nuclear waste at this time.

Admiral RICKOVER. Yes, sir. As you know, the Department of Energy has about a 500,000-acre piece of land out there which was used during World War II as a testing site for large guns. The naval fuel is processed at that site.

Senator JACKSON. How do you see this direction going? This is my concern on the Navy's nuclear program.

Admiral RICKOVER. Mr. Chairman, I don't know all the considerations, but if it were my problem I think I would develop waste processing because it has to be done, and the longer we wait, it is probably going to be more difficult. That is a personal opinion. As I say, I don't know all the considerations that have gone into the recommendation made by the administration.

Senator JACKSON. We are running into also a problem now—I think it is clearly unconstitutional—suggestions that the States have the right to veto nuclear waste sitings which cover and include military waste. I think the States should have a proper role, it is a matter of public safety on nonmilitary waste, but when you get into a situation where the States are going to be able to veto a military requirement, I think it is clearly in violation of the Constitution.

Admiral RICKOVER. Are the States going to defend themselves, too? Is each State doing to defend itself, too? Is that a good question?

Senator JACKSON. I think you have given a good answer.

It is so clearly and blatantly unconstitutional that it should not even have to be discussed but we have such proposals pending around here.

Admiral RICKOVER. That is a national issue and must be faced as a national issue. In a democracy you always have groups of people whose ideas differ from those of the majority but it is one of the aspects of democracy that ultimately the majority must prevail or else democracy is a joke. You cannot have a democracy with each person constantly maintaining his views against the majority. That is what democracy also implies, majority rule. Each man or each State is given a chance to vote the way he wants but he must abide by the majority.

#### NEED FOR FASTER SUBMARINES

I would like to add a couple of points here concerning submarine speed. Reducing the speed of future U.S. attack submarines by 5 knots, compared to the current *Los Angeles* class would mean that our submarines would be unable to keep up with most Soviet nuclear attack submarines. Also, the slower U.S. submarines would be unable to stay

with and attack high speed surface ships. Our slower submarines would be unable to escort U.S. surface ships in high speed operations and the slower submarines would require an extra day and a half to transit the Atlantic. In a day and a half a nuclear attack submarine could search an area nearly the size of New England and an area larger than the States of Florida and New York. That is what it would mean from a practical standpoint. Intuitively, you know, a faster ship is better than a slower one.

Senator JACKSON. You should always have an option.

Admiral RICKOVER. You can always just slow down.

Senator JACKSON. Yes, but that is an option you should always have.

Admiral RICKOVER. The thrust of what I am saying is that we should have the faster submarines.

Senator JACKSON. Admiral, we want to thank you for, as always, a very fine statement. We will conclude our hearings. We hope to mark up the bill very shortly and if we have any questions we will have them submitted to you for response.

Admiral RICKOVER. I would like to include a statement I made to the Subcommittee on Energy Research and Production of the Committee on Science and Technology in the House of Representatives which touches on this. I think you will find it valuable if you have a chance to look at it.

Senator JACKSON. Without objection, it will be included as part of your statement.

[Retained in committee files.]

Admiral RICKOVER. Thank you, sir.

Senator JACKSON. We want to thank you for your appearance here.

[The questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR HENRY M. JACKSON, ANSWERS SUPPLIED BY DUANE C. SEWELL, ASSISTANT SECRETARY OF DEFENSE PROGRAMS, DEPARTMENT OF ENERGY

#### COMPETITION FOR RESOURCES

Senator JACKSON. Last year when Secretary Schlesinger appeared before this Committee, I raised with him the issue which concerns me most about your budget for defense programs and that issue is in regard to the competition for resources within the Energy Department. I'm seriously concerned because I think your proposed budget for defense programs for this next fiscal year is so low that you will not be able to produce the weapons and perform the related R&D and testing that is required by the current stockpile paper. Let me be more specific, I think:

Your R. & D. and testing program may be underfunded by \$100 million,

Your weapons production program is based on such low inflation estimates that you will be at least \$100 million short of production funds,

Your budget for the production of nuclear materials is at the margin and makes no provision for additional capacity that will be needed in the mid-'80s and does nothing to restore some operating efficiency caused by block obsolescence of equipment, and

Your defense waste program is underfunded so badly that you will not have enough moneys at Hanford and Savannah River to remove high level nuclear waste from old, leaking tanks into new tanks that are ready to receive the waste.

We will get into specifics in these areas in a few minutes, but let me first illustrate my concern with a handout:

This first is a table showing the reductions made in the FY 81 defense programs budget during the budget review process. Let me be clear at the outset that I support the budget process and I think tradeoffs are necessary to keep Federal spending at a prudent level, but when it comes to the very heart of our strategic deterrent, I for one, would like to err on the high side. It appears to me that the budget process is being used to squeeze the life out of our defense nuclear programs and those who advocate unilateral disarmament are very cleverly using the budget process to achieve their objectives. The FY 81 budget, which I assume you scrubbed very carefully, was reduced another 20 percent before it came to Congress; half of that reduction was made in the Energy Department and half at OMB. I seriously question whether these reductions have any basis other than the necessity for defense programs to take their "fair share" of the budget cuts.

## DOE DEFENSE PROGRAMS, FISCAL YEAR 1981 BUDGET

[Request for budget authority, dollar amounts in millions]

Program	By Assistant Secretary for Defense Programs	By DOE		President's	
		To OMB	Percent change	Budget	Percent change
Materials production.....	\$601	\$597	-1	\$523	-13
Weapons activities.....	2,320	2,120	-9	1,927	-15
R. & D. testing.....	(1,074)	(941)	(-12)	(851)	(-21)
Production.....	(1,205)	(1,141)	(-5)	(1,803)	(-10)
Overhead.....	(41)	(38)	(-7)	(38)	(-7)
Defense waste management.....	612	514	-16	350	-43
Subtotal.....	(3,533)	(3,231)	-9	(2,845)	-20
Inertial confinement fusion.....	250	225	-10	202	-19
Naval reactors development.....	305	305	0	305	0
Verification and control technology.....	55	42	-24	41	-25
Security and safeguards.....	68	54	-21	50	-27
Total.....	4,211	3,857	-8	3,443	-18

*Question.* Mr. Sewell, I'm concerned that we are doing irreparable damage to our nuclear deterrent by squeezing the system too tight in the budget process. Are you comfortable with the FY 81 budget request for defense programs and the process that was used to develop that budget?

*Answer.* The budget that the President presented to the Congress provides sufficient funds to meet our FY 1981 commitments to the DOD. I think that level of funding could have been more comfortable, but there is a degree of risk that must be associated with anything we do in terms of how much is enough for national security. We believe that the program we have proposed contains a level of risk which we can accept. I am concerned, however, that if the current level of inflation continues we may be unable to meet our FY 1981 commitment to DOD.

*Question.* Who made the decisions in DOE (above yourself) and OMB to cut the budget? Are these people knowledgeable in the nuclear weapons business?

*Answer.* Within DOE the final budget decisions were made by the Secretary, Deputy Secretary, and the Under Secretary. Within OMB initial reviews were made by the budget examiners assigned to our program, and their recommendations were submitted to the OMB's Associate Director for Natural Resources, Energy, and Science. I met with OMB and discussed their recommendations. Upon receipt of the initial OMB passback, I appealed a number of the reductions. The final allowance for the weapons program was based upon decisions of the Director of OMB and the President.

With respect to the OMB examiners, they have a broad knowledge of the program. We have presented several program briefings to them and they have visited a number of our facilities.

*Question.* Would you favor or oppose the creation of an independent agency (like the old AEC) to handle the defense nuclear programs?

*Answer.* As you know, when Congress raised the question of the proper location of defense programs in section 307 b. of the Energy Reorganization Act of 1974, a comprehensive study was undertaken which explored the various organizational alternatives. The ensuing report "Funding and Management Alternatives for

ERDA Military Application and Restricted Data Functions", which was completed in January 1976 and submitted to the Congress, carefully identified the various principal considerations applicable to each practical alternative—one of which was the establishment of a separate independent agency to conduct the nuclear defense mission. Even before that study, but certainly since then, and especially in the course of fulfilling my responsibilities as Assistant Secretary for Defense Programs, I have given much thought to the best possible organizational setting for the national security functions now under my jurisdiction. All practical things considered, the recurrent answer to my reviews of the situation has been: to continue defense programs where it is now, in DOE. It would probably take at least another study substantially as thorough as the earlier one four years ago, and some unusual and sharp change in circumstances, before I could be persuaded that it would be beneficial in the national interest to assign responsibility for the nuclear security functions either to a new, separate agency in the Executive Branch or to the DOD.

I am afraid that a separate agency devoted solely to nuclear weaponry and related defense matters might not be able to maintain the uniquely qualified technical capabilities and assets needed to meet our Nation's nuclear defense needs. I am speaking here particularly of the continuing contribution of the National weapons laboratories not only to defense work but to a full range of energy and conservation developments. It is my clear judgment that such an aggregation of tasks has sustained the well-being of the laboratories by attracting talented people and helping retain them as valued assets of these outstanding institutions. It may be visualized that a separate agency could continue to permit the laboratories to support such non-defense R&D efforts. However, I believe that this sort of split federal jurisdiction would suffer considerably because of the lack of first-hand knowledge by the responsible agency of the relative merits of the non-defense tasks sought to be undertaken by the laboratories.

*Question.* Would you favor or oppose the transfer of the defense nuclear programs to DOD? Why?

Answer. As I indicated in the answer to the previous question, I would not favor the transfer to DOD. The rationale that originally led to the independent status of the nuclear weapons program is still valid today. I think it is important that the well-established independent channels of communication to the President and the Congress remain open so that the government can fully consider the technical, military and other merits of various options that arise from time to time concerning the direction of the nuclear weapons program and its technical content. There have in the past and can be expected to be in the future significant differences of opinion concerning technical aspects of nuclear weapons having overriding national security significance that I believe must be resolved at the highest level. In my opinion the present organization helps to keep this decision process open and viable.

If our mission were transferred to DOD, I feel its relative small size in relation to other DOD programs would serve to substantially diminish the amount of high-level attention it distinctively deserves, not only within the Department, but at OMB and the Congress.

Similarly, by placing the management responsibility for the National Laboratories under Defense Programs in the DOE, I feel the Laboratories are afforded a singularly important freedom. That is, they can provide to senior DOE management as well as to other senior levels in government such as the Congress, an exceptionally high quality and unbiased technical view of matters of critical importance to our national security.

I would have strong concerns about maintaining this institutionally unbiased and valuable source of technical knowledge should the nuclear weapons program be subsumed in a much larger organization.

And, of course, my point about the need to use the weapons laboratories for nondefense R&D of national import would pertain here also.

In summary, my experience thus far is that I have seen no unusual or sharp changes in circumstances since the study completed 4 years ago which would lead me to recommend either the formation of a new agency or transfer of the nuclear weapons responsibilities to the Department of Defense. The advantages of retaining the function in the DOE are dominant.

*Question.* Do you have any suggestions as to how to eliminate the unfortunate competition for resources now available to DOE?

Answer. The DOE Under Secretary has written a letter to OMB requesting that OMB provide a separate DOE budget ceiling for the weapons and nuclear materials production programs. This can be accomplished through the normal OMB

review and coordination of both DOE and DOD's budget submissions. By building on the existing review and coordination processes, I believe this separate target will ensure that our important defense mission fully supports the Administration and the defense posture of the country. We understand that OMB has this proposal under consideration.

SUPPLEMENTAL BUDGET

*Question.* You have a request pending for supplemental authorization for FY 80. Provide details of that request and justify the urgency for a supplemental.

*Answer.* We are requesting for Defense Programs a total supplemental authorization for FY 1980 of \$39,000,000. This would be allocated among three programs in the following manner:

Operating expenses:	
Weapons activities.....	\$30,000,000
Nuclear materials production.....	1,700,000
Inertial confinement fusion.....	3,000,000
<hr/>	
Total operating.....	34,700,000
Plant and capital equipment: Nuclear materials production (total).....	4,300,000
<hr/>	
Total supplemental request.....	39,000,000

This FY 1980 supplemental budget request for a \$30,000,000 increase in budget authority for weapons activities is required for the production of nuclear warheads as directed by the President.

The FY 1980 Weapons Activities budget was originally formulated to support nuclear weapons planning and production directed by the President in Presidential Directive/NSC-44 dated January 5, 1979. Early in 1979, it became evident that substantial cost increases were occurring. These increases are continuing and are having a significant impact on resources required for weapons production and surveillance operations in FY 1980. The factors adversely affecting funding adequacy include increases in procurement costs; technical manufacturing problems; longer procurement leadtimes, along with an accelerated delivery schedule for one DOD system; and other considerations not foreseen during budget formulation.

Extensive and continuing efforts were made to reduce the funding deficiency while continuing to meet directed program goals. Despite these continuing efforts, the requested \$30,000,000 supplemental has been identified as required to meet our production and delivery commitments in FY 1980 and beyond.

The urgency associated with this supplemental has resulted in the weapons production complex being directed to continue to support current production schedules pending Congressional action on this supplemental request. We have done this while maintaining an option to transfer funds from the weapons plant and equipment appropriation as a temporary measure, should the supplemental not be approved. If this action is required, it would seriously jeopardize our ongoing construction projects. The only alternative would be the layoff of over 2,000 contractor people and the complete disruption of all weapons production activities through FY 1983.

A \$6,000,000 requested increase in budget authority for the Nuclear Materials Production program is split between operating expenses and construction. Approximately \$1,300,000 of the requested funding provides for wages and costs of [deleted]. The remaining \$400,000 in operating expenses is needed to provide two-man surveillance in one of the plants [deleted] and to operate and maintain a helicopter.

The construction activities cover a supplement to the General Plant Projects (80-GPP-1) for \$1,000,000 (B/A) and a construction project at Richland, Washington titled "N plant security and surveillance" (80-D-101) for \$3,000,000 (B/A). The GPP supplement includes additional items which strengthen the various sites safeguard posture. The N-reactor construction project (80-D-101) includes addition of facilities, structures and equipment to [deleted] the N-reactor to protect against acts of sabotage, arson, vandalism and theft of government property. The remaining funding of \$300,000 is needed to provide [deleted] at the Richland site.

During 1979, all production sites involved in producing, handling, or storing significant quantities of strategic nuclear materials have undertaken extensive reviews of safeguards and security considerations appropriate to these sites.

Special assessment teams of recognized experts in the safeguards field have [deleted] in existing protection at these sites. The nature and extent [deleted] necessarily are classified National Security Information. To remedy the [deleted], some specific actions have been defined [deleted] and other upgrading actions are being designed or developed for near-term and longer-term implementation. Sufficient funds are not available in the FY 1980 budget to correct these deficiencies.

Finally, a \$3,000,000 supplemental for the Inertial Confinement Fusion program is requested. Subsequent to the submission of the President's FY 1980 budget, the Inertial Confinement Fusion program was provided with recommendations for a new set of program directions based upon an intensive review of the program. The program review, under the direction of the Under Secretary of Energy, was conducted by an Ad Hoc Experts Group chaired by Dr. John S. Foster. The primary objective of the review was to clarify the role of the Nova facility in the program. The group gave highest priority to the construction of a 100 kilojoule Nova glass laser. In order to insure an adequate level of program balance, the Foster group observed that the program should "initiate the development of alternate drivers, accelerate experiments on coupling physics, and upgrade pellet fabrication facilities." In addition, the group identified the need to develop a more effective role for the supporting research groups (University of Rochester, KMS Fusion, Inc., and Naval Research Laboratory) through implementation of lead laboratory relationships.

Supplemental funding of \$3,000,000 for advanced driver research is requested to allow the program to respond to the remaining Foster recommendation which was not previously met by Congressional guidance.

The \$3,000,000 for advanced drivers will permit the program to begin, in FY 1980, the development of prototype demonstrations of the scalability of candidate driver systems. These brassboard demonstrations will allow the program to evaluate scaling of these drivers to the energy required for high gain experiments, which are necessary for both weapons and civilian power applications.

The military and civilian applications both depend on power multiplication techniques not yet fully developed and evaluated. Initiation of the advanced drivers demonstration program in FY 1980 will permit a timely evaluation of the scalability of the candidate drivers for high gain experiments and will enable a smooth transition into an aggressive advanced driver in FY 1981, without impacting the existing FY 1981 ICF Budget Request.

#### BUDGET AMENDMENT

*Question.* There is also a budget amendment pending to the FY 1981 budget. Provide details and justification for this budget amendment.

*Answer.* The Department of Energy has not submitted an amended FY 1981 budget request for the weapons program. However, I am concerned that the funding levels requested for FY 1981 may not support the research and development effort, the testing level, or the production workload stated in the budget if this Nation continues to experience the current high rate of inflation. We are currently reassessing our FY 1981 funding requirements. Extensive and continuing efforts are being made to reduce any funding deficiency to the maximum extent possible. Depending on the future range of inflation, additional FY 1981 funding probably will be required to achieve the weapons program objectives included in our budget justification.

#### STOCKPILE PAPER REPORT

*Question.* Last year, in the conference report on the authorization bill, we asked for a report on details from the "stockpile paper" with an assessment of the adequacy of the budget to meet the requirements in the stockpile paper. That report was requested by February 1, 1980, for use in hearings and review of your FY 1981 budget. A copy of that report will be inserted in the record at this point. Why was the report submitted so late?

*Answer.* Extensive coordination with the DOD and review by the Office of Management and Budget and the National Security Council resulted in the report being submitted late.

#### LIVERMORE ICF TARGET FACILITY

*Question.* You have pending before the Committee a request to revise the scope of the target fabrication facility at Livermore. Provide a copy for the record and justify.

Answer. The proposed revision of scope would allow construction of the target fabrication facility to begin in FY 1980, whereas the current scope consists of only design activities. The change would allow erection of the building shell, providing an opportunity to complete the project as early as the end of FY 1981. Early completion will allow the program to avoid the construction of temporary facilities which will result in an overall savings of \$560K.

The building shell for the fusion target fabrication facility will be most cost effectively and expeditiously constructed using the tilt-up construction method.

Since a standard light industrial type building is required, this design/construction approach to complete the building shell can take advantage of "assembly-line" methods for low cost units as well as procurement of standard items for increased price stability. A copy of the request to revise the scope of the Livermore target fabrication facility is provided for the record.

MARCH 5, 1980.

Hon. JOHN C. STENNIS,  
*Chairman, Committee on Armed Services,*  
*U.S. Senate, Washington, D.C.*

DEAR MR. CHAIRMAN: The purpose of this letter is to request approval to expand the scope of the Target Fabrication Facility at the Lawrence Livermore National Laboratory (LLNL) to permit start of construction in FY 1980. This project was authorized at \$1,000,000 as a subproject within the Plant Engineering and Design Project 80-PE&D-1, and as such the scope is currently limited to plant engineering and design in FY 1980. The FY 1980 Energy and Water Development Appropriation Bill conference Report (No. 96-388) identified \$1,000,000 for the facility as a line item construction project.

During the FY 1980 Authorization hearings the need for target fabrication facilities for the Inertial Confinement Fusion (ICF) program was discussed. At that time it was believed that substantial design work would be required before start of construction of the facility at LLNL. However, it has subsequently been determined that the LLNL Target Fabrication Facility does not require a complex or specialized facility but can be housed within a standard light industrial type building. As a result, in an effort to reduce project costs and accelerate project completion, a review was conducted of eleven light industrial facilities in the San Francisco Bay area. The majority of these facilities were constructed using the "tilt-up" method of construction whereby pre-fabricated walls and modules are brought to the site for rapid and cost-effective erection. In all cases the cost for the completed building shells ranged from \$13.00 to \$16.00 per square foot as compared with the cost of approximately \$30.00 to \$38.00 per square foot for custom made structures.

After this general review was completed a site specific study was made by an independent contractor which included a review of: the needs as outlined in the conceptual design report; the applicability of "tilt-up" construction and standard materials, practices, and techniques as used in industrial and development construction; and schedule and cost projections using actual contractor estimates. Based on this review a determination was made that the "tilt-up" type construction is adequate for the LLNL Target Fabrication Facility and that it is the most cost-effective way to proceed.

The cost estimates indicate that the shell of the target fabrication facility can be completed, using the "tilt-up" construction method, for approximately \$560,000 to \$574,000. With consideration of an expenditure of \$330,000 for utilities extension from the existing SHIVA facility and the range of estimates for the shell construction, the exterior of the facility can be completed within the \$1,000,000 appropriated for this facility in FY 1980. The total estimated cost for the entire facility is \$7,600,000 and it is scheduled for completion in 1982.

In summary, by permitting construction of the Target Fabrication Facility at Livermore to start in FY 1980, we expect to reduce overall project costs by approximately nine percent, avoid a \$500,000 expense for temporary facilities, and permit the project to be completed one year earlier consistent with the overall program requirements for this important facility.

Your earliest possible consideration of this matter would be appreciated.

Sincerely,

JACK E. HOBBS, *Controller.*

*Question.* How much have you requested for this project for FY-81?

*Answer.* The FY 1981 President's Budget request seeks an authorization of \$6.6M for full authorization with a TEC of \$7.6M and an FY 1981 appropriation of \$5.5M for the Livermore target fabrication facility.

*Question.* Why do you need this reprogramming authority if you have requested no project to complete the building?

*Answer.* This project was partially authorized in FY 1980 for \$1M which was to be used for plant, engineering and design. As different design and construction approaches were considered, it was determined that a modular "tilt-up" building would be the optimal approach to use for the Livermore Target Fabrication Facility. The cost savings of this approach made it possible to design and erect the building shell for slightly less than the \$1M authorized and appropriated in FY 1980. Proceeding with construction at this point will also avoid the necessity to provide interim facilities. Initiation of construction in FY 1980 will allow the facility to be completed with the total estimated cost of \$7.6M. The current funding profile includes \$5.5M in FY 1981 and \$1.1M in FY 1982. Full authorization of the facilities is being sought in FY 1981; however, it is extremely advantageous in terms of both cost and schedule to being construction of the facility immediately with the money which had been appropriated in FY 1980.

#### PRODUCTION COMPLEX

*Question.* According to your statement, you have used an inflation estimate of 7.9 percent in computing your funding requirements. What is your current best estimate of what inflation will be?

*Answer.* Currently, the composite escalation throughout the weapons production complex for manpower, utilities, and procurements is about 15 percent above the FY 1980 budget level for weapons production.

During FY 1981, 26,200 troy ounces of gold will be required to support our production requirements. Our budget was based on a cost of \$329 per troy ounce for gold. If we are unable to borrow gold from the Treasury and the price of gold remains within the \$500 to \$600 range per troy ounce, our FY 1981 budget will be further impacted by as much as \$7.1 million.

*Question.* Recompute your weapons production funding requirements at your best estimate of inflation provided in the previous question. Also, provide recomputed requirements at inflation rates of 10, 15, and 20 percent.

*Answer.* Assuming that the Department of Energy must purchase gold on the open market in FY 1981 at \$600 per troy ounce, the FY 1981 funding requirements for the weapons production and surveillance operating budget are currently estimated to be \$974 million in budget authority and \$911 million in budget outlays. However, if we are able to borrow gold from the Treasury Department, the FY 1981 funding requirements for the weapons production and surveillance operating budget are estimated to be \$959 million in budget authority and \$880 million in budget outlays.

If you exclude gold and assume a 10 percent inflation rate in FY 1981, the required weapons production and surveillance operating budget authority would be \$918 million; if you assume a 15 percent inflation rate, the budget authority required will be \$959 million; and if you assume a 20 percent inflation rate, the budget authority required will be \$997 million in FY 1981.

*Question.* Discuss the gold situation. Are you having success in your attempts to borrow from the Treasury?

*Answer.* Precious metals are important in weapon design and gold, in particular, is used in several different weapons to be developed and produced during the next several years. Our projected requirements are:

Fiscal year:	Troy ounces
1980 -----	<sup>1</sup> 26,200
1981 -----	26,260
1982 -----	16,788
1983 -----	10,000-15,000
1984 -----	10,000-15,000
1985 -----	22,000-25,000

<sup>1</sup> 21,500 troy ounces have been procured from commercial suppliers.

We are sensitive to the high cost of precious metals and use gold in our nuclear weapons production only when absolutely necessary. While it is possible to develop alternative materials for weapons systems design, cost, time, and other constraints would weigh heavily against such an undertaking. Cost savings would be offset by the cost of the alternative materials themselves and by the cost of new process and production development efforts. The time required for such development would seriously affect vital production schedules. Further,

for new technology would probably require additional nuclear testing; [deleted]. In some cases, the only alternatives are more expensive than gold and could not be produced in time to meet current schedules.

On March 12, 1980, we asked the Treasury to explore the possibility of providing, by loan or otherwise, to the Department of Energy (DOE) sufficient gold to meet our nuclear weapons production requirements through FY 1985. On Friday, May 2, 1980, we met with the Treasury Department staff and discussed the loan of gold to DOE. The Treasury has agreed to review our proposal to consider the policy issue of handling gold as a commodity and to examine various legislative acts, in particular the Economy Act, which allows transfer of commodities and services between agencies when there is an economic benefit to the government as a whole. Also, assuming that gold could be made available, the Treasury will determine how such a transfer could take place and what the cost may be.

#### SPECIAL NUCLEAR MATERIALS PRODUCTION

*Question.* The DOD and the DOE have jointly submitted a nuclear weapon stockpile plan to the President for the year 1980 through 1987. Has the President approved that plan? What are the amounts of plutonium and tritium required to build the weapon systems in that plan? Can you meet those requirements?

*Answer.* On February 27, 1980, the President approved the DOD/DOE nuclear weapons stockpile plan for weapons production for the years [deleted]. As part of that approval, DOE, in coordination with DOD, also was authorized to initiate production of certain long leadtime nuclear warhead parts as may be necessary to prepare for [deleted] production. The stockpile projection for the years [deleted] was noted by the President for planning purposes. The amounts of plutonium and tritium required to build the weapons system through [deleted] were projected to be [deleted] of plutonium and [deleted] of tritium. DOE can meet those requirements. By [deleted] a total of [deleted] of plutonium and [deleted] of tritium would be required. Based on current operations, DOE could not meet those requirements for the [deleted] the projected weapons-grade plutonium shortfalls are [deleted].

*Question.* In FY 1980, \$5 million was added to your program to initiate R&D on a special aspect of advanced isotope separation technology being pursued at LLNL and LANSL. Can you give us a status report on your progress in that endeavor? In your opinion, should the program be expanded in FY 1981?

*Answer.* The Office of Nuclear Materials Production (ONMP) allocated \$4.0 million of the \$5.0 million in Special Isotope Separation (SIS) program operating funds provided by Congress to the Lawrence Livermore National Laboratory (LLNL) and \$1.0 million to the Los Alamos National Scientific Laboratory (LANSL). We also reallocated \$1.5 million in capital equipment and GPP funds to LLNL and LANSL to support the SIS program. With the FY 1980 funds, LLNL began construction of a new building to house the [deleted].

With the funds provided in the President's FY 1981 budget, [deleted].

#### INERTIAL CONFINEMENT FUSION

*Question.* Are there scientific, technical, operational or other reasons why funding for NOVA was denied by OMB?

*Answer.* In its budget request to the OMB, the DOE included \$25 million for NOVA for FY 1981. The DOE was subsequently advised by OMB that no funding for NOVA for FY 1981 would be included in the President's Budget request to the Congress. The Administration considered that the pace of the NOVA project was advancing somewhat too fast and zero funding in FY 1981 would result in a better overall balance of the ICF program.

No additional specific scientific, technical, operational or other reasons why funding was denied were communicated to us by OMB.

*Question.* The ANTARES program is reported to be under study with regard to increased total estimated cost and a change in the scope of the project. What are the recent problems encountered by ANTARES that might require significant changes in scope and cost?

*Answer.* The ANTARES project was originally scoped at six power modules, producing nominally 100 kilojoules of 10.6 micrometer laser energy. This level was then thought to be sufficient to achieve target breakeven. Recent experiments and theoretical projections suggest that driver outputs required to achieve

breakeven are closer to one megajoule. This, together with a projected cost overrun stimulated a rescope of the ANTARES project. The proposal is to finish two beams at this time, which will allow experiments to begin on ANTARES 2-3 years sooner. Two power modules will yield 40 kilojoules of energy. The FY 1983 completion date and \$62.5 million remain unchanged from last year's budget submission. In order to preclude future cost overruns, significant steps were taken to strengthen project management at both the Los Alamos Area Office and the Laboratory.

*Question.* If ANTARES is restricted to less than the 6 beam legs under construction, what will this mean in terms of possible quality weapons program experiments?

*Answer.* Completion of the ANTARES facility at 40 kilojoules will not provide the same opportunity for target interaction experiments or for weapons physics experiments as would be available with a full 100 kilojoule system, but it would be possible to begin experiments 2-3 years earlier. The advantage offered by this approach is that it will be possible to determine the energy requirements for breakeven at an earlier time. This will provide an earlier opportunity to achieve in the next generation of machines the full weapons technology objectives associated with high gains.

*Question.* By the end of FY-81, \$1 billion will have been spent or obligated on the ICF program. You are now proposing to start a heavy ion program which will cost at least another \$1 billion for facilities.

Will glass, gas and light particle systems ever be able to provide useful facilities for laboratory weapons research programs?

Is it now believed that only heavy ion systems can provide the energy needed for ICF to succeed as an energy source?

Why can't preliminary research on heavy ion systems be done at the Holifield Heavy Ion Facility at the Oak Ridge National Laboratory?

Is it planned that future year ICF budget requests will call for large heavy ion facilities to be built at three or five national laboratories?

*Answer.* The heavy ion technology development proposed would not lead to an additional major experimental facility in the program. Approximately \$15M is requested in the FY-81 budget to be used to support heavy ion driver development. The heavy ion program will in FY-81 begin to construct two experimental test beds. The test beds, an induction linac and an RF linac/storage ring, are expected to require a total expenditure of \$25-30 million each. Their purpose is to validate the proposed accelerator methods and provide the data base for a choice between them. One accelerator will then be chosen to upgrade to 10 kilojoules at an estimated cost in the range of \$20-50 million to perform scaled ion/target deposition studies.

The glass, gas and particle beam studies are the program's main primary experimental tools. During the past year or so we have concluded from experimental data that a half to one megajoule or more will be required from a driver to reach breakeven. This range reflects both uncertainties in the calculations and assumptions about absorption and transport of laser and particle beam energy of various kinds. For the near term, the next five years or so, we will refine this estimate through experiments using the drivers we understand best—glass and carbon dioxide lasers and light ion accelerators—[deleted] to establish TN burn requirements. Fortunately we can study the beam interaction with the target for short wavelength advanced lasers using frequency converted glass lasers, and light ion experiments will tell us important information about both light and heavy ion deposition. We do not plan to drop any of the already developed drivers, or to bring the advanced short wavelength laser and heavy ion drivers to the experimental stage in the near future. The major development costs for the existing driver options have already been met. We are building target irradiation facilities using them: the NOVA glass laser system, the ANTARES CO<sub>2</sub> laser system and the PBFA-II light ion system.

There is no basis for the position that only heavy ion systems can provide the energy needed for ICF to succeed as an energy source. On the contrary, each of the driver options that is being actively considered may be appropriate for high gain applications. The question to be addressed at this time is the choice of the most effective driver to be used for single-pulse high gain experiments. When this question has been answered using the currently planned facility, the program will be able to select a single driver most appropriate for a high gain demonstration.

For short wavelength lasers and heavy ions we are requesting development funds for test beds only in order to verify that these drivers are capable of

being developed to high energy and power operation if we should decide to take one of these as the driver option for the later 1980s and the 1990s.

The Holifield Heavy Ion Facility is for nuclear physics research requiring a continuous beam of very low current—typically one millionth of an ampere. Heavy ion fusion accelerators will require the ion beam to be produced in extremely short pulses with peak currents approaching one thousand amperes. Nuclear physics accelerators such as the Holifield Heavy Ion Facility are not capable of producing the peak currents required for inertial confinement fusion.

In its later stages, after scientific feasibility has been demonstrated, development of the application in the ICF program as a whole is likely to cost in the range of billions of dollars over the next two decades. These costs will be associated with whatever driver option we choose. There are still questions about the costs and feasibility of scaling each of these drivers to the multi-megajoule level. Therefore we can only say that there is no strong cost or technical reason we can identify at this time that would clearly rule out one option or clearly indicate another as superior to the rest for either weapons research programs or energy application.

Narrowing the driver options by selection of a single driver technology before proceeding to the high gain demonstration will mean that a large facility for any one driver would be built probably at only one location.

#### WASTE MANAGEMENT—DECONTAMINATION AND DECOMMISSIONING

*Question.* Please describe briefly the defense decontamination and decommissioning program and compare it to the efforts underway in the civilian decontamination and decommissioning program?

*Answer.* The Surplus Facilities Management Program, for which Richland is the lead field office, consists of basic programmatic activities applicable to both the "defense" and the "civilian" decontamination and decommissioning programs for DOE-owned surplus facilities.

Program activities for both budget categories include:

1. Maintenance and surveillance of surplus contaminated facilities to protect the environment and the public until disposition can be accomplished.
2. Planning to identify the priority, disposition mode, and resources required for a disposition project.
3. Engineering and field operations required to accomplish the disposition project.

All decommissioning activities for facilities designated as surplus prior to October 1976 are funded under the Commercial budget category. Facilities designated surplus after that date are now being placed in the budget category which reflects their original use; i.e., Defense or Commercial.

*Question.* Is there a master plan for the decontamination and decommissioning of the Mound Facility? What are the total estimated costs and the time required?

*Answer.* A master plan for the decontamination and decommissioning of the entire Mound Facility has not been prepared since DOE intends to continue nuclear related activities at the Mound Facility for the foreseeable future. As portions of the facility are declared surplus, plans are prepared which address the disposition approach, cost, schedule and required documentation including environmental and project reports for each specific project. Projects for which decontamination and decommissioning costs and schedules are available include SM Building at an estimated cost of \$19-21 million beginning in FY 1982 and ending in FY 1987 and the Defense Decommissioning Program portion of PP and R Buildings at an estimated cost of \$18 million beginning in FY 1981 and ending in FY 1985.

*Questions.* Briefly describe the defense decontamination and decommissioning plans for Idaho and the Oak Ridge National Laboratory (ORNL). How many of the structures at ORNL in the decontamination program were actively involved in defense programs?

*Answer.* The Surplus Facilities Management Program Plan for decommissioning defense related surplus facilities at Idaho National Engineering Laboratory (INEL) and ORNL provides for maintenance/surveillance of currently designated surplus facilities to protect the public and environment, planning and engineering for facility disposition, and implementation of decommissioning operations. Disposition of individual facilities at each site will be conducted in a manner which provides long-term protection of the public and environment while minimizing or eliminating maintenance/surveillance costs.

The decommissioning plan for INEL pertains to approximately 30 defense related surplus facilities. During FY 1981 detailed characterization studies will be performed for several Chemical Processing Plant facilities to prepare for decommissioning operations which are scheduled to begin during FY 1982.

Three projects at ORNL are included in the defense decommissioning plan since they were directly involved in defense related programs. These facilities are the Metal Recovery Building, the Curium Facility and the Intermediate Level Waste Transfer Line.

*Question.* Briefly described the decontamination processes or procedures used on the different facilities, objects and structures involved—building, underground tanks, piping, etc.

*Answer.* In general, all decontamination processes and procedures are designed to reduce surveillance and maintenance requirements, occupational exposure, and the volume of waste requiring disposal. These objectives can be met by carefully planning each decontamination operation and the use of specially designed techniques.

Contaminated equipment is removed from a facility using normal maintenance procedures and techniques. The equipment is packaged for disposal where possible decontaminated for possible reuse. Equipment decontamination techniques include water/chemical/detergent washes, electropolishing, and vibratory polishing.

Decontamination of structures is accomplished by water/detergent/chemical washing or mechanical removal of the contaminated material. The intent of structural decontamination is to reduce residual contamination levels to allow reuse of the building or demolition and disposal at a normal sanitary landfill.

The disposition of underground systems (piping, tanks, cribs) depends on the intended future use of the property. For unrestricted use, these systems may be removed using normal excavation techniques with appropriate contamination control measures. If continued restricted use is acceptable, they can be stabilized in-place with measures taken to control erosion, animal and plant intrusion, and other forms of contamination migration.

A Decommissioning Handbook, which provides detailed descriptions of decontamination processes and techniques, is in preparation and will be published during the latter part of FY 1980.

*Question.* What is planned to be done with decontaminated waste tanks at Savannah River?

*Answer.* The defense high-level waste tanks at Savannah River are not currently the responsibility of the defense decommissioning program. Anticipating the transfer of these facilities to surplus status, the Savannah River Operations Office has requested funds for disposition planning in the event they are declared surplus and become the responsibility of the Surplus Facilities Program. As proposed, the planning effort would assess disposition modes, identify tanks, and develop budget estimates for project funding requests.

*Question.* What decontamination and decommissioning efforts are underway at Richland?

*Answer.* Decontamination and decommissioning efforts currently underway at Richland include:

Surveillance and Maintenance of 100 Area Production Reactors.

Surveillance and Maintenance of 200 Area Facilities.

Decommissioning of the Redox Plutonium Concentration Facility (Bldg. 233-S).

Engineering for Decommissioning of 100-F Production Reactor.

These efforts are now funded under the commercial decommissioning program since they were declared surplus prior to October 1976.

*Question.* Are any low-level DOE waste sites undergoing decontamination and decommissioning? If so, which ones?

*Answer.* No low-level waste disposal sites are presently being decontaminated and decommissioned under the Surplus Facilities Management Program (SFMP). Most waste disposal sites under the SFMP responsibility are located in controlled areas on active DOE sites, and management consists of stabilization, maintenance, and surveillance actions to assure continued containment integrity.

Waste storage areas for which SFMP is now responsible but which are not located on DOE reservations (New Brunswick Laboratory, NJ; Niagara Falls, NY; and Weldon Spring, MO) are currently in the planning phase to determine an optimum disposition mode and the resources required to either relocate or stabilize the stored radioactive materials in place.

## INTERIM WASTE OPERATIONS

*Question.* Does the defense interim waste operations program provide for the handling, storage or disposal of *all* DOE radioactive wastes pending implementation of a long-term waste management program?

*Answer.* No. The defense interim waste operations program only provides for the handling, storage or disposal of DOE radioactive waste at the Hanford site, Savannah River Plant, INEL, ORNL, Los Alamos Laboratory, NTS, and the Sandia Laboratory in Albuquerque. Radioactive waste handling, storage or disposal at the Y-12 Plant, Feed Materials Production Center, Pantex Plant, Livermore Laboratory, Oak Ridge Gaseous Diffusion Plant, Portsmouth Gaseous Diffusion Plant, and the Paducah Gaseous Diffusion Plant, are managed through other budget accounts. The first four are under the management of the Assistant Secretary for Defense Programs and the last three are under the management of the Assistant Secretary for Resource Applications. Initial radioactive waste handling at DOE facilities which ship their waste to other DOE sites for storage or disposal (e.g., Rocky Flats Plants, Mound Laboratory, Naval Reactors facilities) is provided by the respective operating programs which generate the waste.

*Question.* What will be done with the existing calcining facility at Idaho when the new facility goes on line in FY 1981.

*Answer.* The existing Waste Calcining Facility (WCF) will be shut down and plans will be made for its eventual decontamination and decommissioning. The WCF may continue to operate along with the NWCF if sufficient space is available in the storage bins that are not connected to NWCF (the third set of bins). Certain ancillary equipment in the WCF building such as small tanks and a waste evaporator may continue to be used.

*Question.* Are any of the procedures employed at the Idaho National Engineering Laboratory for the interim waste operations program in violation of established state or federal regulations? In "violation" of proposed state or federal regulations?

*Answer.* The interim waste operations program at INEL is in substantive compliance with existing State and Federal regulations.

The State of Idaho is expected to gain authority under the Safe Drinking Water Act to prohibit the use of injection wells for disposal of low-level radioactive and low concentration chemical wastes. This could impact future operations since injection well disposal is used for these types of very dilute waste streams. A feasibility and cost-benefit study of alternatives to injection well disposal is underway and will be completed in October 1980.

*Question.* Describe the solid waste processing facility under development at Oak Ridge. What will be its total estimated cost and how will it differ or be similar to comparable devices under development at Idaho, Hanford, Rocky Flats, Los Alamos, and Savannah River?

*Answer.* It is planned to modify an existing facility and install equipment to convert combustible solid waste into a form that can be disposed of by shale fracture at Oak Ridge. This alternative to land burial for combustible solid waste can complement the limited Oak Ridge burial ground capacity. The facility could also be used for other low-level waste processing.

The facility modifications, equipment procurement, and installation are estimated to cost \$25 million. While it will serve defense-related needs from past activities at Oak Ridge, it will also serve some non-defense needs and may be transferred to a commercial waste category beginning in FY 1982.

Facilities planned at the other sites are for volume reduction and/or solidification of solid waste by compaction, incineration, or other processes prior to either land burial or storage. These facilities will meet site specific needs. The Oak Ridge Facility will be the only one to convert solid waste for disposal by shale fracture.

*Question.* What is the life expectancy of the Hanford single-shell tanks which contain minor amounts of interstitial salt cake liquids?

*Answer.* A recent analysis of Hanford tank failure has shown that the average single-shell tank will safely contain liquids for approximately 35 years. Many of the 149 old tanks have been in service for this time or longer. Twenty-four (24) have been confirmed as leaking and another 34 of "Questionable Integrity". Additional old tanks will likely become questionable or leak in the next several years.

Another recent analysis indicated that the old tanks will retain structural integrity for at least 50 more years during which time they can continue to safely contain damp salt cake and sludge.

*Question.* From how many of the single-shell tanks have the strontium and cesium been removed? Are significant quantities of strontium and cesium still in any of the single-shell tanks?

*Answer.* Cesium and strontium have been removed from 18 of the old Hanford single-shell tanks. This was done to reduce the heat load on the tanks for safer interim storage. Two of the old tanks may contain enough cesium and strontium that they may require continued supplemental cooling by forced air ventilation. There are no plans to remove the cesium and strontium from these tanks. The other old tanks contain some cesium and strontium but not enough to require removal for safe storage.

*Question.* It has been stated that crystalline salt cake and sludge will remain in the single-shell tanks for the interim period, that is, until the long-term waste management program is implemented. It has also been stated that the 149 old tanks will be stabilized and isolated by 1985.

When is it anticipated that a long-term waste management plan might come into operation at Hanford?

*Answer.* To provide safe interim storage of waste, the old Hanford tanks, will be deactivated in early FY 1981, and be stabilized and isolated by the end of FY 1985. Hanford is scheduled to select a reference long-term HLW management alternative by the end of FY 1985. The long-term management plan for HLW at Hanford is detailed in DOE/SC-WM-79-3, "Strategy Document—Long-Term High-Level Waste Technology Program". Details of alternatives are included in ERDA 77-44, "Alternatives for Long-Term Management of Defense High-Level Radioactive Waste, Hanford Reservation."

*Question.* Will emptying the salt and sludge from the old tanks be a necessary part of a long-range plan?

*Answer.* Options being evaluated range from removal and processing to leaving the wastes in place. An EIS is being prepared as part of this process.

*Question.* What methods are under study to empty the old tanks?

*Answer.* After evaluating several hydraulic and mechanical retrieval methods, a mechanical system has been selected as a reference method and a prototype retrieval system design has been completed.

*Question.* What percentage of the funding for interim waste operations at Hanford is used for safety, environmental, and other reports and studies preparations? How many years of N-reactor operation, in conjunction with Purex reprocessing, would be required to fill the double-shell tanks? Assume the current backlog is cleaned up and future N-operation is (a) for 12 percent material; (b) 6 percent material.

*Answer.* At Hanford, approximately 4 percent (about \$2.5 million) of the interim waste operations funding will be used in FY 1981 for safety and environmental reports and studies preparation.

The new double-shell waste tanks either completed or under construction provide storage capacity for N-reactor and PUREX operation until about 1988, assuming that the current production of 12 percent material is continued. If N-reactor is converted to produce 6 percent material, there will be sufficient tank capacity for operations until about 1987.

*Question.* Would Hanford B-Plant improvements permit more expeditious removal of strontium and cesium? What would such improvements cost? Describe any research underway at Hanford on methods to remove from the waste stream or tanks fission products, in addition to strontium and cesium, which could have economic and/or beneficial value.

*Answer.* Improvements to B-Plant to allow more efficient removal of strontium and cesium would cost approximately \$1 to \$2 million. These improvements have not been recommended because most of the cesium and strontium has already been removed from the old tanks, and the capacity of B-Plant is more than adequate for future waste management needs.

There is no research underway at Hanford to remove any fission products from the waste other than cesium and strontium, primarily because the cost of recovery is estimated to be 10 to 100 times their potential market value.

*Question.* A description of the interim waste operations program at Hanford indicates increased efforts with only a 10-percent funding request increase for

FY 1981 over FY 1980. Explain how the program can accommodate increased activity when real funding will be reduced.

Answer. The increases in interim waste operations at Hanford described in the budget submission refer to particular portions of the program. The total increase is only about 10 percent because there are off-setting decreases in other parts of the program. For example, waste evaporator operations will be reduced in FY 1981 because deactivation and transfer of liquid waste to new tanks will have progressed well by then.

*Question.* Project 81-T-104 will provide significant new facilities for the Oak Ridge National Laboratory. Please describe the defense program functions served by the Laboratory for which these new waste facilities are required.

Answer. This project will replace or upgrade the components of existing facilities for managing gaseous and liquid wastes at the Oak Ridge National Laboratory (ORNL). The project consists of improvements to upgrade four systems to meet present standards for safety and environmental control. The project will not provide any new capabilities for processing or storing wastes.

The construction planned will replace or upgrade outmoded facilities that were built during the early days of ORNL when the mission of the Laboratory was exclusively oriented toward defense programs. These facilities were built mainly to handle wastes from solvent extraction reprocessing and to support the preparation of isotopic power sources and development of nuclear propulsion systems. The facilities have been modified in response to the growth of the Laboratory, but most of the contaminated facilities and wastes remain as a legacy of defense program activities and require monitoring and continuing waste processing.

Included in this category are the radioactive sludges containing strontium and cesium and lesser amounts of plutonium and other nuclides that have accumulated in waste tanks as by-products of defense program activities. These tanks must be continuously monitored. Certain areas around the waste tanks and other facilities have residual contamination from past defense activities, and these areas must be monitored and the rainwater run-off from them must be processed to control releases. All of the containment areas and cells within closed-down defense program facilities as well as those associated with current operations must be ventilated, maintained under reduced pressure, and the effluent air must be monitored and purified as required. These defense program related activities place a continuing burden on waste management facilities at ORNL.

*Question.* In FY 1981 at Savannah River and Richland, how many new tanks will be completed but not filled?

Answer. At Richland, 13 new tanks will be completed and placed in service during FY 1980. Of these, approximately five will be filled by the end of FY 1981.

At Savannah River, all 18 new tanks needed for the tank replacement program will be completed and placed in service by the end of FY 1981. These tanks will contain differing amounts of waste but none will be completely filled during FY 1981.

*Question.* What is the average cost of one of the new double wall tanks?

Answer. At Savannah River the average cost of one of the double-wall tanks is approximately \$8M. The average cost of a new tank at Hanford is approximately \$4M. These costs include the necessary waste transfer piping, and facilities for control and surveillance of the high-level radioactive waste. The reason for the cost difference is that the new double-wall tanks at Hanford are smaller (1.0 million gallons) than those at Savannah River (1.3 million gallons) and do not contain active supplemental cooling systems.

*Question.* Within the funds available in the FY 1981 budget for RL and SR, how many of the old tanks will be emptied of waste?

Answer. At Savannah River the transfer of liquids and salt cake from old tanks to new tanks will be completed by early FY 1982. Sludge removal is not scheduled to begin until FY 1982. Only one old tank, used as a demonstration for waste removal techniques, will be completely emptied of wastes by the end of FY 1981. At Richland it is not planned to remove all wastes from the old tanks. As part of the tank stabilization and isolation program at that site, most of the drainable liquids will be removed from all old tanks by 1985. Damp salt cake and sludge will remain in the old tanks for the interim period.

*Question.* If additional funding were provided, could the transfer of high level waste from old tanks be expedited? Provide for the record the additional authorization necessary at SR and RL to optimize the transfer of waste to the new tanks.

Answer. At Richland drainable liquid is being removed from crystalline salt cake and sludge, both of which will remain in the single-shell tanks for the time being. Fill lines and other connections into the older tanks will be disconnected and sealed. This stabilization and isolation of waste in the single-shell tanks will be completed by the end of 1985. Additional funding might expedite this process but is not deemed necessary to maintain safe interim storage of high-level wastes at Richland.

As part of the tank construction and waste transfer program at Savannah River, the transfer of mobile liquids and salt cake from old to new tanks is scheduled for completion by early FY 1982. Additional funding in FY 1981 would not significantly expedite this part of the program. In the sludge removal process which is scheduled to begin in FY 1982, a fixed period is required per tank to transfer the sludge. The experience gained in the sludge removal from one group of tanks will be useful for the removal of sludge from the next group. While significant additional funding might accelerate completion of this process, this experience might be sacrificed. Also, with a significant increase in activities in the tanks farms, efficiency, control and safety might be jeopardized. The requested funding for FY 1981 will result in an acceptable rate of waste transfer to the new tanks, consistent with good waste management practice.

#### LONG-TERM WASTE MANAGEMENT TECHNOLOGY

*Question.* The DOE long-term nuclear waste management technology program, it has been stated, has integrated the research and development efforts on commercial and defense wastes. Current administration plans are that defense nuclear wastes will be disposed of in commercial waste facilities, none of which will be characterized for at least 5 to 10 years. The defense waste will be safely stored for the next 20 to 50 years. Why should any defense program funds be spent *now* to develop a variety of "final high-level waste forms" for a multitude of projected, hypothetical commercial waste repositories which will provide *no data* for the next 5 to 10 years on what the required final form might be?

Answer. In his February 12, 1980 speech, the President stated that "the responsibility for resolving military and civilian waste management problems shall not be deferred to future generations." This statement also reflects the principle that those who benefit from waste generation should take care of its disposal.

The development of waste forms is necessary now to prepare the defense high-level nuclear wastes for permanent disposal in repositories. It is important to proceed promptly to show our ability and commitment to resolving the nation's nuclear waste disposal problem. Immobilization of defense wastes will reduce their mobility through leaching many millions of times, and will prepare them for disposal, and let us discontinue construction of additional interim storage tanks.

Defense program funds are needed now to assure close coordination between the waste preparation and waste isolation programs in order that the waste form will be compatible with the interim storage and repository facilities.

*Question.* What civilian program experiments for "final forms" are projected for the next several years? Would not such funding be duplicated by defense waste program expenditures?

Answer. The immobilization of West Valley wastes is planned subject to authorization by the Congress. If carried out, it will be a one percent scale demonstration of our ability to handle the volume of Savannah River wastes. Such funding would complement, but not duplicate defense waste program expenditures.

*Question.* The FY 1981 high-level waste technology budget request is 46 percent greater than the FY 1980 appropriation. As justification it has been stated that the funding increase is for the *accelerated* development and evaluation of alternative forms for high-level wastes. What are the alternative forms?

Answer. Alternative waste forms under study include the following :

## Waste form:

	<i>Contractor</i>
Concrete (Fuetap)-----	ORNL.
Pelletized calcine-----	ICPP.
Stabilized calcine-----	ICPP.
Porous glass matrix-----	Catholic University.
Glass ceramic-----	PNL.
Tailored ceramics-----	Rockwell/PSU.
Synroc development-----	LLL.
Synroc science-----	ANL.
Synroc science-----	NC State.
Titanates-----	Sandia.
Sol gel technology-----	ORNL.
Metal matrices-----	ANL.
Matrix forms-----	PNL.
Coated particles-----	PNL.
Cermets-----	ORNL.
Clay ceramics-----	RHO.

*Question.* Why must there be *accelerated* development for alternative forms?

*Answer.* The accelerated development of alternative waste forms is proposed in order to provide a sound technical basis for selection of high-level waste form(s) for implementation of long-term management programs for the 75 million gallon inventory of defense high-level waste which has been accumulating for the past 30 years. The Interagency Review Group on Radioactive Waste Management has recommended a broader waste form technology base and that immobilization of the waste begin as soon as practicable.

*Question.* Is it not conceivable that the alternative forms developed for processed wastes at high cost because of *accelerated* effort will be incompatible with the repositories eventually established for unprocessed civilian reactor wastes since *no* research for a processed defense waste repository is underway?

*Answer.* Nuclear waste repositories are being designed for both commercial spent fuel and defense high-level waste. Liaison between the waste processing and waste isolation programs will assure compatibility of waste forms, canister, overpack, back fill, geology, etc.

*Question.* Why does the Department of Energy continue to push for *accelerated* engineering studies and the conceptual design of a multibillion dollar defense waste processing facility at the Savannah River plant before there is any indication that the processes under study or development for converting salt cake to other forms will work?

*Answer.* We have demonstrated in the laboratory and in non-radioactive large-scale tests that the processes work.

*Question.* That even if the salt cake is successfully converted to other forms, that these forms would be compatible with a yet undefined and uncharacterized final geologic repository for processed defense wastes.

*Answer.* The waste acceptance criteria are sufficiently well known to permit selection of a waste form even now without undue risk. By the time this selection must be made in FY 1983, the criteria and standards for doing so will be in hand.

*Question.* What methods are under study to remove fission products for beneficial uses from existing wastes and from future streams in the canyon buildings?

*Answer.* We have experience with the removal of cesium and strontium from Hanford high level wastes. This effort was necessary to remove the heat load from the stored wastes. The byproducts, cesium and strontium, have proven about ten times more costly and difficult to separate and encapsulate than expected. Despite a charge of only \$0.10 per Curie, compared with \$1.00 per Curie actual costs not including that of capital facilities, there has been virtually no demand for these products. What little demand there was, has proven temporary and the material was returned to us for disposal.

We are looking at the retrieval of valuable metals for catalysts from wastes. The cost to recover would be approximately 10 to 100 times their value. The remaining waste would be harder and more costly to manage than if these materials had not been recovered. Additional personnel exposure and the generation of a large volume of low level waste would accompany any recovery operation.

We will continue to study alternatives that might permit the temporary use of materials in waste, but view such use as a deferral of rather than an alternative to disposal.

*Question.* Please list the studies, research, development, experiments, and demonstrations underway and planned on:

Alternatives for the long-term management of DOE's buried and/or retrievably stored transuranic wastes (TRU).

Answer. a. Environmental Assessment and Documentation—6 tasks—Site characterization data are being collected and alternative methods for future management of buried and stored TRU waste are being evaluated on a site specific basis. NEPA documentation for alternative management strategies is being prepared at Idaho National Engineering Laboratory, Los Alamos Scientific Laboratory, Oak Ridge National Laboratory, Hanford Reservation, and Savannah River Plant.

b. Buried Waste Alternatives—Engineering studies will be conducted on the feasibility of alternative methods for treating exhumed wastes.

c. Hanford Stored and Buried Waste Technology Development—Technology is being developed to support long-term management alternatives for stored and buried waste.

d. INEL Buried Waste—Technology is being developed for long-term management of INEL buried wastes.

*Question.* "Final forms" under consideration for TRU for safe storage, transportation, and final disposal.

Answer. a. Pelletized Waste Form Development—A pelletized cold pressed cementitious waste form is being developed on a laboratory scale for process scale-up to a pilot plant demonstration.

b. Alternative Immobilization Technology—A laboratory scale comparative study is being conducted using several candidate immobilization waste forms including borosilicate glass, cementitious products, and glass ceramic products.

c. Nuclear Waste Immobilization—Bench scale and pilot plant studies will provide process data for a borosilicate glass bead waste form.

d. Synthetic Basalt—Laboratory and pilot scale processing and property studies on iron-rich synthetic basalt.

e. Material Characterization Center—Standardized test procedures will be developed to compare waste forms with acceptance criteria for nuclear waste disposal repositories.

f. Systems Analysis—This task will identify technical impacts on waste form development resulting from the establishment of a policy of licensing TRU waste repositories.

g. TRU Waste Certification Analysis—Methods and requirements for certifying wastes to repository requirements are being studied.

*Question.* TRU waste handling, treatment, and volume reduction.

Answer. a. INEL Stored Waste—Handling equipment and retrieval techniques are being evaluated for safe removal of wastes from storage pads.

b. Transportation and Packaging Studies—This task will study detailed requirements for waste forms and packages necessary for transportation of the wastes.

c. Reduced Waste Generation—Methods for reducing TRU waste generated at specific sites will be defined in this study.

d. NDA Instrumentation Development—Assay systems are being developed to provide quantitative analysis of transuranic wastes and separation of transuranic from low-level wastes.

e. TRU Surface Decontamination—R&D demonstration of decontamination of metals by electropolishing and vibratory finishing.

f. Equipment Decontamination and Decommissioning—Development and demonstration of hot cell cutting and decontamination.

g. Soil Decontamination—Laboratory and pilot scale studies on removal of transuranic elements from a variety of soil types.

h. Controlled Air Incineration—Demonstration of gas-fired pyrolysis process for incineration of TRU wastes.

i. Cyclone Incineration—Demonstration of in-drum incineration of TRU wastes.

j. Fluid Bed Incineration—Demonstration of sodium carbonate fluidized bed incineration of TRU wastes.

k. Electric Air Incineration—Demonstration of electric fired pyrolysis.

l. Commercial Incineration Demonstration—Demonstration of incineration of LWR power plant wastes (planned only at this time).

m. Support studies for Transuranic Waste Treatment Facility—Technology development studies in support of INEL facility.

n. Sodium Waste Processing—Laboratory, engineering, and demonstration studies on removal and treatment of sodium from radioactive wastes.

*Question.* How much has been expended to date on the TRU waste treatment facility (TWTF) being planned for construction at Idaho? Why were the funds requested for A-E studies in FY 1981 not approved by OMB? In FY 1981 how much will be spent on the Idaho TWTF? What will be obtained for this expenditure?

*Answer.* Approximately \$7.8 million have been expended to date on the TWTF. Expenditures include technology development, conceptual design, PE&D, and the Reedy Creek Project.

The FY 1981 submission to OMB included an \$18 million design-only capital project at the Enhanced level. The project was not approved due to budget constraints.

In FY 1981, \$7 million has been planned for TWTF-related work. The funds will support the following activities:

	<i>Dollars in millions</i>
Continue construction of the Reedy Creek Demonstration Project.....	\$4.5
Technical support of Reedy Creek.....	.3
Continued A-E design support.....	.2
Project management and technology development for TWTF.....	2.0
<b>Total</b> .....	<b>7.0</b>

Deliverables will include completion of about 50% of Reedy Creek construction and completion of technology studies such as:

- neutron monitoring;
- slag handling;
- photon assay of TRU waste;
- effects of fine soil in the slagging pyrolysis incinerator;
- plutonium volatility.

*Question.* Please provide a detailed explanation of why the Reedy Creek Utilities Demonstration Plant, which will be an *exact scale demonstration incinerator* for the TRU waste treatment facility at Idaho (TWTF) has an estimated total cost of \$11 million while the TWTF is estimated to cost \$500 million.

*Answer.* The nuclear waste processing facility will require an elaborate waste preparation system, a comprehensive off-gas system, and multiple containment as a Plutonium Facility. By contract, the Reedy Creek Plant consists of an incinerator only. The supporting systems, such as waste preparation, utilities, etc., are already in place. The TRU Waste Treatment Facility (TWTF) also includes labs, office space, material handling, rail spur, and other services and utilities to support a processing plant. The TWTF must satisfy nuclear safety standards, seismic design criteria, include off-gas treatment, quality assurance, redundant systems, and provide for remote maintenance. By comparison, the calciner in the NWCF constitutes only 1-2% of the total facility. The incinerator relates to the TWTF in a similar way.

*Question.* Why are defense program funds being used for the development and evaluation of equipment and systems to transport DOE spent fuel?

*Answer.* No defense high level waste (HLW) transport system hardware now exists and it is necessary to use existing spent fuel transport hardware for evaluation, testing, and research on design modifications to determine optimum designs. Since DOE does have an inventory of non-commercial spent fuel which has largely resulted from defense program activities, DOE must maintain a capability to ship some of this fuel when programmatic objectives dictate. Because of the uncertainty involved in depending on the private sector in the timely availability of transport systems hardware to meet DOE needs, a small on-going effort must go into maintaining such a capability.

DOE is also using FY 1980-1981 funds for evaluation of the effects of sabotage on transportation equipment and systems. This small *design* activity now underway on spent fuel transportation hardware is directed primarily at modifications aimed at mitigating the effects of sabotage and to provide information necessary for the design of defense waste transport hardware.

## TERMINAL STORAGE

*Question.* Is terminal storage research, development, test and evaluation (RDT&E) being conducted by DOE?

*Answer.* Yes, DOE's Commercial Waste Management Program will provide for extensive research, development, and implementation of the technology necessary to provide for the long-term management and disposal of radioactive wastes.

*Question.* Where and in what types of geologic media is DOE terminal storage RDT&E being conducted?

*Answer.* DOE is conducting terminal storage research, development, testing, and evaluation (RDT&E) in a variety of media. The following table shows the location, the name of the test facility, and geologic media.

Location	Facility name	Media
Nevada test site.....	Climax test facility.....	Granite.
Hanford, Wash.....	Near surface test facility.....	Basalt.
Avery Island, La.....	Avery Island salt test facility.....	Salt dome.
To be determined.....	Salt test facility.....	Salt.
Nevada test site.....	G-tunnel.....	Tuff.

In addition, prior to 1980, DOE conducted terminal disposal RDT&E in Kansas at Project Salt Vault for bedded salt and at ORNL in Tennessee and the Nevada Test Site for shale. DOE is also participating in the Stripa granite project in Sweden and the Asse' salt project in West Germany.

*Question.* How much was appropriated in FY 1980 and how much has been requested for FY 1981 for DOE terminal storage RDT&E at each site involved?

*Answer.* The following table indicates how much was appropriated in the Commercial Waste Management in FY 1980 budget and how much has been requested for each site as applicable involved in Commercial DOE Terminal Storage RDT&E.

[In millions of dollars]

	Fiscal year 1980	Fiscal year 1981
<b>Climax test:</b>		
Operating.....	5.8	1.8
Equipment.....	.2	.1
Construction.....	0	0
<b>Total.....</b>	<b>6.0</b>	<b>1.9</b>
<b>Near surface test facility:</b>		
Operating.....	7.5	10.0
Equipment.....	.9	.3
Construction.....	8.4	3.6
<b>Total.....</b>	<b>16.8</b>	<b>13.9</b>
<b>Avery Island:</b>		
Operating.....	.5	.6
Equipment.....	0	0
Construction.....	0	0
<b>Total.....</b>	<b>.5</b>	<b>.6</b>
<b>Salt test facility:</b>		
Operating.....	.1	1.6
Equipment.....	0	.5
Construction.....	0	6.8
<b>Total.....</b>	<b>.1</b>	<b>8.9</b>
<b>G-tunnel:</b>		
Operating.....	.8	.4
Equipment.....	.1	.1
Construction.....	0	0
<b>Total.....</b>	<b>.9</b>	<b>.5</b>

**Question.** Is any site where terminal storage RDT&E is underway a part of a defense program facility? Are Nuclear Regulatory Commission licensing studies underway at any or all of the sites which are part of defense program facilities?

**Answer.** DOE has terminal storage RDT&E underway at the Nevada Test Site and the Hanford Reservation. Both locations are also the sites of major defense materials production or weapons testing facilities. The Nuclear Regulatory Commission (NRC) does not have regulatory authority over DOE's research and development activities; therefore, NRC does not have any licensing studies underway for these sites. However, if in DOE's Commercial Waste Management Program's characterization, screening, and selection of a waste repository site, a site is selected which is collocated within a defense facility, then the repository site would be reviewed by NRC.

**Question.** What geologic media in which geographic areas are being considered as candidate sites for an "initial" (or secondary) nuclear waste repository?

**Answer.** The following table indicates the geologic media and geographic areas which DOE is currently considering as potential locations for a nuclear waste repository.

Geologic media	Formation	Locations
Salt bed.....	Paradox basin.....	Utah.
	Permian basin.....	New Mexico.
Salt dome.....	Gulf interior region.....	Mississippi, Louisiana, East Texas.
Basalt.....	Columbia River.....	Hanford Reservation.
Tuff.....	Yucca Mountain.....	Nevada test site.

In addition, DOE plans to broaden its Commercial Waste Management Program to include additional geological media such as crystalline rock (granite) and argillaceous rock (shale). These geologic media are located throughout the United States as shown on the following map. Specific areas to be investigated will be determined later this fiscal year.

**Question.** What "final forms" of nuclear wastes or simulated nuclear wastes are being employed in terminal storage RDT&E? Specifically, is defense program reprocessed wastes—without and with strontium, cesium, and other fission products removed—being used in any terminal storage RDT&E?

**Answer.** The "final forms" of nuclear wastes that will be employed in the terminal storage RDT&E include both commercial and defense high-level and transuranium type wastes. At this time engineering scale tests using commercial spent nuclear fuel are in progress, and test with plant scale canisters of vitrified commercial high-level waste are scheduled for next year. In addition, alternative forms of wastes, such as calcines and ceramics, and their associated process technologies are in various stages of research and development. These activities are scheduled to meet the NEPA and NRC requirements for the waste repository planned for operation in the 1996 to 2006 period.

The alternative waste form development does include the high-level forms of defense waste with varying amounts of strontium and cesium. It is noted that only part of the strontium and cesium is being removed from the high-level wastes at Hanford.

**Question.** Is it economically and technically realistic to design and build a multibillion waste processing facility to produce thousands of tons of a waste "final form" for permanent geological disposal *before* any tests for compatibility between small amounts of the "final form" and the geologic medium are conducted?

**Answer.** Less than 20% of the DWPF is directly effected by choice of waste form. Design of the majority of the facility can proceed prior to waste form selection; scheduled for 1983. Development of data to support this selection includes tests of waste form and geologic media compatibility. Sufficient testing of waste form/media compatibility will be completed before 1983.

#### CONSTRUCTION PROJECTS

**Question.** Senator Domenici has written to Senator Jackson asking that a project for a Reactor Support Facility, Sandia Lab, be considered for inclusion in the FY 1981 budget. Provide details to include the normal budget justification for this project. Could it be put under contract in FY 1981? What is its priority?

Answer. The purpose of the reactor support facilities is to provide office and light laboratory space for approximately 150 people associated with the weapon effects simulation program conducted by Sandia National Laboratories for DOE and with the experimental reactor safety and other nuclear fuel cycle programs. These people are presently located at the site of the Annular Core Pulse Reactor (ACPR) and the Sandia Pulse Reactor III (SPR III).

It is necessary, for reasons of safety, to remove all personnel except those associated with facility operations, from the reactor site. Continued occupancy at present and projected levels will needlessly expose personnel to potential risks which are not necessary for achieving programmatic goals and is inconsistent with reducing personal exposure to as low as reasonably achievable. Expanded weapon effects simulation studies, as well as ongoing complex reactor experiments, which are planned throughout the 1980's for the Advanced Reactor Safety Research Program can thereby be conducted with minimum risk to personnel. By FY 1979-1980, there will be approximately 200 people located at the reactor site—150 of which are not required for direct operations. This rapid growth of personnel is a result of Sandia Laboratories' commitment to nuclear energy related research, principally on behalf of DOE and the Nuclear Regulatory Commission, added to a continuing requirement for weapons effects simulation studies which will be expanded in the event of a Comprehensive Test Ban. Sandia's Advanced Reactor Safety Research Program is a major part of an essential requirement for decisions regarding safety and acceptability from a licensing point of view of the various alternate breeders and advanced converter reactors under consideration by DOE as part of the President's nuclear energy policy. Weapon effects simulation has been conducted for approximately 17 years at the reactor site and is expected to continue throughout the 1980's in response to the development of advanced weapon systems. This simulation activity represents the only viable alternative to full-scale weapons effects test which would be eliminated in the event of a Comprehensive Test Ban.

We are currently proceeding with design of these facilities utilizing FY 1979 plant engineering and design funds. The total estimated cost of the Reactor Support Facilities is \$9.7 million. Appropriations of \$9.0 million in FY 1981 will permit us to begin construction of the facilities promptly in FY 1981. This project was given a high priority in our submission to the OMB. We feel it is prudent for reasons of safety to remove all personnel except those associated with facilities operating from the reactor site at Sandia. The continued present occupancy needlessly exposes personnel to potential radiation hazards. Alternative facilities are not available elsewhere.

*Question.* Provide budget justification data on the new tritium facility needed at Los Alamos. Could it be put under contract in FY 1981? What is its priority?

Answer. The handling systems and equipment in the Los Alamos National Scientific Laboratory's tritium facility are obsolete. The existing system was designed to protect operating personnel only and to vent all excess tritium to the atmosphere. This design results in the lowest emission rate at the existing facility, during relatively inactive periods for the system, being 50 times the limit for new facilities. The proposed new facility, by means of triple containment, would conform to the DOE as low as practicable policy and would meet or exceed all DOE manual chapter requirements for radiation protection.

Also, the new facility would be subject to less leakage from process equipment and there would be less maintenance by operating personnel and therefore less exposure of these people to radiation. Further, much of the equipment to be installed is automated and equipped with more new safety features to protect site personnel and the public from possible radioactive exposure.

The capability to handle tritium is essential to the Laboratory's weapons research and development program. The existing tritium facility is utilized primarily in classified weapons research. Other activities performed in the tritium handling facility include establishing filling methods for targets used in the laser fusion program, repackaging tritium into small quantities for research and development usage, removal of  $^3\text{He}$  for mass spectrometer standard samples, and for experimental uses.

Design is underway utilizing FY 1979 plant engineering and design funds.

The total estimated cost of the new tritium facility is \$4.6 million. Appropriations of \$4.1 million in FY 1981 will permit construction to begin promptly in FY 1981.

Although this project was not given as high a priority as the Reactor Support Facilities, this project is proposed so that we may reduce the release of radioactive material to as low a level as is reasonable.

*Question.* Do you need construction authority to proceed with PERSHING II earth penetrator facilities?

*Answer.* This weapon is currently in Phase 3 development engineering. Based on the present planning, authorization is not required until FY 1982.

*Question.* When do you need authorization for facilities for the W82 in order to meet production schedules included in the stockpile paper?

*Answer.* Based on the proposed production [deleted] authorization for construction of W82 production facilities will be needed in the first quarter of FY 1982.

Production of the W82 warhead on this schedule assumes the availability of a special facility to be provided under Project 81-D-115, M-X Warhead Production Facilities, Various Locations. [Deleted]. It will be necessary that the construction schedule for this project proceed promptly in FY 1981 to ensure no adverse impact on W82 production.

*Question.* Discuss your plans for modernization of the nuclear stockpile. What is your current funding schedule?

*Answer.* The nuclear weapons stockpile modernization program, as currently planned, was developed on a weapon-by-weapon evaluation. The stockpile modernization program will be initiated in FY 1982, and we expect to complete the program in FY 1986. The program will be limited to a minimum number of weapons. The modernization process will include manufacturing of new or redesigned weapon parts and the exchange of those parts. The initial stage of the modernization program will be limited to [deleted]. Some modifications will require substantial disassembly, reassembly, and recertification. This work will require construction of additional production and assembly facilities at the Pantex Plant.

*Question.* Provide budget justification for pollution abatement facilities at Richland (81-D-126). Discuss the requirement.

*Answer.* If PUREX restart were funded in FY 1981, the facility emissions will be required to meet applicable federal, state, and local pollution abatement regulations and standards. Project 81-D-126 is required to ensure that NO<sub>x</sub> emissions from the PUREX Plant will comply with EPA NO<sub>x</sub> emission standards.

Pollutants such as nitrogen dioxide are formed during the denitration of PUREX waste and, under the current plant design, are discharged via the PUREX main stack with the PUREX ventilation exhaust. This project provides for a metal building 40 feet square by 20 feet high to house required equipment and instrumentation. Absorber towers will be installed adjacent to the new building. Piping and equipment will be modified to allow routing of off-gases to the facility.

#### SUFFICIENCY OF WEAPONS-GRADE NUCLEAR MATERIALS

*Question.* I am greatly concerned about the capability to produce the necessary weapons-grade nuclear material, primarily plutonium and tritium, that will be needed to produce the nuclear weapons so vital to our defense arsenal. Last year we were told that you would run out of plutonium by about [deleted] if something wasn't done. The preferred solution, according to testimony, was to convert the N-Reactor at Hanford to weapons-grade material and to start up the PUREX plant. Is there still a problem with plutonium production and is the startup of PUREX still the most cost effective way to address the problem?

*Answer.* As far as the plutonium production is concerned, the FY 1981 budget provides for a constant level of effort in the production and processing of the nuclear materials.

For the period from FY 1980 through FY 1985, which includes all Presidentially approved deployments and procurements, the projected new plutonium and tritium requirements derived from the stockpile memorandum can be met by continued operation of three Savannah River reactors now in use. The FY 1981 budget supports the operations of these reactors.

The long-term projections in the stockpile memorandum [deleted] indicate that [deleted].

The administration is continuing, therefore, to review the projected future needs in both plutonium and tritium, along with the corresponding production requirements, and will take the necessary action as required to meet the needs of the stockpile. When considering all of the facets of the plutonium supply curve, the startup of PUREX and the conversion of N-Reactor from fuel-grade plutonium to weapons-grade plutonium is still [deleted].

*Question.* Last year in conference on the FY 1980 Authorization bill we sought to address the problem by adding authorization to get started on the PUREX plant. Let me quote from that conference report:

"According to testimony presented to both the Senate and the House Armed Services Committees, the production of weapons grade plutonium could seriously limit planned and approved weapons production programs starting in the early 1980's.

One option under consideration by the Department of Energy to solve this problem is to convert the "N" reactor at Richmond, Washington, from the production of fuel grade plutonium to weapons grade plutonium. The conferees consider this option highly desirable and have agreed to the authorization of \$15 million to begin the startup of the PUREX plant at Richmond, Washington. The PUREX plant (plutonium-uranium-extraction) is needed to process the plutonium from the irradiated fuel elements. The conferees expect to see the necessary costs budgeted in fiscal year 1981 to continue the conversion of the "N" reactor to the production of weapons grade plutonium and to prepare the PUREX plant for processing during fiscal year 1983."

The President signed into law the FY 1980 Authorization Act, PL 96-164, on December 29, 1979. Events since that time have me puzzled. I thought we were accommodating your desires in getting the N-Reactor/PUREX program moving, *but* since then:

you sent over an FY 1980 supplemental appropriations request and did not include PUREX, and

your FY 1981 budget request makes no mention of the plutonium problem and the PUREX solution.

Now, I understand you are considering starting up two of the standby reactors at Savannah River.

Just where do you stand on this issue.

Answer. As I stated previously, long-term projections in the stockpile memorandum indicate that [deleted]. These projections include planning uncertainties in the interest of preserving options until requirements harden. The administration is continuing to review projected future needs for plutonium and tritium along with the corresponding production requirements.

For the short term [deleted] additional plutonium may be made available by blending low-assay plutonium (Pu-240 content [deleted] with existing separated higher assay plutonium (Pu-240 content of 12 percent). For longer periods, plutonium from PUREX is needed to continue the blending option; also PUREX could process weapon-grade plutonium which may be produced in N-Reactor if it is converted to that mode of production.

If still greater quantities are needed, the restarting of the standby reactors (L&R) at Savannah River may be a viable option. The FY 1981 standby costs of less than a half-a-million dollars is a modest amount of funds to maintain the option for the weapons-grade plutonium that these reactors are capable of producing.

*Question.* Did you include in your FY 1981 budget request to OMB necessary authority and funds to proceed with the conversion of the N-Reactor and/or the startup of PUREX? (Provide those figures for the record.)

Answer. The FY 1981 DOE budget request to OMB did include the necessary authority and funds to proceed with the conversion of the N-Reactor from fuel-grade to weapons-grade plutonium and the initiation of the startup activities of PUREX. These requests for N-Reactor and PUREX were:

	<i>Millions</i>
N-Reactor: Operating expense-----	\$4.0
<b>PUREX:</b>	
Operating Expense (Startup)-----	12.5
Construction Pollution Abatement Project-----	13.5
Subtotal -----	16.0
Total -----	20.00

<sup>1</sup> The total estimated cost is \$8.5 million.

*Question.* What is the position of the Secretary of Defense on this issue? Does he support the conversion of the N-Reactor and the startup of PUREX? (Note: The Committee has on file a memo from Harold Brown to Jim McIntyre urging funding for N-Reactor/PUREX.)

**Answer.** While we cannot speak for the Secretary of Defense, he is on record as supporting the restart of PUREX followed by the conversion of N-Reactor to weapons-grade plutonium production. This support is based on the DOD assessment of increased risks in not meeting the nuclear material requirements for the mid-to-late 1980's and the long leadtime involved in the restart of PUREX or any alternative for producing more weapons-grade plutonium.

**Question.** This presents an interesting situation. Both the Secretary of Energy (and former Deputy Secretary of Defense) and the Secretary of Defense strongly favor converting the "N" reactor and starting up PUREX, and yet they are overruled. Did the President personally overrule his secretaries or did someone in OMB overrule them? Who did it and on what grounds?

**Answer.** This Administration continues to review the defense needs for Special Nuclear Materials. In the near term, the planned supplies of the Special Nuclear Materials are adequate for the specified defense programs. For the latter part of the 1980's, both the requirements and the rates of production are currently being studied. In the meantime this Administration proposes no increase in our national production capacity.

**Question.** With regard to the restart of the standby Savannah River reactors, discuss the problems that would be associated with such a restart and give your assessment of the chances that these reactors could be restarted within a reasonable period of time.

**Answer.** Two production reactors (L and R) are currently in standby at Savannah River (SR). Reactivation of L Reactor would take about two years and cost about \$90 million. The estimated cost to reactivate R Reactor is \$180 million, and this effort would take about three years.

Reactivation of these reactors may be considered a major Federal action as defined by the National Environmental Policy Act (NEPA) and, as such, may require preparation and distribution of an environmental impact statement (EIS) for public comment. Restart of these reactors could be hindered by lawsuits until the adequacy of the EIS is acted on by the courts.

To date, no U.S. production reactor in a standby mode has been returned to service. The L Reactor was placed in standby in 1968 and R Reactor in 1964. A post-shutdown inspection of R Reactor revealed stress corrosion cracking in the reactor cooling water intake nozzles. Repair of these cracks would necessitate removal of part of the reactor vessel concrete shield, vessel decontamination, grinding out of cracks or nozzle replacement, and weld preparation and repair.

During the restart period, it would be necessary to hire and train reactor operators and support personnel; replace the reactor's primary heat exchangers and pumps, steam boilers, and control instrumentation; and install dual safety and dual process control computers in both L Reactor and R Reactor. In addition, the control rods, safety rods, and motor generator sets for R Reactor would have to be replaced.

The SR chemical processing facilities could accommodate the extra weapons-grade plutonium produced in L Reactor if existing steam boilers were upgraded. However, if R Reactor were on-line at the same time, additional steam capacity would be required.

Each reactor would require 35 megawatts of off-site electricity for operation. The availability and cost of this additional power from the South Carolina Gas and Electric Company has not yet been established.

It is our assessment that these two reactors can be restarted and that it will be more difficult to restart R-reactor than L-reactor.

**Question.** Production of SNM at two locations—SRP and RL—seems to provide a desirable redundancy. Would you discuss from a national security standpoint the desirability of having the capability to produce SNM at two separate locations?

**Answer.** The three heavy water-moderated Savannah River Plant (SRP) reactors are essentially identical in design and are capable of producing both weapons-grade plutonium and tritium for the national defense. The N Reactor at Richland (RL) is a graphite-moderated, pressure tube reactor which has demonstrated a capability for the coproduction of tritium and plutonium. Therefore, the capability for the production of special nuclear material (SNM) at two locations, SRP and RL, utilizing facilities with different technologies, provides not only redundancy but diversity. For example, if a generic technical problem is encountered which could threaten the operation of the three heavy water-moderated SR reactors, it would probably not be characteristic of the significantly

different graphite-moderated N Reactor design at Richland. Similarly, a problem at N Reactor probably would not be encountered in the three SR reactors. In addition, the potential adverse impact of natural phenomena; e.g., seismic event, tornado, etc., at the SR site would not preclude the production of the highest priority nuclear materials; i.e., tritium and plutonium, at the other site, Richland, Washington (N Reactor), and vice versa.

The desirability of a materials production system with diversity and redundancy at two separate locations is also important to the continued production of SNM for the national defense when considered from the aspect of the potential consequences from sabotage. The diversity of reactor design results in different vital component designs and separate locations dictates a different safeguards and security system. This combination reduces the probability of a successful sabotage attempt which would render both SNM production sites inoperable.

[Deleted.]

*Question.* Dr. Kerr presented interesting testimony on a concept for a new production reactor. What is the DOE position on this subject, where does the effort stand, and is additional funding needed in FY 1981 to pursue concept studies that would lead to the initial operation of a new production reactor in the 1990 timeframe?

*Answer.* The DOE position is that a dual approach is required to ensure the future continued production of special nuclear materials (SNM) for the national defense. First, it is essential that the existing nuclear materials production and defense waste management facilities restoration (upgrade) program be implemented to ensure the continued operation of the existing facilities through the early to mid-1990's. Secondly, work must be initiated to develop a replacement production facility to ensure it is on-line in the early 1990's. In FY 1980, DOE initiated an effort to evaluate ten alternatives for the purpose of selecting a few of the more promising concepts for conceptual design and further definition of the project. The Materials Production budget for FY 1981 contains \$1 million for this purpose. To ensure the initial operation of a new production facility in the early 1990's timeframe, \$5 million in additional funding could be used in FY 1981 to pursue this effort in a more expeditious manner.

*Question.* You have a project in your budget request, 81-D-129, to start additional storage for N-Reactor irradiated fuel.

a. What is the total estimated cost?

*Answer.* The total estimated cost is still to be determined. The FY 1981 request of \$5,000,000 will provide for initiation of Title I and Title II architect-engineering services and initiating long lead procurements to maintain an acceptable project completion schedule. Total facility cost is dependent on the assumptions made for PUREX restart. If the PUREX facility is retired, a new storage basin will be required to store N-Reactor spent fuel pending long-term disposition decisions. Total estimated cost for a modern facility meeting current safety criteria could be as high as \$200-\$300 million.

If PUREX restart is deferred to FY 1982, additional short-term storage is required for N-Reactor spent fuel as existing storage capacity would be completely filled before PUREX becomes operational in 1986 (4-year startup if initial funding is provided in FY 1982). The short-term storage costs are approximately \$37 million, including \$5 million for hangers (supplemental storage in existing basins) and \$32 million for modifying an existing reactor clearwell (water reservoir) as an additional interim storage basin.

With FY 1981 funding for PUREX, only the \$5 million for hangers is required to provide the needed storage capacity until PUREX is operational in 1984.

*Question.* Why do you need it?

*Answer.* In the event PUREX is retired it will be necessary to consolidate the storage of all N-Reactor irradiated fuel now in temporary reactor basin storage or discharged during continued operation to provide for prolonged, safe storage, pending final long-term decisions on disposition of the fuel.

If funding for PUREX startup is deferred to FY 1982, PUREX could not be operational until FY 1986 and additional short-term storage for N-Reactor spent fuel would be required beginning in early FY 1985 for continued operation of N-Reactor in a fuel-grade plutonium production mode and commencing in mid-1984 if N-Reactor operation is changed to a weapon-grade plutonium production mode in FY 1983.

With FY 1981 funding for N-Reactor conversion and PUREX restart, supplemental storage in existing reactor basins (hangers) would be required during FY 1983.

*Question.* Do you need the project if you convert N-Reactor to weapon grade material and restart PUREX?

Answer. Additional storage capacity is required even if activities for PUREX restart were initiated in FY 1981. A project to provide fuel hangers in the existing 105 KE and 105 KW basins would be needed, having a TEC of \$5,000,000. No other additional storage basins would be needed. The additional hanger capacity would be equivalent to nine months of N-Reactor operations with weapon-grade plutonium product. If PUREX restart were funded in FY 1981, Project 81-D-129 would be converted to the hanger installation activity only.

*Question.* Until this year, there has been a requirement for a [deleted] reserve of plutonium.

a. What was the origin of this reserve requirement?

b. I understand that this reserve requirement has been dropped in the latest stockpile paper. Is that accurate, if so, why?

c. Does the Defense Department and the JCS agree with dropping the reserve requirement?

Answer. a. The [deleted] reserve of plutonium was established to provide a surge capability against an adverse strategic arms limitation outcome, for flexibility in the event of unexpected reactor downtime, and a capability to support contingency projects.

b. Previous stockpile memoranda addressed a plutonium reserve for the approval of the paper; i.e., a three-year period. There is no specific reserve requirement identified in the latest stockpile paper because at the time it was generated available information indicated there would be more than a [deleted] reserve for the approval years. For FY 1982, for example, the stockpile paper projected that supply would exceed demand by [deleted]. The plutonium, however, must be processed before it can be used in nuclear weapons. At the present time, because of processing limitations at the Rocky Flats Plant, much of the reserve (i.e., excess in supply over demand) is in the form of temporarily unusable scrap.

c. Both the Department of Defense and the Department of Energy concurred in the stockpile paper.

#### WASTE ISOLATION PILOT PLANT PROJECT (WIPP)

*Question.* Let's turn to the WIPP project for a moment. The Congress—and especially this Committee—spent a great deal of effort last year in sorting out the WIPP project and getting waste management policy which was to put off any long term storage of nuclear waste for another five years. At the same time the President sent to Congress a rescission proposal on the WIPP funding. It seems fairly obvious that there will be no rescission bill forthcoming from Congress by April 29, 1980 which is the 45th day as prescribed in the Budget Impoundment Act; indeed, the Congress does not intend to rescind the WIPP funds. What are your plans for the WIPP project?

Answer. In the event that the rescission bill on the Waste Isolation Pilot Plant (WIPP) is not forthcoming from the Congress, the Department will continue project activities to the extent mandated by law, within the constraints of available funding.

*Question.* We defined the WIPP project in law last year (P.L. 96-164) as follows: "Notwithstanding any other provision of law, the Waste Isolation Pilot Plant is authorized as a defense activity of the Department of Energy, administered by the Assistant Secretary of Energy for Defense Programs, for the express purpose of providing a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission." (Section 213)

Do you consider that pursuit of this project is not in harmony with the President's recently announced nuclear waste management policy? Why?

Answer. The President considered that all repositories for permanent storage of highly radioactive waste should be licensed and that an R&D facility for transuranic waste alone would not provide the useful experience relevant to either licensing or geologic radioactive waste disposal and, therefore would be an inefficient use of funds. These reasons, coupled with the strategy to compare sites of different geologic characteristics prior to site selection, were considered to override the advantages of early experience with an unlicensed repository for defense waste only.

*Question.* You have no funds in the FY-81 budget for WIPP. How much funding is needed to keep WIPP on the schedule you had last year?

Answer. For the balance of Fiscal 1980, no additional capital funds other than \$17.0 million withdrawn will be required due to delays experienced in complet-

ing the final Environmental Impact Statement which has delayed initiating final design, long-lead procurements, and exploratory shaft construction. An additional \$2.5 million in operating funds would be required to support site characterization on a schedule consistent with a 1982 construction start. The estimated requirement for Fiscal 1981 is \$59.0 million in capital funds, and \$9.0 million in operating funds. These requirements are based on initiating final design in FY 1980, long-lead procurement of equipment in Fiscal 1981, and initiation of exploratory shaft construction in April 1981. These requirements are subject to issuance of the final Environmental Impact Statement in FY 1980, site access for the exploratory shaft construction by March 1981, and land withdrawal for permanent construction by June 1, 1982. Assuming adequate funding in subsequent years, the facility could be completed in 1987.

*Question.* The nuclear power industry in this country is treading on thin ice. Three Mile Island has had a tremendous adverse impact. But even more threatening is the dilemma of spent fuel. Until a few years ago, reprocessing was going to solve the problem. Now storage pools are full and even with reracking, lack of storage for spent fuel is about to force the shutdown of some reactors. In my discussions with the nuclear power industry, they applauded the congressional action on WIPP in the FY-80 bill; another step in closing the nuclear fuel cycle had been taken. But then the President's nuclear waste management policy announcement canceled WIPP and put off long term, geologic storage for at least five years. One more major, expensive hurdle had been erected for the nuclear power industry to cross. I think WIPP is important and should proceed. I'm not saying that the current Carlsbad, New Mexico, site is where nuclear waste should eventually be stored, but we have spent nearly \$100 million so far on this project and I think we should go on and finish this R&D effort to learn what we can about storing nuclear waste in salt. More important, we need to send a signal to the nuclear power industry that the Federal Government endorses nuclear energy and wants to help—rather than hinder—in solving the spent fuel problem. Comment?

*Answer.* The Department recommended proceeding with WIPP for many of the reasons you cite. The President balanced these advantages against the benefits of the broader program providing for licensing and characterization of additional sites prior to a decision on the first repository.

#### SECURITY BREACHES

*Question.* During the past two years there have been several serious security breaches—the Moreland article, the Rotow findings, and other quite sensitive breaches. Last year I asked Secretary Schlesinger if the Atomic Energy Act needs some overhaul on this point. I'm not sure that nuclear weapons information is adequately protected—it seems that all the offenders got off scot-free. Does something need to be done to increase the sanctions against those who would disclose classified information? How can we stem this growing rash of serious security breaches?

*Answer.* We believe the Department's system for the protection of classified nuclear weapons information continues to be basically sound. Classified documents which are properly marked and maintained under standard physical and personnel security control within the DOE weapons complex are receiving satisfactory protection.

However, we would agree with the broader implications of your question that it is appropriate at this time to review whether any policy initiatives should be pursued to provide enhanced protection. Accordingly, I have determined that a group be formed under the direction of my Office to address these issues. I will be pleased to inform you and the committee of any major initiatives which we would consider pursuing as a result of this review.

[Deleted.]

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QUESTION SUBMITTED BY SENATOR HENRY M. JACKSON, ANSWER SUPPLIED BY DR. F. CHARLES GILBERT, DIRECTOR, OFFICE OF NUCLEAR MATERIALS PRODUCTION

*Question.* Senator Jackson. Do you plan to continue operation of the heavy water plant at Savannah River in 1981? Do you have adequate heavy water to operate the Savannah River reactors and satisfy other requirements? When would you plan to shut down the plant?

*Answer.* Dr. Gilbert. Plans to continue operation of the heavy water production plant at Savannah River are dependent upon sales of heavy water as delineated in our FY 1981 budget request. Estimates show that heavy water sales

of about 47 metric tons are needed to provide about \$5 million to meet operating costs to maintain the plant at the minimum level, which is about three-eighths of its capacity. Our firm sales forecasts now only total about 21.8 metric tons which are designated to the Department of Defense. We plan to continue operation of the plant as long as sales provide adequate funds. However, in the event that sufficient sales of heavy water are not accomplished, we would be forced to shut down the heavy water production plant. The current stockpile of heavy water amounts to about 800 metric tons which will be adequate to meet currently known Federal requirements through 1988 while retaining reserves for startup of the two Savannah River reactors held in standby.

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QUESTIONS SUBMITTED BY SENATOR HENRY M. JACKSON, ANSWERS SUPPLIED BY DUANE C. SEWELL, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS; AND GENERAL WILLIAM HOOVER, DIRECTOR OF MILITARY APPLICATION, DEPARTMENT OF ENERGY

#### NEUTRON BOMB DECISION

*Question.* I assume you are familiar with the President's so-called "neutron bomb" decision. Would you review for the Committee where that stands?

*Answer.* In October 1978, President Carter directed the Department of Defense and the Department of Energy to initiate production of the W70-4 LANCE and W79-0 8-inch AFAP warheads. These warheads do not have an enhanced radiation (ER) capability, but are designed to accept an ER capability [deleted]. The Department of Energy has complied with the President's direction. The W70-4 and W79-0 warheads will enter production in May and July of 1981, respectively.

*Question.* Last year in response to report language that we included in our report on the FY 1980 bill, you filed a report with the Committee on ER employment options. A copy of that report will go in the record at this point. My assessment of that report makes it clear that unless [deleted] we will not have an ER option in the future. Do you agree with that assessment?

*Answer.* The warheads are designed and are being produced so that there will always be an option to add the ER capability. The amount of time required to deploy ER weapons does depend, however, upon when a positive deployment decision is made.

[Deleted.]

*Question.* Let me make clear my understanding of how the President's ER decision is being implemented:

First, the two ER weapons, the LANCE warhead and the 8-inch artillery round, will go into production shortly [deleted].

Is that understanding accurate?

*Answer.* That understanding is correct.

*Question.* If you were to make the decision to employ the ER capability [deleted]. It appears to me that the way you are implementing the President's ER decision will result in giving up the ER option. [Deleted.] If so, by whom?

*Answer.* We have been prohibited [deleted] by President Carter in an October 1978 directive.

*Question.* [Deleted.]

*Answer.* [Deleted.]

*Question.* [Deleted.] How long would it take to convert them all?

*Answer.* [Deleted.] Conversion of the complete stockpile, assuming that all of the LANCE and 8-inch warheads had already been produced and fielded, would require approximately [deleted] depending on the time [deleted].

#### WEAPONS TESTING

*Question.* How many nuclear weapons tests did the USSR conduct in 1979? In 1978? At what rate are they testing in 1980?

*Answer.* In 1979, the USSR conducted a total of [deleted] tests. Of these, [deleted] were at identified weapons test sites, [deleted] and [deleted] were presumed peaceful nuclear explosions (PNE's). In 1978, the USSR conducted a total of [deleted] tests. Of these, [deleted] were at weapons test sites, [deleted] and [deleted] were presumed PNE's. [Deleted.]

*Question.* Have the Soviets exceeded the Threshold Test Ban ceiling of 150 kt in the last two years?

*Answer.* [Deleted] it is not possible to state with absolute certainty whether or not the Soviets have exceeded the 150 kiloton (kt) ceiling of the Threshold Test Ban Treaty. [Deleted.]

*Question.* How do you explain the [deleted] number of Soviet tests?

*Answer.* [Deleted.]

*Question.* How many nuclear weapons tests did the United States conduct in 1979? in 1978? At what rate are we testing in 1980? How many tests are budgeted for fiscal year 1981?

*Answer.* In 1978, the United States conducted [deleted] DOE tests, [deleted] test in support of the DOD weapons effects programs, and [deleted] test in support of the U.K. In 1979, the number was [deleted] DOE nuclear tests and [deleted] tests in support of the U.K.

In 1980, we expect to complete about [deleted] DOE tests, [deleted] tests in support of DOD effects program, and [deleted] test supporting the UK. In 1981, we are budgeted for about [deleted] DOE weapons tests. [Deleted.]

*Question.* What is the logic behind the number of tests that you have requested for FY 1981?

*Answer.* The testing program is structured on the basis of principal emphasis being given to warhead developments to meet current military requirements. Anticipated future military requirements, advanced development concepts, and basic weapon physics experiments are other considerations in compiling the program. Of the [deleted] nuclear tests budgeted for FY 1981, [deleted] are categorized as weapons development, engineering, and certification tests and [deleted] are tests supporting the weapons technology base.

*Question.* What is the relationship between the number of tests budgeted for FY 1981 and the proposed Comprehensive Test Ban?

*Answer.* While it was assumed in preparing the FY 1981 budget that there would be no CTB during FY 1981, the weapons program includes testing and related research and development activities which would afford some preparation to undertake a CTB, should an early decision be made. The program is structured to meet identified DOD requirements in nuclear weapons research, development, and testing. In addition, within the limitations of the resources expected to be available, the RD&T program has been developed to include some attention to longer range needs.

*Question.* What is the status of negotiations for the Comprehensive Test Ban Treaty?

*Answer.* The tenth round of negotiations in Geneva concluded on April 4, 1980, and the eleventh round will begin on June 16, 1980. There has been little progress for more than a year.

[Deleted.]

*Question.* How many tests have been conducted on the W80 warhead for the ALCM which goes into production this year? For comparison, how many tests were conducted on the W68 POSEIDON warhead before it went into production? How do you explain the difference?

*Answer.* [Deleted] tests have been conducted on the W80 design to date. [Deleted] preproduction nuclear tests were conducted in the W68 program. Additionally, a performance test using production hardware of the W68, with modified high explosive, was conducted in this year's program. The W68 design was the first in a family of small reentry vehicles for the multiple warhead submarine missile force. [deleted]. Also, the development tests included experiments with two types of high explosives, one of which was selected for the warhead as first fielded. When chemical stability problems were encountered with that high explosive, there was high confidence that the other tested explosive could be fielded. The W68 warheads are now under a modification program to be retrofitted with the alternative high explosive. The test in the FY 1980 program successfully verified [deleted].

*Question.* For the record, how many preproduction tests have been held on each of the nuclear devices from the B61 through the W84?

*Answer.* The numbers of preproduction nuclear tests for the B61 through the W84 are tabulated below.

B61 (a family of 6 mods).....	} [Deleted.]	W76	} [Deleted.]
W62.....		W78	
W66.....		W79	
W68.....		W80	
W69.....		W81	
W70.....		W82	
W71.....		W83	
W72.....		W84	

[Deleted.]

*Question.* What is the status of the enhanced testing program that has been under consideration within the Department?

*Answer.* A draft of this proposed program is under review by the President's Office of Science and Technology Policy.

*Question.* This testing situation is another example of the budget squeeze that I alluded to earlier. We are not doing the number of nuclear tests that the nuclear weapons experts feel we should be doing to stay current technologically and to have confidence in our new weapons and our stockpiled weapons. We are doing all the tests we can within some artificially generated budget ceiling that has no relationship to need. We can't get behind the Soviets in nuclear weapons technology; we've already given them a sizable quantitative advantage in SALT. Why are we keeping the number of weapons tests so low?

*Answer.* The Administration has decided upon what is believed to be an appropriate total level of funding for the nuclear weapons program. High priority in that funding is assigned to the production of weapons for the DOD. The research, development, and testing program also gives highest priority to more immediate work on specific DOD requirements. Although this prioritized approach somewhat limits the number of future weapon concepts which the R&D laboratories are able to pursue, it does permit attention to some longer term ideas. The testing program, closely linked to overall R&D efforts, also is structured first to meet DOD requirements. The level of testing does permit some concept development experiments to be performed, either on a dedicated basis or in conjunction with specific weapon development tests.

*Question.* Provide for the record the FY 1981 cost for an enhanced program that is 50 percent greater than budgeted. Provide comparable figures for a program 100 percent greater than budgeted.

*Answer.* Assuming an FY 1981 escalation rate of 8.5 percent, approximately \$285 million would be required for a test program of between [deleted] events. A program ranging between [deleted] events would require about \$350 million. If we assume an escalation rate of 11 to 12 percent, an additional \$7 to \$10 million would be required in each case. It should be noted that because of the FY 1980 level of testing activity, it is questionable whether an FY 1981 program as high as [deleted] events could be accomplished; however, increased funding in FY 1981 could assure the ability to execute a program of [deleted] events in FY 1982.

#### WEAPONS LABORATORIES

*Question.* One of my concerns centers around the weapons laboratories—Livermore, Los Alamos, and Sandia. These are unique national assets that must never be allowed to lose their primary defense focus or their world-preeminence in nuclear weapons technology. The recent perturbations caused by some on the University of California's Board of Regents attempting to divest Livermore of its nuclear weapons mission are especially disturbing. Last year we wrote into law (PL 96-164) our concerns in this area in an effort to stabilize the situation. I'm sure you are aware of Section 212 of last year's bill. From your viewpoint, what is the health of our laboratories?

*Answer.* Generally speaking, I believe the current health of the weapons laboratories to be good, but I am concerned that adverse trends may be developing in the areas of employee morale, and the ability of the laboratories to continue to attract and retain the top engineering and scientific talent. Many factors are contributing to these trends including uncertainties concerning the future importance of the laboratories in the Nation's defense and energy missions as perceived in declining real budgets, policy statements, etc.; lower laboratory pay scales relative to private industry; increasing administrative and "paperwork" requirements; adverse publicity surrounding certain laboratory functions, and the overall erosion in this Nation's scientific and engineering talent base.

*Question.* Are you prepared to seek another contractor to operate Livermore and Los Alamos if the contract with the University of California becomes untenable? What are your plans in this regard?

*Answer.* It is not the intention nor plan of the Department of Energy to do any thing to disrupt the excellent working relationship that has been developed over the last 30 years with the University of California for the operations of the Los Alamos National Scientific Laboratory and the Lawrence Livermore National Laboratory. However, as a result of a public examination of this relationship and a recommendation of the Energy Research Advisory Board, I directed on June 7, 1979, that a study be initiated to explore, strictly as a con-

tingency plan, alternative arrangements for the operation of the two laboratories. The objective of this study was to identify those options which would be most likely to maintain the high quality of effort and results characteristic of the national laboratories. This study was not intended to examine nor prejudice in any way a decision on the part of either DOE or the present contractor concerning continuation of the present contractual relationship. Indeed, it is not expected that the relationship will be terminated by either party in the foreseeable future. However, as a result of the study, we have developed a plan and a timetable for the replacement process. Thus, we are prepared to establish a replacement contractor should that prove necessary or appropriate at some future point in time.

QUESTIONS SUBMITTED BY SENATOR HENRY M. JACKSON, ANSWERS SUPPLIED BY  
ROGER E. BATZEL, DIRECTOR, LAWRENCE LIVERMORE NATIONAL LABORATORY

#### M-X

*Question.* What warhead options are there for the M-X?

*Answer.* The principal warhead being considered for the M-X is the W78, combined with the MK-12A reentry vehicle, as currently being produced for the MINUTEMAN III. An alternative warhead option also being considered would fit into the ABRV (Advanced Ballistic Reentry Vehicle) and would have [deleted] enhanced safety, but at a slight weight penalty.

*Question.* What is your personal opinion of the M-X system to include the racetrack basing mode?

*Answer.* Answered in the transcript on page 64.

#### CTB

*Question.* Should we proceed with CTB negotiations at the present time?

*Answer.* I am presently opposed to a CTBT because of its negative impact on the nuclear weapon stockpile and because it will inhibit the introduction of desirable new types of weapons. Breaking off treaty negotiations, however, carries some political risk.

#### SEPTEMBER 22 EVENT

*Question.* In your opinion, how do you explain the so-called "September 22" event?

*Answer.* The "September 22 event" was recorded on a single Vela satellite [deleted]. It is possible that the event could be explained by a natural occurrence [deleted].

*Question.* What should we do to provide reasonable assurance that we can detect nuclear detonations anywhere in the world?

*Answer.* The possibilities of successful undetected testing in the atmosphere at high latitudes, or in the southern hemisphere, or in outer space can be much reduced by upgrading our satellite detection system. Instrumenting of satellite schedules for deployment [deleted] is a step in this direction. [Deleted.]

#### CRUISE MISSILES

*Question.* Is it feasible to go to multiple warheads on the cruise missile? Do you have any work underway in that regard?

*Answer.* Answered in the transcript on page 98.

#### NUCLEAR POWER

*Question.* What do we need to do to strengthen the role of nuclear power in this country?

*Answer.* As you know, LLNL is not particularly involved in fission reactor power. Nevertheless, most of us at LLNL feel that it is an important and necessary component of our Nation's energy picture. No combination of alternatives to fission power appear to meet our total needs for the next few decades. Dependence on foreign oil can result in security problems, potentially of great severity. To obtain needed public acceptance of nuclear power, the public must be educated responsibly about the real but minimal risks involved. Our highest level leadership needs to make these points so that the public confidence can be increased.

## BREAKTHROUGHS

*Question.* We often hear of technological "breakthroughs" in various scientific areas. I realize that you can't accurately forecast breakthroughs, but in what areas related to nuclear weapons and nuclear power do you foresee "breakthroughs?" Where can we expect to see the greatest technological advancement?

*Answer.* We really can't predict breakthroughs, in the usual sense, in the nuclear weapon field. First of all, as stated, breakthroughs are typically not forecastable. Second, our major efforts are going into essential activities such as improvements in safety, security, and the fitting of warheads to new weapon systems. We do, however, have some programs where potential for breakthrough exists. [Deleted.] Our ideas on these projects are in the exploratory state and their ultimate success is, of course, highly questionable.

## NUCLEAR TALENT

*Question.* The list of distinguished nuclear scientists is long—Fermi, Oppenheimer, Groves, Rickover, Teller, and many, many more. Is the system producing nuclear scientists today with comparable capability and foresight?

*Answer.* The distinguished nuclear scientists you refer to came out of the earliest period of the nuclear weapons program. It is hard to predict who the next generation of distinguished scientists will be. We have some very bright and aggressive young people working for us today. I hope some of these will be tomorrow's distinguished scientists.

*Question.* For Lawrence Livermore National Laboratory indicate the percent of nondefense work being accomplished and trace the history of nondefense work as a percent of total effort for the past five years.

*Answer.*

	Percent
Fiscal year 1975-----	30
Fiscal year 1976-----	32
Fiscal year 1976TQ-----	34
Fiscal year 1977-----	35
Fiscal year 1978-----	34
Fiscal year 1979-----	37
Fiscal year 1980 estimate-----	38

*Question.* Are you dedicating enough manpower to basic research? What have been the historic trends in this regard?

*Answer.* At LLNL, basic research is approached differently for the weapons and the nonweapons programs. For nonweapons programs, basic research is done as needed within each program as approved by DOE. In the weapons program at LLNL, basic research is managed as broad, discipline-oriented programs in those areas of physics, chemistry, and engineering which are pertinent to weapons.

As I have noted several times in other testimony, the funding for the nuclear weapons program has declined substantially during the past decade and we have had to reduce the weapons program manpower accordingly. During this period, we have kept the manpower levels for basic research for weapons at about a constant fraction of the total manpower for the weapons program, so that basic research has declined essentially in direct proportion to the overall weapons program funding. I do not believe that we are devoting enough manpower to basic research, but neither are we devoting enough manpower to advanced development, or materials R&D, or nuclear testing, among other things, in the weapons program. We have maintained some degree of balance with regard to basic research, but balance in itself cannot make up for too little funding.

*Question.* How are you insuring that the lab does not lose its defense focus?

*Answer.* As the funding for the weapons program declined and the Laboratory expanded in nondefense areas, we have kept the Laboratory strongly focused on nuclear weapons in several ways. Among them are the following:

In my own statements to employees and others, I have consistently emphasized that the weapons program is LLNL's reason for being and that, with LANSL, we have a unique responsibility to the Nation in this area.

In addition to my duties as Director, I also act as program leader for the weapons program, coordinating the activities of the several Associate Directors who have management responsibilities for weapons.

Our selections of nonnuclear weapons projects are carefully weighed to ensure that they complement and support nuclear weapons technology. For example, the work we do for DOD on nonnuclear ordnance helps to support our high explosives research for nuclear weapons.

*Question.* List in order of priority the three highest priority unfunded construction requirements.

Answer. 1. Weaponization Facilities, \$6.6 million.

This is our highest priority project and provides for upgrading several environmental test facilities which are urgently needed for several near-term weaponization programs which are currently in Phase III.

FY 1981 funding will impact the designs of the W84, B83, and M-X prior to their PPU's.

2. The following two projects are distinguished from the Weaponization Facilities in-being large construction projects which will satisfy a long-term need for new capability to develop new materials which will reduce weapons costs, extend weapons lifetimes, and add to the safety of the new weapons. They are listed in order of priority.

Weapons Material Research and Development Facility (WMRDF) (design funded), \$22.1 million.

High Explosives Applications Facility (HEAF) (design funded), \$35.0 million.

3. Management Support Center—CORE II, \$26.8 million.

In addition to the above very direct programmatic facilities, we have a very serious problem housing our administrative support functions. CORE II will alleviate this deficiency to a major degree.

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QUESTIONS SUBMITTED BY SENATOR HENRY M. JACKSON, ANSWERS SUPPLIED BY DONALD M. KERR, DIRECTOR, LOS ALAMOS NATIONAL SCIENTIFIC LABORATORY

M-X

*Question.* What warhead options are there for the M-X?

Answer. Although there exist several tested warhead candidates for the M-X system, studies indicate the two warheads that most closely meet the military characteristics requested would be the W78 MINUTEMAN III warhead or a variant [deleted] design to fulfill requirements for an alternative warhead that the Air Force has also requested.

*Question.* What is your personal opinion of the M-X system to include the racetrack basing mode?

Answer. Our Laboratory agrees that there is a need for M-X, particularly in terms of the number of additional warheads it provides in the more capable missile that it will include. The basing mode, of course, remains a contentious issue. There, I think, one must find ways to economically trade off the military capability desired and the arms control verification capabilities that are needed as well. The Laboratory has no responsibility in basing studies, per se. We note with interest, however, that there have been proposals made other than for the racetrack, which should be examined very seriously. In addition, we believe that one should also look at the option of defending the missiles with some sort of advanced antiballistic missile system. The technology that has developed since 1972 when this country decided not to deploy the ABM system that was then possible should be reviewed since applicable work has been done since, and it may be appropriate at this point to look again at that possibility as an alternative to some of these expensive basing modes.

*Question.* Should we proceed with CTB negotiations at the present time?

Answer. The trilateral (U.S.-UK-USSR) CTB negotiations in Geneva have now completed ten separate negotiating sessions without resolution of a number of key issues.

This fact illustrates the true difficulty inherent in the CTB concept as it applies to the major nuclear weapon states, and it suggests that the premises and commitments on which the CTB objectives are based should be subject to careful reexamination. I believe, therefore, that suspension of the trilateral negotiations pending resolution of a number of policy as well as technical issues would be beneficial in terms of achievement of long-term U.S. arms control objectives. I stress the term arms control, an objective which I fully support, rather than disarmament, an objective that many observers consider unfeasible in the foreseeable future.

The U.S. commitment to work toward a CTB dates from the 1963 Limited Test Ban Treaty and the 1968 Non-Proliferation Treaty. The extended negotiations thus far have demonstrated sincere effort to this end; the commitment in my view has been met. As early as 1958, it was evident that technical problems existed in achieving a CTB, compounded by differences in the political systems of the two principal negotiators. A secretive Soviet society made, and continues to make, adequate verification of a complete prohibition of nuclear weapon test explosions impossible. In the intervening years, our understanding of the military significance of relatively low-yield tests has increased, particularly their role in maintaining a technology base and preserving stockpile confidence. It has become clear in the light of even the most recent scientific achievements that, should the Soviets encounter the type of stockpile problems with which we have become very familiar, there would be little inhibition to the solution of those problems even if a few unidentifiable tests were required.

The United States, in contrast, would conduct such tests only if it judged their importance sufficient to justify abrogation of the CTB. Thus, there is an asymmetry, which would become more severe as the duration of any CTB becomes extended—pressures from which can certainly be anticipated—that could lead to defeat of arms control objectives by creating the conditions for abrogation, on the one hand, or for serious military instability on the other.

Moreover, the commitments I mentioned were undertaken long before the recent—post SALT I—massive, if not to say brutal, Soviet buildup of strategic and theater systems. SALT II does little to constrain a further buildup, in my opinion; there is no sign that an entire fifth generation of Soviet strategic missiles will not appear within a very few years. Growing concern about this threat will scarcely be helped by a complete CTB that leads to uncertainty about our own ability to respond, nor will it facilitate SALT III or other agreements truly responsive to the objective of arms control. The United States did not invite this situation, but it should not, in my view, ignore it in any reassessment of its commitments of the 1960's.

Since March 31, 1976, this Nation has rigorously observed the yield constraints on weapon tests imposed by the 1974 TTBT, at some military cost and without assurance that the Soviets have done the same. The fact that the TTBT/PNET agreements have been withheld from Senate debate and possible ratification has deprived us of verification-related data that—though imperfect in some respects—was considered essential to adequate verification of compliance with those treaties. The process of data exchange would at least have allowed us to evaluate Soviet cooperation in advance of any more restrictive agreements; if a review of the operation of the TTBT/PNET takes place in 1981, five years after it took effect, that review will not have the benefit of the key verification provisions.

I suggest that, before more restrictive limitations are considered, we should assess the verification situation with regard to existing treaties and their impact on existing and possible future U.S. weapons systems. The precedent for verifiable arms control agreements at present is, as the situation now stands, adverse.

I should also point out that the situation today is in many ways analogous to that in 1958 when, as we entered a moratorium lasting three years or longer had the Soviets not suddenly resumed testing, we were in the process of replacing a number of key weapons with new designs having capabilities more in line with perceived defense needs. We are doing so again today, and the new weapons are markedly superior to those they will replace in every respect including longevity and—should a future replacement program be needed, as it inevitably will under a CTB—replicability. We have done the best job we know how to do on these new designs, yet we are concerned about the results of post-moratorium testing in the early 60's that disclosed a number of serious design errors in the weapons we had stockpiled with such confidence during the moratorium. Should a CTB persist more than a few years, we would be deprived of the opportunity to discover or solve, through testing, any latent problems in the new systems, and we would lose the skilled technologists on which continued stockpile confidence depends. Again, the conditions for abrogation of the CTB might result directly from its absolute nature.

It is argued in support of the CTB objective that it will enhance the prospects for nuclear weapons nonproliferation, but it is important to put this argument in perspective: (1) the NPT acts as a CTB for the nations that have become parties, and (2) the nations considered almost universally to be the most likely

proliferators are not members of the NPT family and have shown no inclination to join. I have heard no convincing arguments that these nations, having rejected the NPT, would participate in the CTB regime. Further, the nominal three-year duration of the proposed treaty, as well as the separate verification provisions for the nuclear weapon state parties, would seem to work against widespread adherence by nonnuclear weapons states and therefore to be counterproductive in terms of long-term arms control objectives.

During the 1978 House Armed Services Committee hearings on this subject, I testified as Acting Assistant Secretary for Defense Programs, DOE, that the DOE supported adequately verifiable and symmetrical arms control initiatives. I have not changed this view. However, the world situation today seems to me to justify a thorough reexamination of the premises on which CTB negotiations have proceeded, including the commitments made in a different political and technological era. I support moves toward ratification of the existing treaties (TTBT/PNET), and consideration of a reduced threshold at some appropriate time in the future if experience under the TTBT/PNET justifies that step and present tensions are eased by progress in the political area and by progress in arms limitation in general. But, a suspension of CTB negotiations at this time without prejudice to future steps would, in my view, be wise.

SEPTEMBER 22 EVENT

*Question.* In your opinion, how do you explain the so-called "September 22" event?

Answer. [Deleted.] No data we know of provides any basis for identifying the country of origin.

[Deleted.] In the September 22 event, the uncertainty in location, the well-known bad weather in the area, [deleted] may well have combined to preclude radioactive samples being obtained.

*Question.* What should we do to provide reasonable assurance that we can detect nuclear detonations anywhere in the world?

Answer. The nuclear explosion or false alarm of September 22, 1979, [deleted] highlights the need to improve U.S. verification capabilities, particularly since our objective now is to monitor proliferation rather than keep track of weapons tests conducted by nuclear weapons states. [Deleted.] Under these circumstances, it is essential to maintain the current schedule of the GPS (Global Positioning Satellites) program and to add [deleted]. Furthermore, we should be developing the verification and control technology that will be required to monitor treaties and agreements now under negotiation or anticipated for the future. Had the Threshold Test Ban Treaty and the Comprehensive Test Ban negotiations been conducted on the basis of proven verification technology, we could have reduced the risk that asymmetries might be embedded in the final agreement. The best arms control initiatives would couple potential desires with proven technical capabilities.

*Question.* Is it feasible to go to multiple warheads on the cruise missile? Do you have any work underway in that regard?

Answer. The answer is yes in the sense that it is feasible and technically possible to design cruise missiles that could carry multiple nuclear warheads. The real point should be whether that adds any new military capability, since one of the presumed attractive features of the cruise missile is that it saturates the air defenses by providing a multiplicity of targets. If one missile is now asked to carry multiple warheads, that will reduce the ability to saturate the defenses, increase the investment in any particular missile, and may not fit the tactics the Department of Defense has developed for their use. At the present time, we are not involved in any work to provide a multiple warhead capability for cruise missiles. On the other hand, our ongoing advanced development program certainly has within it developments that could be used if such a future capability were needed.

*Question.* What do we need to do to strengthen the role of nuclear power in this country?

Answer. The future of nuclear energy in this country depends on our ability to overcome three major problems: assured safety, acceptable waste disposal, and effective safeguards. The Los Alamos National Scientific Laboratory is making significant contributions to all three, but I see improved nuclear safeguards as perhaps the most pressing requirement today.

Two major risks are incurred by the worldwide accumulation of weapon-usable nuclear materials: The potential proliferation of nuclear weapon states and the

possible diversion of nuclear materials by a subnational group for the purpose of mass terrorism. International and national safeguards and security measures to limit these risks have evolved over several decades and they must continue to evolve. We know now that our hope to achieve diversion-proof and proliferation-proof fuel cycles is unattainable. This was recently shown by studies of the International Nuclear Full Cycle Evaluation and the Non-Proliferation Alternative System Assessment Program. These same studies also confirm the urgent need of some countries for nuclear power. This is emphasized further by a 1980 GAO report on the problem of nuclear fuel reprocessing that concludes that U.S. plutonium reprocessing safeguards technology has only limited effectiveness. The inescapable conclusion is that the U.S. must improve its safeguards technology if it wishes to promote nonproliferation goals and influence the strengthening of safeguards in other countries.

As the Department of Energy's lead laboratory for research and development in special nuclear material control and accountability, the Los Alamos National Scientific Laboratory supports national objectives by developing the following:

- instruments for advanced nondestructive assay and chemical analysis;
- methods for modeling and simulating safeguards systems in generic fuel-cycle facilities.
- systems of near real-time material accountability with instrumentation measurement controls and statistically based decision analysis for alarm systems;
- techniques for nuclear containment and surveillance;
- evaluations of computer security; and
- support for the Nuclear Emergency Search Team (NEST).

Los Alamos also has the principal responsibility for transferring this developing technology to industry, the Nuclear Regulatory Commission, International Atomic Energy Agency, and other countries. In this role, the Laboratory sponsors an extensive program of special training courses and participates directly in the design of new facilities and the addition of new safeguards to existing facilities.

However, technology only augments the institutional controls on nuclear materials and weapons technology. Institutional developments must proceed in parallel with technology if we are to achieve an adequate level of deterrence.

#### BREAKTHROUGHS

*Question.* We often hear of technological "breakthroughs" in various scientific areas. I realize that you can't accurately forecast breakthroughs, but in what areas related to nuclear weapons and nuclear power do you foresee "breakthroughs?" Where can we expect to see the greatest technological advancement?

*Answer.* In the area of nuclear weapons and nuclear power, we are basing any advances on a relatively mature technology. Nuclear physics is now at the point of making accurate predictions and experimental confirmation is achieved in many cases. The "breakthroughs" will come in other areas; in particular, advances related to new materials development, areas of electronics that will enable smaller more reliable, and safer arming and firing systems for weapons, the continued development of high explosives technology, and the fundamental understanding of detonation physics. We expect advances in metallurgy that will considerably ease the nuclear design problem in the future. In the nuclear power area, clearly we anticipate more fundamental understanding of the behavior of radionuclides in geologic formation. We should stress this kind of research in order to lay to rest the questions that revolve around the safety of underground nuclear waste disposal. Other areas where we may see advances in the next few years may not be in nuclear weaponry at all but may derive from applying the technical capabilities of the nuclear weapons laboratories to questions like the detection of chemical and biological agents and the design of protective measures against such agents. The same sorts of techniques that were developed to deal with the detection of radiation and safety in nuclear facilities may provide the basis for significant advances in this other area that has in the past seemed unrelated but, in fact, because of the common technological problems, could be an area where our talents could be well applied.

*Question.* The list of distinguished nuclear scientists is long—Fermi, Oppenheimer, Groves, Rickover, Teller, and many, many more. Is the system producing nuclear scientists today with comparable capability and foresight?

*Answer.* It is true that the early days of the nuclear weapons program saw signal contributions from pioneers in the still-new field of nuclear physics but also from engineers and chemists of that era. Today nuclear physics, in par-

ticular, is a relatively mature science. The continued success of the U.S. nuclear weapons program since, perhaps, 1955 has depended more on the developing skills, knowledge and experience of those who followed on to pick up the mantle of the pioneers. That is not to say that these scientists do not possess capabilities and foresight comparable to those of their predecessors in the field; many significant steps forward in every aspect of nuclear weapon technology have been the result of their effort. However, we face a problem today. Largely as a result of public and governmental attitudes toward all things nuclear, as exemplified for example by the pressure toward a CTB and nuclear disarmament (without parallel progress toward disarmament in other areas), it is becoming increasingly difficult to recruit new talent for service in the weapons program. Moreover, the eroding cadre of knowledgeable, experienced people in this field will, if a CTB (rather than an appropriate threshold) comes into force over a modest number of years the weapons laboratories would lose their expertise because of the empirical nature of the weapons design profession. The process of erosion will accelerate unless it is made clear by the Administration that a commitment to resume testing can be relied upon, and without that clear assurance no safeguards—of the type established under the LTBT but now substantially reduced to lip-service—can be expected to mitigate the adverse effects of a CTB on the weapons technology base, even a CTB of purportedly short duration. The corporate wisdom that has been accumulated over decades cannot be easily replaced, and those who remain in the weapons program will inevitably become ignorant as to what can and cannot be done with weapons. Only continued tests can avert that result.

*Question.* For Los Alamos National Scientific Laboratory, indicate the percent of nondefense work being accomplished and trace the history of nondefense work as a percent of total effort for the past five years.

Answer. In FY 1980, approximately 47 percent of the total Los Alamos National Scientific Laboratory effort is devoted to nondefense work. This fraction has risen over the last 5 years from 44 percent to this current value.

Below is a table which shows the trends during the last five years between nondefense and defense work.

[Dollar amounts in thousands; fiscal years]

	1976	1976T	1977	1978	1979	Estimate	
						1980	1981
ASDP .....	\$101,358	\$30,374	\$129,710	\$149,861	\$155,336	\$174,400	\$105,500
DOD .....	5,840	1,185	5,626	6,757	10,253	15,000	18,800
Subtotal .....	107,198	31,559	135,336	156,618	165,589	189,400	124,300
Total .....	191,632	58,724	242,016	277,200	330,561	359,400	418,600
Percent of total effort:							
Defense .....	56	54	56	56	50	53	54
Nondefense .....	44	46	44	44	50	47	46

*Question.* Are you dedicating enough manpower to basic research? What have been the historic trends in this regard?

Answer. The Laboratory is not dedicating as much manpower to basic research as it would like. Such research is very important to the maintenance of our long-term capability, creativity, and innovative strength and is the source of much of our ability to maintain contact with, appraise, and react to new developments wherever they may occur. But this long-term capability is continually being threatened and eroded by the steadily increasing pressures to concentrate a greater percentage of our research efforts on shorter term problems. External decreases in real funding for weapons research and development activities and continuing heavy DOD development engineering requirements have forced us to greatly reduce the share of weapons funds devoted to supporting research (from 22 percent in FY 1975 to 17 percent in FY 1979). Within the large growth in energy-related programs, there has as yet been only a limited provision of similar funds. We are actively seeking further support and would welcome all assistance in obtaining it. Meanwhile, we intend to fund some institutionally supported research from indirect charges as a partial corrective measure. We believe that, in the aggregate, we need a 40 to 50 percent increase in basic research activities. Our goal is to bring these to a level near 15 percent of all direct research.

*Question.* How are you insuring that the lab does not lose its defense focus?

*Answer.* The primary mission of the Los Alamos National Scientific Laboratory remains, as it always has, the application of science and technology to problems of national security. Today this requires that the Laboratory address a broad range of issues in national defense, in arms control and verification, and in technology for a secure energy future.

The Laboratory places its highest priorities on those national defense programs for which it bears prime responsibility, namely, programs which support U.S. nuclear deterrence through the development of advanced technology for nuclear weaponry. Defense programs continue to account for over half of the Laboratory's effort, and while continuation of this balance depends in part on factors beyond our control, the Laboratory management structure and the stated policy of the Director will assure that nuclear defense issues remain first in our attention. The weapons program will continue to have first call on essential general purpose facilities, such as the computation center.

Nuclear weapons will provide the keystone to national defense for the foreseeable future but, as nuclear technology continues to mature, developments in non-nuclear weaponry will exert an increasing influence on our defense posture. DOD-funded programs are absorbing an expanding share of our technical resources, calling upon areas of expertise both essential to new defense technology and unique to the weapons laboratories. We expect programs such as those now underway [deleted] to grow in size and importance to the Laboratory and to keep us at the forefront of modern defense developments.

While our many energy programs cover a wide range of technologies, we emphasize programs having strong synergism with nuclear defense technology. Geosciences research supports underground test containment and influences verification and control studies concerning the ability to detect seismically nuclear explosions. The inertial fusion program, looking in the long term toward energy applications, holds near-term interest for the weapons program as it shares many techniques, common physics, and even people.

In short, LANSI will preserve and even enhance its focus on defense issues by sustaining an active program of nuclear weapons R&D, by continuing to grow in important areas of nonnuclear defense technology, and by pursuing energy programs which support and complement our base in defense R&D.

*Question.* List in order of priority the three highest priority unfunded construction requirements.

*Answer.* Our three top priority construction projects are, in order of priority:  
1. New Tritium Facility, \$4.1 million.

The \$4.1 million estimate does not include \$0.5 million currently funded for design. This project is required to replace an obsolete, inadequate facility with a new structure and equipment to provide for safer, more reliable, and more efficient tritium handling operations.

2. Enriched Uranium Processing Replacement Facility, \$23.5 million.

This project will provide a new building and associated equipment to replace existing, 35-year-old structures used for enriched uranium recovery and processing. [Deleted], while the operations conducted therein are highly important to LANSI weapon and other programs. Thus, a new replacement facility is essential.

3. Safeguards and Security Upgrading, \$13.0 million.

This project provides for increased security of classified material and nuclear material (SNM). The ever-growing terrorist activities and the greater threat of diversion of special nuclear materials and for classified information for political, terrorist, or blackmail reasons make improved protection essential.

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QUESTIONS SUBMITTED BY SENATOR HENRY M. JACKSON, ANSWERS SUPPLIED BY MORGAN SPARKS, PRESIDENT, SANDIA LABORATORIES, ALBUQUERQUE, N. MEX.

M-X

*Question.*—What warhead options are there for the M-X?

*Answer.* A feasibility study, completed in 1979, identified more than 40 warhead options for the M-X application with maximum yield up to [deleted]. These candidates variously included such technology features as: Insensitive High-Explosive; minimum use of fissionable materials; and command and control options. Some of the candidates exist in the stockpile today and some have been tested at the Nevada Test Site in weaponized configurations. Sandia's responsibility for these candidates represent no departures from our current technology

base. The two warheads which are now being pursued by the DOE and the DOD for M-X were candidates in the feasibility study.

*Question.* What is your personal opinion of the M-X system to include the race-track basing mode?

*Answer.* Although I am concerned about our tendency to exclude ABM's from the many options which have been proposed to maintain the viability of the land-based leg of the strategic triad, I don't think I can add anything to the debate about M-X.

#### CTB

*Question.* Should we proceed with CTB negotiations at the present time?

*Answer.* Since the comments of the directors of the nuclear weapons laboratories regarding the desirability of a CTB are likely to appear self-serving, I prefer to limit my comments. Personally, I doubt that a CTB would discourage the proliferation of nuclear weapons or that it would decrease world tension. I hope that we will insist that any CTB we sign and ratify be adequately verifiable. If the treaty were not adequately verifiable, I would be concerned about the serious asymmetries in nuclear weapon capabilities and in confidence in weapon stockpiles which are likely to develop between ourselves and the USSR, mainly as a result of the asymmetries between the two societies.

#### SEPTEMBER 22 EVENT

*Question.* In your opinion, how do you explain the so-called "September 22" event?

*Answer.* It is our opinion that the signals recorded by the two optical sensors (Bhang-meters) on Vela Satellite [deleted] on September 22, 1979, [deleted]. The only other plausible explanation is that the signals were caused by a meteoroid with the proper shape, size, linear velocity, and spin rate passing in front of the satellite to generate the observed signals by reflecting sunlight into the optical sensors.

[Deleted.]

*Question.* What should we do to provide reasonable assurance that we can detect nuclear detonations anywhere in the world?

*Answer.* The only planned system capable of providing complete global coverage for the detection of atmospheric nuclear explosions is the Global Positioning System (GPS) of satellites. All GPS satellites launched after [deleted] should carry Bhang-meters according to the present plan (a few of the satellites launched earlier will also). The system should become fully operational in the [deleted] time period to provide the U.S. with the capability to detect and locate atmospheric nuclear explosions [deleted] anywhere in the world, [deleted]. No other satellite system now planned by the U.S. can provide this degree of coverage. The only alternative to GPS for complete coverage of southern polar regions would be to deploy [deleted] which provide the necessary southern coverage. This could be accomplished with as few [deleted] in properly phased [deleted].

#### CRUISE MISSILES

*Question.* Is it feasible to go to multiple warheads on the cruise missile? Do you have any work underway in that regard?

*Answer.* The Tomahawk cruise missile, used for SLCM and GLCM, is modular and could easily be modified to deliver more than one warhead. The warhead, however, would be very different from the W80: it would resemble a bomb. (It could even be a standoff bomb or missile so that the cruise missile itself would not need to fly through several terminal defense systems.) Significant range reduction would result from the loss of fuel volume and the additional weight of the payload. The ALCM would require significant redesign. There is no current activity in this area.

#### NUCLEAR POWER

*Question.* What do we need to do to strengthen the role of nuclear power in this country?

*Answer.* I believe that the real problem is the present lack of public acceptance of a basically adequate technology. To strengthen the role of nuclear power, the American public will need to believe that it needs nuclear power and that it is adequately safe. Technically, this requires that we improve the safety of reactors and that we demonstrate the safety of the nuclear fuel cycle including waste management.

## BREAKTHROUGHS

*Question.* We often hear of technological "breakthroughs" in various scientific areas. I realize that you can't accurately forecast breakthroughs, but in what areas related to nuclear weapons and nuclear power do you foresee "breakthroughs?" Where can we expect to see the greatest technological advancement?

*Answer.* Recent advances in microelectronics technology now make it possible to perform highly sophisticated data processing functions and analyses at very low cost and in very small volumes. [Deleted.] This technology may also make it possible to develop small, relatively inexpensive weapons which are capable of autonomously locating, identifying, and attacking specific targets. [Deleted.] In fission energy, no breakthroughs are needed or foreseen.

We do anticipate great advances in accelerator technology for [deleted] inertial confinement fusion and in implosion physics for inertial confinement fusion [deleted].

## NUCLEAR TALENT

*Question.* The list of distinguished nuclear scientists is long—Fermi, Oppenheimer, Groves, Rickover, Teller, and many, many more. Is the system producing nuclear scientists today with comparable capability and foresight?

*Answer.* Today we are able to attract scientists and engineers who have as much ability and foresight as their predecessors forty years ago, but I have two concerns:

a. We tend to burden today's talent with bureaucratic procedures which their predecessors didn't have to face.

b. The weapon designers of the forties were not told by their President that nuclear weapons should be abolished; such a policy does affect motivation. A CTB would aggravate this problem.

*Question.* For Sandia Laboratories indicate the percent of nondefense work being accomplished and trace the history of nondefense work as a percent of total effort for the past 5 years.

*Answer.*

	Fiscal year—				
	1976	1977	1978	1979	1980
Defense.....	82	81	80	77	75
Nondefense.....	18	19	20	23	25

It should be noted that the number of employees working on defense-related activities is about level throughout this period. The percentage declined because of growth in the nondefense activities.

*Question.* Are you dedicating enough manpower to basic research? What have been the historic trends in this regard?

*Answer.* No. There are various ways of defining basic research and the fact that definitions change from year to year complicates the identification of basic research. If we include such work as that on advanced concepts, nonnuclear design technology, research facilities technology, and materials technology, our manpower conducting research is as follows:

Fiscal year 1976.....	440
Fiscal year 1977.....	380
Fiscal year 1978.....	395
Fiscal year 1979.....	400
Fiscal year 1980.....	360

The numbers compare with an average of about 500 for the years 1970 through 1974.

The total manpower assigned to weapons research and development has remained relatively constant at the 1,300 to 1,400 level since FY 1976, but the number of weapon systems in Phase 3 has made it necessary to move manpower from research to weapons development, engineering, and certification. Thus, in FY 1976 manpower assigned to research was 33 percent of the R&D total and in FY 1980 it is 26 percent.

*Question.* How are you insuring that the labs do not lose their defense focus?

Answer. Our management has taken the position that the level of nonweapons work will stay at about the current level. Nonweapons work will generally be of a type that draws on technology developed in our basic weapons development mission. Since much technology has applications in both fields, work in the two areas is complementary. Further, employees of Sandia National Laboratories understand that they may be moved freely between the two kinds of work performed here. Thus, we have flexibility in responding to changes in workloads while recognizing that our primary mission is as a weapons lab.

*Question.* List in order of priority, the three highest priority unfunded construction requirements.

Answer. Assuming that the \$3.5 million requested for seismic upgrading of buildings at SNLL will be a part of the FY 1980 supplemental appropriation for DOE, Sandia National Laboratories lists the following projects for which funding has been requested:

1. Reactor Support Facility, \$9.7 million.

The RSF will provide facilities for assembly of experiments and will permit relocation of nonessential personnel away from the Reactor area. Plant Engineering and Design funds for this project were provided in FY 1979 and construction was planned for FY 1981 before OMB deleted the RSF from the FY 1981 budget.

2. Laboratory Building, SNLL, \$13.5 million.

This building will correct a serious and growing deficiency in space for applied research and components development for weapons work. Lab space is needed for development and testing in operational capability, nuclear safety, security and survivability. Diagnostic, simulation, and test equipment is increasing in complexity and utilization, and additional space is required for safe and effective use.

PE&D funds were provided in FY 1980 and construction is planned in FY 1982.

3. Energy Technology Lab, \$20.0 million.

About 30 percent of Sandia's current effort is applied to work on the Nation's energy problems, yet no lab or office facilities have been provided by any arm of DOE except Defense Programs. Consequently, SNL proposes to build, at Albuquerque, a facility incorporating a Technology Transfer Center, a Heavy Lab, and a Light Lab/Office Building to house about 500 employees who work in various fields of energy research and development. The facility will accommodate work in solar, fossil, geothermal and magna energy, nuclear waste, and environment research.

The Senate Energy and Natural Resources Committee Authorization for DOE for FY 1981 includes this facility at its TEC of \$20 million.

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QUESTIONS SUBMITTED BY SENATOR HENRY M. JACKSON, ANSWERS SUPPLIED BY ADMIRAL HYMAN RICKOVER, DEPUTY ASSISTANT SECRETARY FOR NAVAL REACTORS, DEPARTMENT OF ENERGY

Senator JACKSON. What is your personal opinion on the issue of reprocessing nuclear fuel?

Admiral RICKOVER. Reprocessing of nuclear fuels is necessary if nuclear power is to substantially increase our energy resources. The nuclear fuel utilization in current "once-through" light water reactors allows the use of less than 1 percent of the total energy potentially available in nuclear fuel. If nuclear fuel utilization is limited to this application much less energy will be available from nuclear fuel than is available in current fossil fuel reserves.

The fundamental importance of energy to the United States warrants developing all alternatives which show reasonable promise of making a significant amount of energy available. This includes continuing the development of breeder reactor fuel cycles along with the necessary reprocessing technology which could make available potential energy sources many times greater than current fossil fuel reserves.

Senator JACKSON. I wonder if you would project for us what the Navy of the year 2000 should look like? Should we be tending toward smaller ships and greater numbers or vice versa? Should we be emphasizing technology or simplicity? In which direction should we be going?

Admiral RICKOVER. I cannot state precisely the Navy we will need for the year 2000. However, we should bear in mind that a significant portion of the warships the U.S. will have in the year 2000 are already in the active fleet or

being built today. For future warships, the decisions to be made are not simple and cannot be reduced to simple alternatives. We should build capable warships and not build for specific, limited purposes—for we cannot accurately predict the threats or situations that will be encountered over the 30 to 40 year life of a warship. As an example, when the existing fleet was built the U.S. was not giving much thought to maintaining a significant naval force in the Indian Ocean.

As I noted in my prepared statement, the advantages of nuclear power have been clearly demonstrated. Because of these advantages, large combatants should be nuclear powered to provide them with maximum flexibility so that these warships can fully utilize their combat potential.

Senator JACKSON. Admiral, what is your personal opinion on the land based MX versus the Shallow Underwater Missile or HYDRA?

Admiral RICKOVER. The land based M-X and the HYDRA system are not submarine related missile systems. I have no responsibility for them and have no opinion on them. I know very little about the submarine related Shallow Underwater Missile system. I have been requested to look at the reactor plant for a version of this system based on a nuclear powered submarine carrying four missiles external to the submarine. It is my personal opinion that this version will be more costly than the Trident missile system on a per missile at-sea basis. Also, the submarine would be far less capable than the Trident submarine.

Senator JACKSON. Where should the Nautilus be permanently tied up?

Admiral RICKOVER. I agree with the Secretary of the Navy's recommendation to berth the Nautilus at the Washington Navy Yard.

QUESTIONS SUBMITTED BY SENATOR CARL LEVIN, ANSWERS SUPPLIED BY DUANE C. SEWELL, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS, DEPARTMENT OF ENERGY

*Question.* Your statement on the Inertial Confinement Fusion program emphasized the importance of short wavelength laser-matter interaction experiments. If the Congress added funds to the ICF budget request for these experiments, could DOE and the Office of Inertial Fusion effectively use that money?

*Answer.* The current program plan does place a high priority on the short wavelength interaction experiments. Additional funds would serve to strengthen this work and to reduce the level of uncertainty in the physics experiments. Increased funding would have the same benefits in all areas of our program.

*Question.* I have been informed that the work KMS Fusion is doing in short laser wavelength experiments and in target fabrication and design is important to developing the scientific data needed by DOE to make major ICF program decisions in the future—such as the selection of the type of laser “driver” to be used in beginning the fusion chain reaction. Such decisions naturally have major funding implications for construction and operating expenses at the national labs, where the large lasers are being upgraded for continued ICF work. KMS Fusion, Inc. of Ann Arbor, Michigan is one of the major industrial participants in the ICF program. What is being done to insure a contributing role in the ICF program for this industrial participant which is recognized as a national leader in laser fusion technology.

*Answer.* Research by universities, private research institutes, and industrial organizations is supported through the designated lead laboratory to the extent that it contributes to program goals and objectives. The Office of Inertial Fusion has the authority and responsibility to provide program guidance to the lead laboratory and monitor and evaluate its performance in executing the program plan. This authority extends to integration of total program resources, including “outside” contractors. Participation by these contractors is encouraged within budgetary constraints but is properly limited to that which complements ongoing research without unwarranted duplication.

Under the lead laboratory management concept, the responsibility for directing research and development is formally assigned to the three national weapon laboratories, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Sandia National Laboratory. KMS has historically been intimately associated with the ICF program because of their unique talents, experience, and capabilities in their respective areas of interest. Their contributions

continue to impact the program under the new management structure which provides for integration of their supporting roles into the individual program elements specified for the lead laboratories. KMS Fusion, the University of Rochester, and the laser experiments portion of the NRL effort are integrated under the one micron glass laser and shorter wavelength experiments lead lab, LLNL.

AVAILABILITY OF SPECIAL NUCLEAR MATERIALS (SNM)

*Question.* On page 6 of your statement, Dr. Gilbert, you say that long-term projections for our nuclear weapons stockpile indicate that requirements for the SNM which give them their destructive power may increase. If so, and if it takes 2-4 years to restart production at our standby facilities, why are you not proposing an increase in our national production capacity at this time?

*Answer.* As previously noted, DOE can produce sufficient material from the three Savannah River production reactors to meet the Nuclear Weapon Stockpile Memorandum (NWSM) tritium and plutonium requirements, [deleted] through FY 1985. The projected [deleted] shortfalls noted in the NWSM could be averted by converting N Reactor from production of fuel-grade to weapon-grade plutonium combined with restarting the Purex processing plant and also restarting the two Savannah River reactors now in standby. For the latter part of the 1980's, both the firmness of the requirements and the necessary rates of production are currently being studied.

*Question.* Since, as you say on page 6, that most of the nuclear materials required for new warheads are obtained by reclaiming and recycling existing materials in retired warheads, does a possible future shortage mean we will be retiring nuclear warheads at a slower rate in the future? If so, how much slower in each of the next five years, compared to the past five years?

*Answer.* A nuclear material shortfall is not projected to occur during the approval years of the latest Nuclear Weapons Stockpile Memorandum (NWSM). Considerations such as changing national policy and changing defense objectives make the force requirements and the associated nuclear material requirements depicted in the planning years of the latest NWSM subject to some degree of uncertainty. The rate of retirement of existing warheads during this period will be dependent on how the above considerations materialize as well, in all probability, on other future considerations. However, for your information, the warhead retirements for the past five years and those planned for the next five years are as follows:

											Fiscal year—									
											1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
[Deleted].....																				

*Question.* What will be the causes of the shortage of SNM in the future, if it does come about? Why wasn't it foreseen that this could happen?

*Answer.* The causes of material shortages in the future, if they occur, probably will be:

1. Firming up of projected requirements for which there has been a high degree of uncertainty.
2. Maintenance, by the DOE, of reserves of materials which would be insufficient to accommodate large surges in requirements.
3. Unforeseen circumstances, such as limited future funding, when needed, or major technical problems, associated with currently operating facilities or with the restart of needed production facilities now in standby.

Long range planning for the production of nuclear materials for weapon purposes is subject to considerable uncertainty. Some of the causes of this uncertainty are changing administrations, changing defense objectives and/or changing national policy. Also contributing to the uncertainty is the high cost of restarting and operating production facilities during a period of high inflation and a national policy of budget restraint.

*Question.* Why won't the modernization of our theater nuclear weapons in Europe with PERSHING II's and cruise missiles permit us to reconfigure our stockpile and reclaim SNM from older weapons we might decide we no longer need? Why won't this offset any projected shortages in SNM, since the possibilities exist for reducing a large number of our present TNW stockpile?

Answer. Special nuclear materials (SNM) consist of two types: enriched uranium (oralloy) and plutonium. These nuclear materials are routinely recycled from retired weapons for use in new weapons. All our planning projections are based on this method of operation. The modernization of theater nuclear weapons will release oralloy for use in other programs [deleted]. Therefore, while the modernization program helps the oralloy supplies, it increases the overall demand for plutonium.

#### NUCLEAR WEAPONS TESTING

*Question.* There are concerns that the present budget for nuclear weapons testing is inadequate for FY 1981. Do you agree with this assessment? Why or why not?

Answer. Competing programmatic and resource priorities determined the total level of testing affordable in FY 1981. Within this level, priority attention will be given to meeting near-term DOD weapon system requirements. This will require, however, the deferral of some efforts related to promising, but lower priority, intermediate-term concepts and ideas.

The directors of the nuclear weapons design laboratories have expressed their belief that an annual level of testing of between [deleted] device tests is appropriate for maintaining an adequately balanced long-term program. I have no reason to disagree with their judgment on this matter.

*Question.* Has there been any progress in the Comprehensive Test Ban negotiations among the U.S., U.S.S.R. and the UK in the past year? What has been the progress, and what problems remain unresolved in these negotiations? What are the prospects for progress in these negotiations in the near future?

Answer. The tenth round of negotiations in Geneva concluded on April 3, 1980, and the eleventh round will begin on June 16, 1980. There has been little progress for more than a year. The prospects for progress in the near future do not appear encouraging.

[Deleted.]

*Question.* Does the current status of the CTB talks, and the progress or lack thereof made during the past year, justify either a decrease or an increase in our nuclear weapons testing in FY 81? Why or why not?

Answer. There is no change in our test program level driven by CTB negotiations. While it was assumed in preparing the FY 1981 budget that there would be no CTB during FY 1981, the weapons program includes testing and related research and development activities which would afford some preparation to undertake a CTB, should an early decision be made. The program is structured to meet identified DOD requirements in nuclear weapons research, development, and testing. In addition, within the limitations of the resources expected to be available, the RD&T program has been developed to include some attention to longer range needs.

#### DEFENSE WASTE DISPOSAL

*Question.* Last year, Congress authorized the Waste Isolation Pilot Plant (WIPP) project as a defense-only disposal site and ordered DOE to move forward on the project after long delays revolving around the issues of whether it would also hold commercial wastes and of a state role in a siting decision.

The President has now decided not to pursue this WIPP project as authorized and to address the disposal of defense wastes within the context of the national effort to dispose of commercial wastes.

Doesn't this just reopen the old argument about what WIPP should hold and whether defense wastes should be regulated by the Nuclear Regulatory Commission for the first time? Won't this just further delay our arriving at a solution as to where we should dispose of our defense wastes?

Answer. The Waste Isolation Pilot Plant (WIPP) project was authorized by Congress in 1977 as a demonstration repository for defense program TRU wastes and to conduct research and development with high-level waste forms in bedded salt. Based upon the recommendations of the Interagency Review Group (IRG) and a comprehensive review of the national nuclear waste management program, the President decided that the WIPP project should be cancelled and that defense waste previously intended for disposal in the WIPP facility could be disposed of instead at the first commercial waste disposal facility. The President considered that all repositories for permanent storage of highly radioactive waste should be licensed and that an R&D facility for transuranic waste alone would not provide the useful experience relevant to either licensing or geologic radioactive waste disposal, and therefore would be an inefficient use of funds. These

reasons, coupled with the strategy to compare sites of different geologic characteristics prior to site selection, override the advantages of early experience with an unlicensed repository for defense wastes only. In the long run the Administration feels that this approach is more likely to result in an acceptable system of high level and TRU waste repositories than the WIPP strategy as incorporated in the FY 1980 Public Law (P.L. 96-164) which authorizes the appropriations for the WIPP project.

As you are aware, the Administration requested no funding for the WIPP project in the FY 81 budget proposal, and on March 4, 1980, the President forwarded to the Congress a rescission notice with respect to funds authorized in FY 80. The Congress did not confirm the rescission, therefore, the Department intends to fully respect all statutory requirements on the WIPP project. Until changed by law, we are proceeding with the mission as authorized, that is, the retrievable storage of Defense TRU wastes and experiments with high-level wastes in an unlicensed facility. Obviously our work plans for FY 80 will be dictated by funding availability.

#### ENHANCED RADIATION (NEUTRON) WARHEADS

*Question.* What is the status of our current program to reduce neutron warheads? When will such warheads be ready for deployment to Europe, and for which systems? How long will it then take to convert non-ER nuclear rounds to neutron rounds?

*Answer.* The Department of Energy (DOE) is complying with President Carter's decision of October 1978 in which he directed that we proceed to modernize the W70-4 LANCE warhead and the W79-0 8-inch Artillery Fired Atomic Projectile (AFAP) and deliver to the Department of Defense (DOD) without the enhanced radiation (ER) features. [Deleted.]

The initial operational capability (IOC) dates, in Europe, for the non-ER versions of the LANCE missile warhead and the 8-inch AFAP warhead are [deleted], respectively.

The amount of time required to convert these non-ER warheads to ER-capable warheads depends upon when a decision to undertake the conversion is made. If a decision is made before actual production begins, then the ER [deleted] can be incorporated in the warheads at the time of manufacture.

[Deleted.]

If the decision is made after all production activities have been completed, then it is estimated that the ER deployment could be completed in approximately [deleted].

#### SAFEGUARDS AND SECURITY

*Question.* On page 3 of your statement, you say that "our perceptions of the threat have changed from time to time, and no doubt will continue to be modified as a reflection of future events. Likewise, safeguards and security system requirements must also continue to change with time."

How have our perceptions of the threats to our DOE nuclear weapons facilities, materials and classified information and to DOE contractors and to civilian nuclear facilities against theft and sabotage change during the past 10 years? Why, in each case?

Have we managed to keep ahead of the threat as it changed? Why or why not?

*Answer.* Although we are responsible for developing safeguards to counter threats against Federally-owned nuclear materials, weapons, and research and development installations and the NRC is responsible for regulating civilian nuclear power plants and selected fuel cycle facilities, the two agencies, nevertheless, work closely together in developing threat guidance in our respective areas.

History is a constant reminder that adversary capabilities and intentions with respect to potential threats to nuclear programs have changed over time. Concerns about foreign espionage prevalent during the Cold War years dissipated somewhat during the 1960's only to be replaced by the threat of diversion of and uncertainties surrounding the adequacies of material accountability that surfaced in the mid- and late-1960's following the highly publicized NUMEC Apollo, Pennsylvania, material unaccounted for (MUF) incident. Increasing emphasis on white collar crime added to this unease. Added to these concerns in the late 1960's and the early 1970's were the threats of civil disorder following the Martin Luther

King assassination and the potential targeting of nuclear facilities for sabotage by ultra-leftist radicals then active in certain portions of the country.

With the shocking massacres at Lod and Munich in the Spring and Fall of 1972 worldwide attention focused on the potential threats posed by international terrorism. In the United States the President created a Cabinet Committee to Combat Terrorism to develop countermeasures to prevent or discourage such acts from occurring on American soil. At first, most concerns related to the safety of international travel in the face of increasing instances of hijacking. But gradually, with increasing attention being accorded the possibility of nuclear materials or weapons theft by one or another of these groups and the alleged feasibility of building improvised nuclear devices, the nuclear community became concerned over its vulnerability to terrorist malevolence. In the face of continuing intelligence forecasts that international terrorism is not likely to recede in the next few years, at least, nuclear security specialists continue their vigilance against the varieties of threats these groups pose.

Also during this period developed an appreciation of the damage certain deranged individuals might wreak upon the citizenry should they decide to undertake some action against America's support systems, such as communication, transportation, water, or energy (including nuclear power). This appreciation was heightened subsequent to the publicity attending a number of instances of mass murder and other violence perpetrated by apparently psychotic personalities and questions that initially were raised about the possibility of malevolence in the Legionnaires Disease case.

The most recent trend in threat change has been with respect to insider-initiated acts of criminality. Insider-initiated threats of theft, diversion and sabotage of nuclear materials have become of real concern to safeguards specialists in recent years due to the contributions of research and the development of a new awareness about the potential threat posed by well-placed, technically knowledgeable employees at nuclear facilities. As a result of this most recent modification of threat perception, increasing emphasis is being placed on developing systems and procedures capable of minimizing opportunities for insider crimes and deterring those who might contemplate such acts.

These are all examples of changes in our perception of threat over time, some of which were successfully anticipated while others, such as the advent of international terrorism, were not fully anticipated by the world community. Although adequate steps have been taken to defeat potential adversaries, including armed terrorists should they choose to attack a DOE nuclear facility, an ongoing critical examination of the threat and implemented safeguards and security countermeasures is warranted.

As to changes in safeguards systems during the 35-year history of the U.S. nuclear program, there have been many. The early emphasis was on protecting classified nuclear technology and the focus was on individual loyalty and physical protection. Later, the emphasis changed to the development of complex physical security systems made up of large guard forces and various types of detection, alarm and deterrence hardware. R&D funding has resulted in the development of more sophisticated safeguards components and subsystems. Recent advances have been made in the development of material measurement and accountability systems, some of which allow for near real-time accountability of special nuclear material (SNM) in process. These changes in technology and safeguards systems have been stimulated in part by corresponding changes in threat perceptions. Certainly much of our current technology development work in the material control and accountability area is a result of recent concerns about insider-initiated acts of SNM diversion and theft.

In conclusion, while sophisticated and ingenious adversaries could severely test any safeguards system, we have made substantial progress in adjusting to these demands.

*Question.* On page 5 of your statement, Mr. Weisz, you say that a comprehensive evaluation of risk and consequences of possible malevolent acts against DOE facilities will be completed in FY 81. When was this study begun, and why is it only finishing in FY 81?

*Answer.* The risk and consequence analyses of malevolent acts against various types of nuclear facilities have been part of DOE's on-going research programs. The results of this research have been used to identify critical problem areas for safeguards and security improvements on an on-going basis.

A comprehensive evaluation and review of the risks and consequences of possible malevolent acts against DOE facilities is being undertaken in FY 80-81 because DOE's safeguards and security responsibilities have been expanded (as compared to those of the former AEC and ERDA), and because the results of several related studies will be available at that time. These results will broaden and complement previous work, permitting a more complete assessment and identification of critical problems.

Specifically these studies will include: an assessment of the consequences resulting from sabotage against DOE facilities; an examination of the social, psychological, and institutional consequences of malevolent acts against nuclear facilities, which could parallel those dramatized by the impacts of the Three Mile Island safety incident; an examination of a broad range of consequences related to plutonium dispersal; and initial study of risks and consequences associated with malevolent acts against non-nuclear energy facilities managed by DOE.

*Question.* You state this evaluation "should provide the basis for identifying major vulnerabilities that will require additional policy changes, R&D security enhancements, and further studies." Haven't you been able to identify these major vulnerabilities before? Why, or why not?

*Answer.* Specific vulnerabilities have been identified at DOE facilities based on previous assessments. The results of these assessments have contributed important information for remedial action and for the development of policy and the identification of needed R&D efforts. The emphasis on developing a comprehensive evaluation of risk and consequences is not based primarily on a previous lack of attention given to this subject; rather, it is based on the need to effectively address the safeguards and security interests of DOE (as compared to the AEC and ERDA) and to incorporate the results of recent studies which broaden and complement previous work in this area. While certain types of risk and consequence analyses address potential generic vulnerabilities, OSS has and will continue to utilize facility specific vulnerability studies which include analyses and expert assessments. This approach is based on our working hypothesis regarding the nature of the threat. Unforeseen potential vulnerabilities can develop as new adversaries or motivational influences appear, or as new capabilities and techniques are utilized in the commission of criminal acts. Thus, we feel the appropriate approach to safeguards involves a continuing process of threat identification, risk and consequence analysis, and the evaluation of generic and specific vulnerabilities of DOE facilities, operations, and classified matter, etc.

*Question.* You continue that "A key policy product which will be developed in part with support from these studies will be the issuance of a revised threat guidance. . . . Additionally, in FY 81, a mechanism to periodically review and issue this threat guidance will be implemented."

Why wasn't such a prudent measure taken before? Why has it taken until FY 81 to implement such a system?

*Answer.* This is not the first year in which we have modified our threat guidance. Guidance has been developed and disseminated a number of times over the years of the nuclear programs in this country to reflect both legal requirements and our perception of the nature of the threat to our security interests. In FY 1981 we will be instituting a formal mechanism to review the threat guidance in order to determine its current applicability and the need to revise it. The reviews will be performed on an annual basis, and will be based upon continuing research into how the threat is characterized as well as liaison with the DOE field office managers (and DOD and NRC) to insure that our threat guidance can be practically and effectively implemented.

As I noted in my written testimony, 1980 will mark a substantial revision to our most current threat guidance. The new guidance will focus on several new aspects which had previously been given only peripheral attention. The new mechanism for threat guidance review will help to insure that future revisions to the guidance will be both timely and will accurately focus on the broad spectrum of threat types which our system must be prepared to cope with.

QUESTIONS SUBMITTED BY SENATOR STROM THURMOND, ANSWERS SUPPLIED BY  
DUANE C. SEWELL, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS, DEPARTMENT  
OF ENERGY

SUPPLY AND DEMAND OF NUCLEAR MATERIALS

*Question.* Mr. Secretary, according to a recent article in the Washington Post newspaper, DOE is nearing completion of a study on material needs for the nuclear weapons program. Is it true that our present facilities are insufficient to support the weapons buildup the Defense Department advises it now needs?

*Answer.* The study referred to in the Washington Post newspaper probably was the National Security Council directed study on nuclear weapons stockpile projections and related materials requirements. The study, being conducted by DOD and DOE, will consider several cases. The study is not yet complete so, at this time, we are unable to comment on whether present production facilities are sufficient to support the requirements projected by that study.

*Question.* Mr. Secretary, when does DOE plan to take substantive steps to build new nuclear reactor complexes to meet the currently estimated and future requirements of our Nation in this area?

*Answer.* A new Materials Production facility will be evaluated in FY 1980 and FY 1981. The DOE budget submitted to Congress for FY 1981 contains \$1 million for the evaluation of various concepts for the production of special nuclear materials required in the 1990's and beyond. More substantial steps are planned to be taken in FY 1982 after completion of the concepts evaluation.

*Question.* Why are the reactors in the Savannah River Plant operating at less than capacity in view of these material needs in the 1980's?

*Answer.* The FY 1980 and the FY 1981 budgets provide the funding required to operate the three Savannah River reactors at their current full capacity level. However, operations of the Savannah River reactors will be limited due to unscheduled downtime associated with upgrading requirements.

*Question.* SALT II has been laid aside since the budget now before us was submitted. In view of the SALT II situation, the increased tension in the world caused by the situation in Iran and the Soviet invasion of Afghanistan, would you favor increased production at Savannah River in FY 1981?

*Answer.* Senator, your observation relative to the dynamic changes in the SALT II, Iran, and Afghanistan situations since the FY 1981 budget was formulated are well taken. The Administration is presently evaluating the need for increased nuclear materials production. Increased production can be realized from starting up PUREX at Richland, Washington, and converting N-Reactor at Richland, Washington, to a weapons-grade plutonium operating mode and by starting up one or both of the standby production reactors at Savannah River.

*Question.* Mr. Secretary, are you absolutely confident that we will have sufficient materials to meet out nuclear weapons demand in the 1980's?

*Answer.* In view of a number of uncertainties related to the future of the nuclear weapons program, it is difficult to certify that we will have sufficient materials to meet nuclear weapon demands in the 1980's. The DOE has the capability of increasing the supply of weapons-grade plutonium and tritium currently being produced. These options include: conversion of N-Reactor at Richland, Washington, from production of fuel-grade plutonium to weapon-grade plutonium; restarting one or both of the standby production reactors at Savannah River; and, blending of fuel-grade plutonium, from N-Reactor, with low Pu-240 content plutonium specially produced in the Savannah River production reactors. Use of any N-Reactor plutonium will require restart of the PUREX fuel processing plant at Richland, Washington. All of these options are considered feasible and are contingent only on the availability of funds and adequate lead time.

*Question.* What is the approximate cost and time period involved in building a new production reactor? Would it involve new technology?

*Answer.* It would cost \$3 billion, depending on the reactor concept chosen, and ten years to design and build a new production reactor if it is assumed that as a Defense Programs effort it would be exempt from the NRC regulatory process. The evaluation process to be employed to select a concept for a new production reactor will place an emphasis on utilization of existing technology and technical resources.

*Question.* Would you favor more planning and design money in this budget in view of recent events and the fact there has been such a change since this budget was drawn?

*Answer.* The need for design and planning resources to support production facilities upgrading, TMI-related safety and training activities, and definition of a replacement reactor facility has placed significant pressure on the Materials Production budget already adversely impacted by a higher than anticipated inflation rate.

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QUESTIONS SUBMITTED BY SENATOR STROM THURMOND, ANSWERS SUPPLIED BY  
DR. GILBERT, DIRECTOR, NUCLEAR MATERIALS PRODUCTION

HEAVY WATER PLANT OPERATIONS

*Question.* The heavy water facility at Savannah River is being operated at minimum level prior to shutdown. Why is this the case?

*Answer.* The Department of Energy FY 1981 budget request depends upon heavy water sales to continue operation of the heavy water production plant at Savannah River. About 47 metric tons of heavy water sales are required to provide additional funds of about \$5 million to meet cost for operating the plant at the minimum level or about three-eighths capacity. Firm sales forecasts now total about 21.8 metric tons, all to the Department of Defense. Should sufficient sales of heavy water not be consummated, the heavy water production plant will be shut down. The current inventory provides sufficient heavy water to meet all known and projected demand through 1988.

*Question.* Is SRP prohibited from operating the heavy water facility at a level above three-eighths capacity unless cost of sales of heavy water are assured?

*Answer.* Firm sales forecasts do not indicate sufficient funding availability in FY 1981 for Savannah River to resume operations at a level above three-eighths capacity. However, three-eighths capacity operation maintains the capability to return the plant to full capacity operation should additional demands emerge.

*Question.* Can you state without equivocation that we now have enough heavy water to assure operation in the 1980's?

*Answer.* The Department of Energy cannot state that we have enough heavy water to assure operations through the 1980's. However, there currently is a stockpile of about 800 metric tons of heavy water which will meet currently known and projected requirements through 1988 while maintaining reserves for startup of the two Savannah River reactors held in standby.

*Question.* What would it cost to build a new plant if this one is closed down?

*Answer.* A new heavy water extraction plant based on the Girdler Sulfide (GS) extraction process is estimated to cost between \$200 million to \$260 million in FY 1978 dollars and require about five years to construct. The GS process produces heavy water of about 8 mol percent concentration which is distilled to 99.75 percent.

*Question.* How much longer can we expect the present facility to produce heavy water?

*Answer.* The heavy water production plant is estimated to be capable of operating into the early 1990's should adequate resources be provided under the Nuclear Materials Production upgrading program to incur maintenance and overhauls.

*Question.* Does this budget provide for a reduction in the heavy water operation and, if so, in what amount and how do you justify this reduction?

*Answer.* This budget request is a reduction of about \$3.3 million from FY 1980's heavy water production funding. Continued operation of the heavy water production plant in FY 1981 is dependent upon heavy water sales. The reduction is based on the availability of the existing stockpile of about 800 metric tons of heavy water, overall budgetary constraints, and priorities of the nuclear materials production program.

*Question.* How do foreign sales figure into the heavy water operation?

*Answer.* I am providing for the record the following chart which illustrates a forecast of foreign heavy water sales.

## HEAVY WATER PRODUCTION, FISCAL YEAR 1981 PLANNING

Status and forecasted foreign sales	Metric tons	Sales costs (millions)
Firm—Power Reactor and Nuclear Fuels Development Corporation, Japan.....	1	\$0.2
Possible—Power Reactor and Nuclear Fuels Development Corporation, Japan.....	8	1.6
Possible—Institute of Nuclear Energy Research, Taiwan.....	4	.8
Potential—Italy.....	430	91.7
Total.....	443	\$94.3

Note: As shown in the chart, forecasted firm foreign sales are small. However, there are a few possible and potential large-scale foreign heavy water sales which cannot be counted on for funding operations.

## ADEQUACY OF THE UPGRADING (RESTORATION) PROGRAM AT SAVANNAH RIVER

*Question.* The most significant capital funding problem at the Savannah River Plant involves the upgrading program. What funds were requested for Savannah River in FY 1981 in the capital and operating accounts for this program?

*Answer.* The funds requested by Savannah River in FY 1981 were:

[In millions of dollars]

	Authorization	Budget authority
Plant and capital equipment.....	328.0	5
Operating expenses.....	3.4	63.3
		3.4

*Question.* What was allowed by DOE and what was allowed by the Office for Management of the Budget (OMB) in the final budget submission?

*Answer:*

[In millions of dollars]

	Authorization	Budget authority
<b>Funds allowed by the DOE:</b>		
<b>Total materials production:</b>		
Plant and capital equipment.....	46.0	46.0
Operating expense.....	4.0	4.0
<b>Savannah River:</b>		
Plant and capital equipment.....	41.3	41.3
Operating expense.....	2.2	2.2
<b>Funds allowed by the OMB:</b>		
<b>Total materials production:</b>		
Plant and capital equipment.....	34.1	9.0
Operating expense.....	0	0
<b>Savannah River:</b>		
Plant and capital equipment.....	34.1	9.0
Operating expense.....	0	0

*Question.* Dr. Gilbert, it is imperative that the deficiencies in this area be corrected at the earliest possible time. The total upgrading program would cost \$340 million. In the incremental plan, what is the minimum amount needed in FY 1981?

*Answer.* In the incremental plan, the minimum amount needed in FY 1981 at the Savannah River Plant is \$43.4 million.

*Question.* How would these funds be used in FY 1981?

*Answer.* The Savannah River incremental funds would be used as shown below.

[In millions of dollars]

Project	Fiscal year 1981		
	TEC	Authorization	Appropriation
Construction line items subtotal.....	39.4	39.4	21.0
Safety improvements reactor fuel handling facilities.....	11.0	11.0	9.0
Replace obsolete neptunium oxide facilities, HB-line.....	23.1	23.1	6.9
Boiler control improvements.....	4.0	4.0	3.8
Metallurgical laboratory improvements.....	1.3	1.3	1.3
Capital equipment, subtotal.....	20.3	20.3	20.3
Operating (maintenance), subtotal.....		2.1	2.1
Savannah River total.....			43.4

*Question.* Dr. Gilbert, a staff visit to the Savannah River Plant indicated that DOE is not moving fast enough with the upgrade program and that unless this effort is not funded, unscheduled shutdowns of some critical facilities might be expected. What is your assessment of this situation?

*Answer.* As a result of assessments conducted by the Savannah River operating contractor, the Materials Production staff, and a large multidisciplinary independent team, it has been established that deterioration and obsolescence are serious and pervasive. A report was submitted to Congress by DOE in June 1979 which assessed the extent of deterioration and obsolescence, forecasted resources required to restore Nuclear Materials Production and Defense Waste Management facilities within a five-year period, and established a system for annually updating the assessment. However, FY 1981 budget limitations resulted in funding only those projects with immediate potential safety implications and resulted in an extension of the restoration program to a six-year period.

*Question.* Dr. Gilbert, do you consider the \$20 million requested by Savannah River Plant to move on boiler controls, reactor heat exchangers and other critical items in FY 1981 high priority programs?

*Answer.* The work required to enhance the reliability of four primary heat exchangers for cooling Savannah River reactor moderator is considered important to the continuity of operation of the production reactors. The boiler controller improvements line item at Savannah River is important to the safety of operation of these facilities. This project provides modern instrumentation and improved alarms and safety devices for power plants serving processing and heavy water production facilities. Installation of continuous sampling and radioactive monitoring equipment, updating of emergency control consoles, and renovation of the Metallurgical Laboratory have been considered among the highest priority facility restoration activities.

*Question.* Dr. Gilbert, I understand funding at Savannah River Plant is so short that officials have warned DOE the contractor is unable to increase the contractor work force to train for extensive retirements at this facility in FY 1982 and after. Are you aware of this situation?

*Answer.* For some time prior to TMI, the operating contractor at Savannah River has been evaluating the need for increased training of reactor personnel. Since TMI, the amount of training deemed appropriate for personnel operating nuclear facilities has been further increased. When the increased training requirements are coupled with the situation at Savannah River where many key reactor staffers will reach retirement age over the next few years, it is apparent that a serious need exists for committing increased resources to training. We have given a priority within available funds to enhanced training throughout the Materials Production complex.

*Question.* What is the current DOE plan to fully fund and implement the Savannah River Plant upgrading program by FY 1986? Show the funding by fiscal years.

*Answer.* The current plan to fully fund the Savannah River Materials Production Facilities upgrade program by FY 1986 is presented below.

[Fiscal year 1980 dollars in millions]

	Fiscal year					
	1981	1982	1983	1984	1985	1986
Capital.....	\$9	\$47.7	\$62.7	\$42.2	\$47.3	\$35.7
Operating.....	0	2.3	2.3	2.2	2.7	0

**Question.** Did your initial plan call for greater expenditures in FY 1981?

**Answer.** Yes, the initial plan submitted to Congress in June 1979 included the following Savannah River Plant expenditures for FY 1981:

	<i>Fiscal year 1980 millions</i>
<b>Production:</b>	
Construction projects.....	\$19.0
Plant engineering and design.....	2.3
General plant projects.....	4.1
Capital equipment.....	10.9
Operating.....	2.1
<b>General Support Facilities:</b>	
Construction projects.....	4.7
Plant engineering and design.....	1.3
General plant projects.....	4.4
Capital equipment.....	26.1
Operating.....	0.8
<b>Total</b> .....	<b>75.7</b>

#### REPROCESSING OF HANFORD SPENT FUEL

**Question.** What plan does the Administration have for processing N-Reactor spent fuel from Hanford?

**Answer.** N-Reactor spent fuel was previously processed at the Hanford PUREX fuel processing plant. The FY 1981 budget request provides for reducing the PUREX plant to a lower level of standby condition than FY 1980. This lower standby condition will preserve the option to resume PUREX operation with appropriate hiring, upgrading, documentation, and engineering. Plans are to resume PUREX processing of N-Reactor spent fuel when a campaign (or campaigns) can be justified based on the need for nuclear materials to meet both defense and energy research and development requirements, provided adequate resources are available.

**Question.** If the PUREX Plant cannot be reactivated, are there contingency plans to process this spent fuel at Savannah River?

**Answer.** Recent inspections, operational tests, and maintenance efforts show that the PUREX fuel processing plant can be reactivated should that decision be made and appropriate resources provided. We have no specific plan for processing N-Reactor fuel at Savannah River. In FY 1979, we evaluated the concept of modifications to the F-processing plant at Savannah River which would be required to process N-Reactor fuel. Major modifications would be required to provide a mechanism to shear the zirconium-clad N-Reactor fuel and dissolve the resulting exposed irradiated uranium for subsequent plutonium processing in the existing portions of the F-processing plant. Modifications to the F-processing plant, support facilities, and shipping casks were estimated to have a capital cost of approximately \$132 million (FY 1979 dollars) which is significantly more than reactivation of PUREX costs. In addition, shipping fuel across the nation from Hanford to Savannah River would require significant logistical coordination and expense.

#### EFFECTS OF INFLATION

**Question.** As you testified, your fiscal year 1981 budget used 8½ percent inflation rate. What funding must be added to adjust for the current rate? If additional funding is not provided, what is the programmatic impact?

**Answer.** We now estimate the 1981 inflation rate may be in the range of 15 to 20 percent with an estimate impact on the total nuclear material production budget of \$34 to \$60 million. Specific examples of large increases that we are

currently experiencing in FY 1980 are purchases of zirconium for fuel cladding (15 percent), petroleum products (76 percent), and purchased electrical power (16 percent).

If inflation is as high as now anticipated and if additional funds are not provided, a comprehensive indepth review at the appropriate time would be made. There would be a major impact upon material production operations.

#### THREE MILE ISLAND (TMI) ASSESSMENT

*Question.* As a result of the TMI incident, has the Department conducted an assessment of production facilities? What additional funding requirements have been identified for fiscal year 1981?

Answer. DOE initiated through the program organization and operating contractors a detailed assessment of the implications of the lessons learned from the TMI incident. The assessment was initiated in April 1979 and is ongoing. It is expected to be completed in FY 1980 with a safety overview evaluation conducted by the Under Secretary for DOE.

The initial results from the technical assessments indicate the following additional funding requirements for FY 1981 to implement the remedial actions identified as shown in the following chart:

FISCAL YEAR 1981 "THREE MILE ISLAND STUDY" FUNDING REQUIREMENTS—SUMMARY—BUDGET AUTHORITY  
[In thousands of dollars]

	Operating	Plant and capital equipment
<b>A. Savannah River plant:</b>		
Computer assisted alarm system.....		2,000
Remote detection and controls Rx areas.....		8,500
Software development, Rx safety projects.....	500	
Operator and supervisor personnel qualifications and training.....	1,500	
Update abnormal condition control procedure bases.....	50	
Upgrade Rx emergency power systems.....		600
Replace cooling water gamma monitor.....		100
Effluent water activity monitoring and sampling system.....		550
Remote radiation monitoring system.....		450
Reactor engineering safety studies, SRP.....	300	
Three Mile Island, 2 lessons learned studies, SRP.....	3,340	
Subtotal.....	5,690	12,200
<b>B. Richland, N reactor:</b>		
Increase reactor maintenance.....	420	
Reactor coolant instrumentation and computerization.....	110	
Reduce complexity of reactor operator response to emergency core cooling situation.....		1,000
Initiate reactor simulator program.....	130	
Upgrade training of reactor shift manager and control room supervisor.....	160	
Increase nondestructive testing of reactor intervals.....	435	
Subtotal.....	1,255	1,000
Total.....	6,945	13,200
Grand total.....	20,145	

#### QUESTIONS SUBMITTED BY SENATOR STROM THURMOND, ANSWERS SUPPLIED BY DR. CUNNINGHAM, ASSISTANT SECRETARY FOR NUCLEAR ENERGY

##### SAVANNAH RIVER, DEFENSE WASTE PROCESSING FACILITY

*Question.* Dr. Cunningham, what was the waste facility money request by the Savannah River Plant for FY 1981 and did it include a capital line item?

Answer. For the Defense Waste Processing Facility, the Savannah River Plant requested a total FY 1981 budget of \$46.9 million, including \$42.5 million for a design only capital line item.

*Question.* Under this proposal, when would the plant be completed and in operation?

Answer. The Savannah River Plant proposal supported an FY 1982 construction authorization and operation in FY 1989.

*Question.* What was the DOE response to this proposal, and did DOE provide for the same schedule on plant completion and operation?

Answer. DOE review concluded that construction authorization in FY 1982 could be attained with an FY 1981 budget of \$24.5 million, including \$20 million for a design only capital line item. Operation would still begin in FY 1989, but there would be less assurance of meeting this schedule than with the Savannah River Plant request.

*Question.* Dr. Cunningham, what did OMB propose and how did they justify their action?

Answer. The President's FY 1981 budget submission to the Congress included \$10 million for DWPF. This amount would continue the project within overall budget priorities, but would extend the schedule for completion by at least a year.

*Question.* Why is it important to proceed promptly with this facility?

Answer. Nuclear wastes generated at the Savannah River Plant have been stored in tanks awaiting permanent disposal for over 25 years. In his February 12, 1980 speech, the President stated that "The responsibility for resolving military and civilian waste management problems shall not be deferred to future generations." This statement illustrates the Administration's conviction that those who benefit from waste generation should take the responsibility for its disposal.

The proposed Savannah River Plant facility would be the first to prepare defense high-level nuclear wastes for permanent disposal. Construction of this facility would show a commitment to resolving the nation's nuclear waste disposal problem. The sooner that we operate a waste processing facility at Savannah River, the sooner we can stop construction of additional interim storage tanks and begin to decommission existing tanks.

*Question.* What is the currently estimated cost of this facility?

Answer. Defense Waste Processing Facility capital construction is currently expected to cost about \$2.3 billion based on a schedule consistent with the President's FY 1981 budget submission. DOE is actively pursuing methods to reduce this cost, including the possibility of building the project in stages.

*Question.* Dr. Cunningham, what do you consider the minimum funding level in order to meet the schedule proposed by officials at the SRP?

Answer. For the entire Defense Waste Processing Facility to be operational in FY 1989 as proposed by the SRP, \$24.5 million would be required in FY 1981, including a \$20 million design only capital line item. Should we elect to proceed with a staged facility, we would be able to construct the first portion of the plant for operation by FY 1989 for \$16 million in FY 1981, including \$6 million preliminary engineering and design funds.

#### SAVANNAH RIVER, INTERIM WASTE MANAGEMENT OPERATIONS

*Question.* What is the current schedule for storage transfer of wastes at Savannah River and how much was cut from the SRP request in this area?

Answer. The current schedule for storage transfer of wastes at Savannah River calls for the completion of liquid and salt transfer, both begun in FY 1979, in FY 1982. The schedule also calls for the completion of sludge transfer by FY 1985 and chemical cleaning for the removal of residual wastes from all old tanks in FY 1988.

In their budget submission for FY 1981, Savannah River requested \$46.5M for the tank replacement/waste transfer program. In the FY 1981 Congressional Budget Authorization \$32.3M is requested for this task. The reduction was made because the final tank cleaning operations can be safely extended for completion in FY 1988.

*Question.* What risks are being taken by this slow, poorly funded program to get the wastes into better tanks?

Answer. No significant additional risks to man or his environment are being incurred with the current schedule for completion of waste transfer to new tanks at Savannah River. The risk of release of radioactive materials comes primarily from the storage of liquid, salt cake, and sludge in the old tanks. These will be removed by FY 1985. Final tank cleaning has been extended for completion in FY 1988.

*Question.* Dr. Cunningham, if the current schedule is stretched out, how many additional waste tanks will be necessary and what will be the approximate cost of the tanks?

Answer. The total number of new waste tanks needed at Savannah River was determined based on current inventories of high-level wastes in the old tanks and on projected generation rates of new wastes in future years. The number of tanks is not dependent on changes in the current schedule for construction of new tanks or waste transfer from old to new tanks. The new waste tanks already completed or under construction have sufficient capacity for storage of the transferred

waste and for future waste, based on continuation of current reactor operations, until about 1989.

QUESTIONS SUBMITTED BY SENATOR THURMOND, ANSWERS SUPPLIED BY MR. WEISZ,  
DIRECTOR, SAFEGUARDS AND SECURITY

SAFEGUARDS AND SECURITY

*Question.* The General Accounting Office recently released a report that was quite critical of procedures at Savannah River for accounting of plutonium inventories. What does the Department intend to do to assure that these procedures are improved in the future?

*Answer.* The GAO's critique of plutonium accounting at Savannah River Plant focused on the cumulative inventory differences observed over the period 1955 through 1978. The cumulative inventory difference is considered by the GAO to be indicative of inadequate safeguards at Savannah River.

By making this observation, the GAO has assigned an incorrect safeguards role to materials accountability at the Federal facility. Within the DOE, first-line reliance in safeguards is placed on physical security and material control measures which are designed to prevent, in real time, thefts or diversions of nuclear materials. Accountability provides an after-the-fact check on the overall effectiveness of the safeguards and security system. In this way, it provides added assurance that, within the limits of measurement uncertainty, no nuclear material has been diverted. To maintain adequate safeguards assurance at the Savannah River Plant, a comprehensive safeguards and security upgrading program has been underway since the mid-1970's. This program has resulted in discrete improvements in all aspects of safeguards and security. Included are major line item and operating upgrades in physical security, material measurement, and material control and accountability. Examples of measures put into place are additional guards and patrols, alarms and communication equipment, hardened guard stations, hardened special nuclear material storage areas, material detection and assay equipment, and portal monitors to detect the passage of special nuclear materials.

To maintain the momentum of this improvements program and insure that safeguards and security is maintained at an effective level, additional studies, surveys and assessments are being carried out. Potential diversion paths at the Savannah River Plant are being identified and analyzed to tighten material control at the facility. Methods to improve materials accountability are also being investigated and implemented.

Results of these ongoing improvements at Savannah River Plant have significantly reduced nuclear material inventory differences due to measurement uncertainties. Performance over the past five years has been reflected in much smaller amounts of accounting differences when compared with prior years.

In conclusion, the DOE has taken reasonable steps to provide for safeguards and security assurance at Savannah River Plant. To date, there is no evidence that any of the inventory difference numbers represent a diversion of nuclear materials from that facility.

*Question.* In December of last year the Department undertook a limited safeguards training program at Barnwell Nuclear Fuel Plant in South Carolina. Would the Department object to continuing this program in FY 81 at a low level to assure that we fully utilize the sophisticated safeguards system being installed there?

*Answer.* The Department agrees in principle to continuing at a low level in fiscal year 1981 limited safeguards training activities at the Barnwell Nuclear Fuel Plant in South Carolina. At the present time the Department is developing the detailed plans for its fiscal year 1981 training program and will ensure that the Allied General Nuclear Services authorities will be contacted to see whether and how an effective low-level participation can be factored into our FY 1981 program.

In this connection we should note that the experience during December of last year led to some criticisms from the participants that the physical security equipment and systems installed at Barnwell were not reflective of commercial considerations or regulatory license requirements. The participants noted that the installations at Barnwell were an extension of the research and development installations and equipment they had been exposed to in Albuquerque. They expressed a strong preference to see and interact with a commercially operating nuclear power reactor that has an operating physical protection system.

[Whereupon, at 11:47 a.m., the subcommittee adjourned.]

# FISCAL YEAR 1981 DEPARTMENT OF ENERGY AUTHORIZATION FOR NATIONAL SECURITY PROGRAMS

TUESDAY, JUNE 24, 1980

U.S. SENATE,  
SUBCOMMITTEE ON ARMS CONTROL OF  
THE COMMITTEE ON ARMED SERVICES,  
*Washington, D.C.*

The subcommittee met at 2 p.m. in room S-407, the Capitol, Senator Henry M. Jackson (chairman of the subcommittee) presiding.

Present: Senators Jackson, Nunn, Exon, Thurmond, and Cohen.

Staff present: James C. Smith, professional staff member; Rhett B. Dawson, counsel; Ronald F. Lehman, professional staff member; and Marie Fabrizio Dickinson, clerical assistant.

Also present: Frank Gaffney, assistant to Senator Jackson; Greg Pallas, assistant to Senator Exon.

Senator JACKSON. The committee will come to order.

The purpose of the session today is to get additional testimony on S. 2341, the fiscal year 1981 Department of Energy defense programs authorization bill.

I felt that before we could mark up this bill, it would be necessary to get additional testimony from key administration witnesses because, as I understand it, there are two budget amendments under active consideration. The first totaling nearly \$100 million was transmitted to the committee on June 20, 1980, and pertains to the weapons production complex. The second which is still working within the administration pertains to the production of nuclear materials and I understand it may total nearly \$150 million.

[Deleted.]

Senator JACKSON. We are running out of time in this legislative session and must act quickly on this most important bill. I talked with Secretary Brown personally on the phone with regard to this hearing and he has assured me that Dr. Wade and General Allen can speak on his behalf.

We have with us today Mr. Duane Sewell, Assistant Secretary of Energy for Defense Programs; Dr. James P. Wade, Jr., Assistant to the Secretary of Defense (Atomic Energy); and Gen. Lew Allen, Jr., Air Force Chief of Staff. I understand these gentlemen do not have prepared statements, but I gather that you are prepared to speak informally on the questions before us. How do you want to start? General Allen, would you like to begin?

STATEMENTS OF HON. DUANE C. SEWELL, ASSISTANT SECRETARY OF ENERGY FOR DEFENSE PROGRAMS; GEN. LEW ALLEN, JR., CHIEF OF STAFF, U.S. AIR FORCE; AND DR. JAMES P. WADE, JR., ASSISTANT TO THE SECRETARY OF DEFENSE (ATOMIC ENERGY)

General ALLEN. No, sir. I am prepared to answer questions.

Senator JACKSON. Dr. Wade?

Dr. WADE. The same, Mr. Chairman. I would like to add that Secretary Brown sends his regrets on being unable to appear. I would like to note for the record that I am representing Secretary Brown and his views on the matters which we will be discussing this afternoon and I am prepared to answer your questions.

Senator JACKSON. I understand, and the Secretary made it clear that you as well as General Allen would be able to speak for him in connection with the questions that we have raised.

Mr. SEWELL. Mr. Chairman, I would like to make a few comments, if now is the right time, for the Department of Energy.

I am pleased to appear before this committee again representing the Secretary of Energy. Incidentally, Secretary Duncan regrets he could not be here.

Senator JACKSON. I spoke to him too. He is in Europe at this time.

FISCAL YEAR 1981 WEAPONS ACTIVITIES BUDGET AMENDMENT

Mr. SEWELL. I would like to make a few comments about these two amendments that you referred to. One was transmitted to you on June 20 by the President. It covers the additional money needed for the weapons development and production activities. We are still developing the second amendment that you spoke about for the nuclear material production program. I hope to have it ready to submit to OMB, shortly, but it is still in the Department of Energy at the present time.

Let me describe the funding requirements that are being requested in the weapons amendment. You mentioned about \$100 million. There actually is \$90.5 million requested in new budget authority and \$132.1 million in additional authorization. Of the \$132.1 million, \$119 million is in operating, and \$13 million is for one construction project. The amendment is necessitated by the greater price increases than were anticipated in the fiscal year 1981 budget. Of the \$119 million in the operating area, \$34 million is for the R. & D. category, and \$85 million is for production and surveillance.

That in the R. & D. area is broken down in the following way: You will remember I testified earlier we had only 8½ percent for inflation in the R. & D. budget. We now realize that we will have about 11.6 percent inflation, roughly 3 percent higher. The \$34 million that we are requesting in R. & D. is divided as follows: \$10 million in utility price increases, primarily due to the gas price regulation change that occurred; \$6.8 million to cover electricity rate increases; \$2 million for the weapons laboratory wage and salary increases that were approved within the President's guidelines; \$11.2 million for inflation of materials and supplies that we must purchase; and \$4 million to

cover problems created by the earthquakes at Lawrence Livermore National Laboratory in Livermore, Calif.

For nuclear weapons production and surveillance, we originally projected a 7.9 percent inflation rate.

We now estimate 11.9 percent. Furthermore, we did not take into account the inflation that occurred in fiscal year 1980 when we projected that 7.9 percent and we have, as you know, a \$30 million supplemental still before Congress that must be taken into account when calculating our funding for fiscal year 1981. The \$85 million for production and surveillance activities is broken down as follows: \$34.1 million inflation in procurements for materials; \$26.6 million for laboratory cost increases; \$17.3 million for utility increases; and \$7.1 million for the unanticipated rise in the price of gold.

#### PROPOSED NUCLEAR MATERIALS PRODUCTION BUDGET AMENDMENT

The second amendment that I indicated is still within the Department of Energy. I anticipate getting it to OMB within the next week or 10 days. This amendment is required for three reasons. The first reason is to be able to provide for the increased quantities of nuclear materials necessary to meet DOD requirements. In previous testimony on our fiscal year 1981 budget request, I indicated that long-term requirements for nuclear materials might take an upturn after fiscal year 1985. Second, the high inflation rate has caused problems in this area too. The final reason is the requirements resulting from the need to implement within DOE's production reactor facilities the lessons we learned from safety studies of the Three Mile Island incident. We feel it is prudent to make those changes now.

That summarizes my statement.

#### NUCLEAR MATERIALS AVAILABILITY

Senator JACKSON. Thank you very much, Mr. Sewell.

This committee has been told that there is no problem with availability of nuclear material. According to the report signed by Secretary of Defense Brown and John Deutch for Secretary of Energy Duncan on April 25, 1980, and according to Assistant Secretary Sewell's testimony on April 28, 1980, the production schedules and current stockpile could be met. Let me ask the question again. Is there a problem with nuclear materials either in the near term, 1981-84, the midterm, 1985-90, or the long term, post-1990? And if so what are we going to do about it?

Mr. SEWELL. Responding to the first part of your question, the near term 1981 to 1984 [deleted]. At the present time, it is scheduled to come on line in the second quarter of 1982. Prior to that time, we are going to add some capability at the Los Alamos Laboratory and at the Savannah River Plant in addition to putting some facilities back into operation at Rocky Flats in order to be able to meet the requirements that the military has placed on us up through the second quarter of fiscal year 1982. [Deleted.]

In the second quarter of fiscal year 1982 [deleted]. We do not believe there will be any delay of delivery of warheads to the military.

Senator COHEN. Clarify what you mean when you say you will add capability at Los Alamos and other facilities. What kind of capability?

Mr. SEWELL. There is an electrorefining process that we will put into place at Los Alamos that will enable us to purify a certain amount of the material, and another process that we will add at the Savannah River plant. I will have to call upon Dr. Gilbert, head of our Office of Nuclear Materials Production, to answer that question. Dr. Gilbert?

Dr. GILBERT. It is a chemical purification process at Savannah River which will chemically process scrap that is coming back from retired weapons at Rocky Flats and make it usable again for new weapons. This capacity at Savannah River [deleted].

Senator COHEN. How long will it take to add that capacity at both Los Alamos and Savannah River and how much money have you budgeted?

Dr. GILBERT. The facilities at Savannah River are already in operation and at Los Alamos I believe it is due to start later this year.

Senator COHEN. When will it be completed?

Dr. GILBERT. We probably will keep both of those extra facilities operating through the second quarter of fiscal 1982.

Mr. SEWELL. When will it be completed and ready to operate?

Dr. GILBERT. At Savannah River it is operating. Ralph, would you know when the Los Alamos facility is going to be in operation?

Mr. CAUDLE. I do not.

Mr. SEWELL. We will get that for the record.

[The information follows:]

The expansion of the electrorefining operation at Los Alamos is scheduled to begin processing in the fourth quarter of FY 1980. The budgeted amounts for this process at Los Alamos is \$445 thousand in FY 1980, \$1.8 million in FY 1981, and \$2.0 million in FY 1982. The process at Savannah River will cost \$2.0 million in FY 1980 and \$2.5 million in both FY 1981 and FY 1982.

#### MIDTERM MATERIALS REQUIREMENTS

Mr. SEWELL. The midterm of 1985 to 1990 I believe were dates that Senator Jackson mentioned. As the report to Congress pointed out, the ability to supply the materials for the weapons that were listed in the stockpile memorandum was only taken care of through fiscal year 1985. There was an indication in that report that there may be an upturn, as I mentioned earlier, in the needs for plutonium beyond fiscal year 1985. If we take the stockpile memorandum and add the production that we could be required to fulfill, the items that are listed for planning purposes beyond [deleted].

We put all of that together, and if there are no changes in our capability to produce material [deleted] of that, there is a requirement for a build [deleted] which is being discussed between ourselves and the military—we have a letter from them asking the impact of such a build [deleted].

If in the fiscal year 1981 budget time frame we were to start the following actions we could alleviate the situation. These include: First, upgrade the three reactors at Savannah River so they will be running at close to 100 percent capacity rather than [deleted] capacity at which we are now running because of needed maintenance and upgrading; second, initiate putting the L reactor at Savannah River back in operating condition; third, convert the N reactor at Richland from the production of 12 percent fuel grade material to weapons grade 6 percent material; fourth, start putting the Purex plant back

into condition to be able to separate the material at Hanford; and fifth, operate the reactors at Savannah River on an operating schedule such that they would produce supergrade material [deleted] material that could be blended with the 12 percent material that we have at Hanford. [Deleted.]

At time beyond—

Senator COHEN. If we go through with all of the planned programs you mentioned, and if we take the five steps [deleted].

Mr. SEWELL. That is correct.

Senator COHEN. We have not talked about enhanced radiation weapons but are you saying that there is no short-term shortage of nuclear materials supplies for our currently planned systems?

Mr. SEWELL. That is correct.

Senator COHEN. And you are taking measures now that will compensate fully for any short-term problem?

Mr. SEWELL. That is correct.

Senator COHEN. [Deleted] if we go ahead with all our projected weapons systems, can we meet the mid-term supply [deleted].

Mr. SEWELL. All projected without air-launched cruise missiles, if we start increasing our plutonium production capacity in fiscal year 1981.

Senator COHEN. Without enhanced radiation weapons?

Mr. SEWELL. That is included in the plan. [Deleted.]

Senator COHEN. I want to know what plans you have for upgrading the plant, the L-Reactor, the N-Reactor, the Purex plant, and the fifth one I can't recall.

Mr. SEWELL. [Deleted] material production at Savannah River.

Senator COHEN. You say "if." Why do you make that condition?

Mr. SEWELL. Because that is not in the budget at the present time and that is the major point of the second amendment that we are talking about for nuclear materials.

Senator COHEN. Since you have apparently calculated this for the five proposals, would you analyze [deleted] if we have No. 1, the upgrade or if we only have one and two or if we have one, two, and three without four and five? If you would do that [deleted] under each plan?

Mr. SEWELL. Let me turn to Dr. Gilbert.

Dr. GILBERT. [Deleted.]

Dr. WADE. May I comment on that, Senator Jackson?

Senator JACKSON. Yes, Dr. Wade.

Senator COHEN. Before he begins, I would like to follow your line of questions to inquire [deleted].

Dr. WADE. I would add to what Dr. Gilbert just said. When we try to talk to specific numbers, [deleted] that degree of detail should be looked at in an overall context. [Deleted.]

Senator COHEN. In addition to the mechanics of the IOC dates, there are implications, for example, such as party platforms or political pressures that say we should discontinue or phase out nuclear powerplants. Certainly that would have an impact upon our ability to produce plutonium.

Dr. WADE. My point is that the policy of the Department of Defense is that [deleted] factor in how we plan and structure our nuclear forces. This is the key to approaching and understanding this issue.

Senator JACKSON. May I ask this question to get to the heart of the matter? As I understand it, Secretary Brown and the Chiefs recommended that we go forth without delay on the L reactor at Savannah River, the Purex plant, and the N reactor at Hanford. Is that not correct? And wasn't that the recommendation of OMB and signed off by Secretary Duncan as well?

Dr. WADE. Back in December, Senator Jackson, Secretary Brown recommended to OMB that, in order to protect outyear requirements and needed flexibility, Purex should be put on line this summer. He was not clear at that time as to whether N reactor should be converted to weapons grade production. He asked that there be sufficient funds put in the contingency account so that as we reviewed the problem over the next several months, the option would not be foreclosed.

Senator JACKSON. It is a question of how much risk you want to take. I think from a professional standpoint there is the need to move forward if we are going to achieve the specific goals and objectives required by our strategic weapons needs and as programed. I am just reading between lines here. My gut reaction is you get down to a risk factor. Sooner or later you are going to have to go to all three, make all three moves—the L reactor, the N reactor, and the Purex reprocessing facility. It seems to me that OMB is saying, "Stretch it out another year. We will keep it out of this budget."

I understand how they operate, but sooner or later you are going to have to do it. The reactors at Savannah River of course are heavily involved too in meeting our tritium requirements, are they not?

Dr. WADE. Yes, sir.

Senator JACKSON. What is the half life?

Dr. WADE. About 12 years.

Senator JACKSON. So you are constantly faced with that kind of commitment that represents a permanent setaside.

#### N REACTOR/PUREX

Senator COHEN. You made the decision not to proceed with the N reactor or startup of Purex?

Senator JACKSON. OMB turned down the recommendation of the Secretary of Defense and the Secretary of Energy—is that not correct?

Dr. WADE. That is correct.

Senator JACKSON. I want to ask you gentlemen, is this the prudent thing to do? I am not asking you to get into a dispute within the administration, but we have to face reality here and we need to know whether we are doing the wise and prudent thing in either going forward or not going forward with what amounts to—for all three items—\$150 million. We don't want to be in a position where we have failed to act responsibly in light of known facts as we understand them.

It seems to me you are right down to the question of how much of a risk do you want to take. That is what Secretary Brown is concerned about. I don't mean to speak for him, but how much of a risk do you want to take—should you take and is it prudent to do so? You are going to have to do it sooner or later, is that not correct?

Dr. WADE. Yes, sir. Sooner, rather than later.

Senator JACKSON. It is a question of delaying it another year.

Dr WADE. I am not suggesting here that Secretary Brown recommended delaying it another year.

Senator JACKSON. I think I know his position and I respect it because I have observed his work since 1955 when he started at Livermore with Ernest Lawrence. I have watched him ever since and I respect his judgment in this particular area; the need for weapons-grade plutonium. That is what we are talking about.

Dr. WADE. The other important aspect of the issue is the need to have adequate flexibility in the capacity of the DOE production Complex to meet unforeseen requirements downstream, one example being if SALT failed, depending on how the Soviets would move with their programs, we have to have the capacity to respond as required.

Senator JACKSON. Isn't this a rock bottom minimum?

Dr. WADE. There is no question about that.

Mr. SEWELL. One comment on that. Remember, up until this planning into the last half of the 1980's, the Department of Defense has requested, and we have maintained, at least a cushion for unforeseen contingencies.

[Deleted.] Now, one part of your question, Mr. Chairman, that I did not finish answering. That was the part beyond the 1990 time frame. We are in a position now, as you probably recognized, where decisions have to be made fairly soon [deleted].

#### TRITIUM PRODUCTION

I am referring to the fact that the Savannah River reactors and the N reactor are old reactors. In the mid 1990's they will be 35 or 40 years old. I think it is not prudent to plan that they will last beyond that time. Therefore, we should have plans for meeting our first production requirement, tritium, [deleted] for the stockpile. Let me digress to give you a feeling for that. If we stopped producing tritium today, the [deleted].

Another thing, if we stopped purifying tritium today, to process it to a form we can use in weapons, [deleted]. Tritium is a vital element. As you pointed out Mr. Chairman, it decays at a rate of 5 1/2 percent per year, a 12 1/2 year half life.

Senator THURMOND. Where are you producing tritium now?

Mr. SEWELL. At Savannah River.

Senator JACKSON. No other place?

Senator THURMOND. Any other place?

Mr. SEWELL. No other place.

Senator THURMOND. That is my home town.

Senator JACKSON. It is the only set of reactors producing weapons-grade plutonium and that is where you get your tritium. Hanford has been closed out and the N reactor is a dual purpose reactor. You have to do the necessary work to raise it up to producing weapons-grade plutonium. I think that a lot of people don't understand that just to maintain the stockpile you have committed how many reactors at Savannah River?

Mr. SEWELL. [Deleted] to maintain the stockpile.

Senator JACKSON. Not to add to it, but to make the weapons systems in the stockpile viable because you have to keep moving your tritium bottles around. As you say the half life is about 12 to 13 years.

So those reactors are absolutely necessary just to maintain the stockpile, to keep them current and that is my concern here. I just don't think we should allow someone over in OMB looking over a bunch of figures—and this happens in all administrations—making national security policy. I will tell you when the thing falls apart and we are caught without weapons-grade material when we need it, you are going to have headlines reading "Big investigations," I just think this is something I can't countenance myself based on the information that we have here.

Senator COHEN. I want to make a point, Mr. Chairman. Ultimately it comes down to a political decision. You gentlemen have testified to the rock-bottom requirements of the country as far as maintaining existing programs and planning for those in the future. But then we have "political decisions being made in OMB in terms of what will be salable to the American people or salable to Congress. We have a situation of an election year in which the chairman's party has called for phasing out of nuclear powerplants which in turn will have a serious impact upon the production of nuclear materials. So I don't know, Mr. Chairman, how we are going to resolve this issue. Further, in dealing with classified material, how do you bring this to the attention of the American people. It seems to me we shouldn't have a statement in the media that the President supports a platform which calls for the reduction of nuclear powerplants if in fact the plants are essential to our survival.

We cannot deal with that issue publicly.

Senator JACKSON. I remind you of Alben Barkley's famous injunction. He said "Political platforms are like a railway station platform, something that is convenient to get in on but not to stand on."

Senator EXON?

#### FUNDING REQUIREMENTS

Senator EXON. Let me see if I can cut through all this for my information. I don't care about platforms and I don't care about political consequences. I have to know what you, the Defense Department are recommending to us for markup and how much of that, if any, has been approved by the President and the Office of Management and Budget?

Dr. WADE. Senator EXON, there are two pieces to the current problem. As Mr. Sewell indicated earlier, there is a \$30 million supplemental for the fiscal year 1980 program.

Senator EXON. So you are recommending that?

Dr. WADE. Yes, sir.

[Deleted.] The bottom line is that these issues are under review today within the executive branch.

We expect there will be additional resource requirements for the Department of Energy in the short term. I don't have the bottom line on what specifically these requirements should be at the moment.

Senator EXON. Do you other gentlemen have that total bottom line figure?

Mr. SEWELL. I can give the numbers I have recommended within the Department of Energy. As I mentioned the amendment for materials production that we are proposing has not been finally signed off by Secretary Duncan and sent to OMB. I hope that happens within

the next week or 10 days. Total numbers in that proposed amendment are \$142 million budget authority and \$220 million in authorization that will be required as additions to the fiscal year 1981 budget if that were to be accepted.

Senator EXON. \$142 and \$220 million?

Mr. SEWELL. That is right.

Senator EXON. Is that in addition to what was originally requested in the fiscal year 1981 budget? Those are additional figures?

Mr. SEWELL. Those are additional figures.

Senator EXON. Those two figures have not been cleared by the Secretary of Energy?

Mr. SEWELL. That is correct.

Senator EXON. They have not been cleared with the Secretary of Defense?

Dr. WADE. No, sir.

Senator EXON. Mr. Chairman, I guess we are trying to make a decision here and these gentlemen are not in a position to speak for the Secretary of Defense and I guess the Secretary of Energy [deleted].

Senator JACKSON. Senator, I think the problem is that if you ask them their separate judgment I think it is one thing, but they are here to carry out the policy of the President. A policy which has been laid down by OMB and in which they cut out the very funds that had been recommended by the Secretary of Defense and by the Secretary of Energy. I think the facts speak for themselves. What they are saying—I am not trying to put words in their mouth [deleted].

The question is how much of a risk they are going to take. Sooner or later they are going to have to take these three steps.

[Deleted.]

That is the risk you run. Is that it, gentlemen?

Mr. SEWELL. That is right.

Senator JACKSON. Does anyone disagree?

General ALLEN. A little. One, the [deleted] program that we are examining but have not made final decisions on or have not received approval for. Second—and I don't mean to say I would see any merit to this—but if we were forced to choose we would make decisions in favor of [deleted].

Senator JACKSON. The Joint Chiefs, the Secretary of Defense, and the Secretary of Energy, last December made a request for the L reactor, the N reactor, and the Purex plant. Now, has there been any change since last December that would invalidate the unanimous recommendation of the three corporate bodies here?

#### L REACTOR

Mr. SEWELL. Let me comment on one. I believe the recommendations that you are referring to did not include the L reactor. It did include Purex which was the fundamental change that had to be made to be able to convert the N reactor.

Senator JACKSON. What about the stockpile paper? Didn't it include all three?

Mr. SEWELL. The President's stockpile memorandum?

Senator JACKSON. The recommendations to the President on the stockpile.

Mr. SEWELL. It showed the L reactor, but it was not as early as fiscal year 1981, and I will have to get for the record when that was recommended, but it was not recommended in the fiscal year 1981 time frame as I remember it. It was recommended for the fiscal year 1982 budget.

Senator JACKSON. I must say gentlemen that we are trying to—as Senator Exon properly mentioned—we are trying to mark up a bill and we need to get the best professional advice that we can get in light of the circumstances and I have been through this about the OMB and its predecessor, the Bureau of Budget.

We have heard it over and over again, we are going to have a big surplus [deleted] and it is, I think, one of those situations where we can ill afford to take the risk. Now let me read from a January 17 memorandum for the Secretary of Defense, Deputy Secretary of Defense, subject, nuclear weapons stockpile. Let me quote the pertinent part: “Special nuclear materials support for 1980–82 stockpile and projected through 1991 are within DOE capability [deleted].”

#### REPLACEMENT REACTOR

Mr. SEWELL. Let me continue with the last part of the chairman's question.

We were sidetracked. The ability to produce beyond the 1995 time frame—I mentioned that we had to think about that in today's time frame, because if we are to build a new reactor or reactors to replace those at Savannah River, I believe that they should have the capability for production of tritium and also plutonium.

We have to start thinking at least 10 years ahead because of the time that it takes to design, manufacture, assemble, test, and get a reactor operating in this country. I think that even a 10-year estimate should have a contingency of about 20 percent in time. If that is the case, we are looking in toto, in the 1982 budget time frame. Decisions are going to have to be made in that time frame. Do we start to design a new reactor to be on line for sure to be able to continue to produce the tritium the stockpile will need in the 1995 time frame?

Senator COHEN. One question. In the memorandum the Chairman has referred to, what was the recommendation as to the advanced production reactor?

Mr. SEWELL. I do not recall. I would have to check.

[The information follows:]

The January 1980 stockpile memorandum stated that the design of new production facilities for the 1990's will be undertaken.

Senator COHEN. Was there any mention of funding in the fiscal year 1981 budget for the advanced reactor?

Mr. SEWELL. I don't believe so but let me call on Dr. Gilbert again. Was there money explicitly spelled out in fiscal year 1981?

Dr. GILBERT. Not explicitly, the Congress would have recognized as a line item. However, we are planning to devote about \$1 million to conceptual design out of our operating expenses.

Senator COHEN. We keep talking about the need to do advance planning for these projects but there is no money in this year's budget. We say we have to start doing something by 1982 and plan ahead for

10 years but there does not seem to be any effort made in the budget to do that. I wonder if, in fact, there is any mention in this particular memorandum because I believe that was the recommendation of the NSC.

Senator JACKSON. There is a 10-year leadtime so I think Senator Cohen is saying if that is the case, where is the planning money so that you can start to put together a program?

#### NUCLEAR TESTING

Dr. WADE. Senator Jackson, let me comment on that part. We have been discussing additional resources to address what I would call near term requirements, both for nuclear materials and weapons production and surveillance. In addition to those, there is a recognition both by the Department of Defense and the DOE that there is a need for increased resources associated with nuclear testing. I believe that the testing level that is currently in the program is too low in the [deleted]. There is also the need for additional resources to improve the technology base that is within the Department of Energy's weapons program.

#### REPLACEMENT REACTORS

Also there is the need to modernize the DOE nuclear weapon complex that has aged over the past 10 years. It gives those of us in the DOD some concern as to whether these facilities are going to stay on line for the next 10 years. Finally, as far as nuclear material requirements are concerned, we currently have under review the need to start work on not just one new production reactor but potentially two. One reason to look at two different reactors is that the technology associated with a new reactor has a certain risk to it. If a single reactor fails downstream, we could fail in a total sense. The impact would be serious.

So in that context our approach is to look at two reactors.

Senator COHEN. Are you contemplating a geographical separation as well?

Dr. WADE. That would be part of the consideration. Yes, sir.

#### STRATEGIC U.S. TACTICAL REQUIREMENTS

Senator COHEN. Can I go back, Mr. Chairman, with your permission, to cover a few points?

Senator JACKSON. Go ahead, Senator Cohen.

Senator COHEN. General Allen, you mentioned something I did not follow clearly. [Deleted.]

Is that what the contingency plan is?

General ALLEN. Yes; I tried to make the point. When we describe our inability to do certain things, it is not really an inability to do that thing. But because of restraints, it is a necessity to make a choice.

Senator COHEN. It can be done if necessary?

General ALLEN. And in general, we have given priority to [deleted].

Dr. WADE. Senator Cohen, may I comment on that. General Allen is correct in the context of where the priority should be [deleted].

Senator COHEN. We have the same problem across the board. We talk about cannibalizing aircraft, taking spare parts from one aircraft and putting them on another. That is endemic in the military. [Deleted.]

Dr. WADE. We have had many such documents in the last 4 or 5 months. I don't recall specifically the April 10 memo.

Senator COHEN. Did you have a briefing on that date [deleted].

Dr. WADE. We have had a series of briefings from DOE to MLC during this time period on this subject.

Senator COHEN. Did the Department of Energy brief that particular committee on April 10, 1980?

Dr. WADE. Again, I am not certain as to exact date, because the DOE has briefed the MLC on nuclear materials quite a few times during that time period.

Senator COHEN. What was the nature of that briefing? [Deleted.]

Dr. WADE. [Deleted.]

Senator COHEN. I am talking about short term. You are talking about near term.

Dr. WADE. The recommendation from [deleted].

Senator COHEN. What you are talking about in this [deleted].

Dr. WADE. That is right.

Senator COHEN. I was led to believe in the initial testimony today [deleted] is not accurate, is it?

Dr. WADE. That is not completely accurate.

Senator COHEN. What is accurate?

Dr. WADE. [Deleted.]

Senator COHEN. [Deleted.]

Dr. WADE. That is right.

Mr. SEWELL. I would like to add a comment about the retirements as I understand it. I gave the briefing you are talking about. I don't remember the date.

Senator COHEN. April 10.

Mr. SEWELL. It was about April 10. The point there was that the retirements within a fiscal year as, I understand it, were not changed in toto. It was a question of when during the fiscal year the retirements would take place. That is usually negotiated with the Department of Defense on a yearly basis. [Deleted.]

I would like to add one additional thing in case you may not have heard it. [Deleted.]

In total, I think we are gaining from that alone.

Senator COHEN. [Deleted] as early as 1982 I assume. Is that not correct generally?

General ALLEN. I think that is too early.

Senator COHEN. Under the SALT agreement, we can't deploy cruise missiles with a range in excess of 600 kilometers before the end of fiscal year 1981. By implication that means we could start deploying some at the end of fiscal year 1981.

General ALLEN. There are 3,000 cruise missiles in the program and there were [deleted].

Senator COHEN. Would you tell me the cost of those options you outlined in your testimony? The L reactor, N reactor and Purex plant and upgrading? You can provide it for the record.

Mr. SEWELL. I will have to do it for the record. In fiscal year 1981, they are the numbers I talked about, \$142 million in budget authority and authorization of \$220 million. But they cost more than that in toto because that is only 1 year's costs. I will give you that for the record.

Senator COHEN. I have more questions, but I think Senator Thurmond would like me to defer at this point, and I would be happy to do so.

[The information follows:]

FISCAL YEAR 1981 BUDGET AMENDMENT

	Fiscal year 1981 (millions)		Total program costs (fiscal year 1981 dollars)
	Budget authorization	Budget authority	
L reactor restart.....	\$114.0	\$39.0	\$161,000,000 incremental with \$70,000,000 annual operating costs.
N reactor conversion.....	4.0	4.0	\$27,000,000 incremental with \$17,000,000 incremental annual operating costs.
Purex restart.....	16.5	13.5	\$98,000,000 incremental with \$29,000,000 annual operating costs.
Facility upgrade.....	31.5	31.5	\$353,000,000 incremental with \$115,000,000 annual operating costs. <sup>1</sup>
Increased production.....	25.0	25.0	\$25,000,000 incremental with \$12,000,000 annual operating costs.
Three Mile Island (TMI) safety related activities.	10.0	10.0	\$106,000,000.
Inflation.....	19.0	19.0	\$19,000,000.
Total.....	220.0	142.0	

<sup>1</sup> The annual operating costs include all maintenance, normal upgrading activities, capital equipment, and construction projects which will increase or maintain production capabilities.

PROPOSED NUCLEAR MATERIALS BUDGET AMENDMENT

Senator THURMOND. This sheet that has been handed me here, as I understand was prepared by the Department of Energy.

Mr. SEWELL. What sheet?

Senator THURMOND. Fact sheet, budget for nuclear materials production activities.

Mr. SEWELL. That was prepared by the Department of Energy.

Senator THURMOND. Do all of you recommend the figures on this?

General ALLEN. No.

Mr. SEWELL. I don't believe the gentleman from the Department of Defense have seen the explicit numbers. We talked about the ideas behind this; namely, startup of L reactor, conversion of N, startup of Purex conversion [deleted] and so on, the items on this list.

Senator THURMOND. Did you prepare this under your supervision?

Mr. SEWELL. It was under my supervision.

Senator THURMOND. I notice you have here for instance some amended budget total operating expenses, \$391,900,000. Amended budget \$486,600,000. Is that correct?

Mr. SEWELL. Those are correct numbers. You must recognize the increase in there is the number that I am recommending within the Department of Energy for the amendment to go forward to OMB. That has not occurred yet. It is still within the Department of Energy.

Senator THURMOND. Capital equipment, you give the figures for those, and construction, you give the figures for those. And then you

give a breakdown of the Savannah River plant and so forth.

Mr. SEWELL. That is correct.

Senator THURMOND. That is what you feel is needed to go forward with at this time as I understand it.

Mr. SEWELL. I have to say that these are the requirements if we are going to be requested by the Department of Defense to produce all of the warheads that are in the President's stockpile memorandum including those that are listed beyond 1985; that is, if we assume that during the period between now and fiscal year 1988 we will be required to put the enhanced radiation warheads in the field, include the continued holding of more of the Poseidon missiles in the stockpile beyond the plans that were originally in the stockpile memorandum, and assume that there will be [deleted].

Senator THURMOND. Did the Department of Defense suggest to you what they needed and based on what they said they needed you prepared this fact sheet?

Mr. SEWELL. I prepared it on the basis that if they requested those weapons that we require this amount. I will have to turn to Dr. Wade to determine the Department of Defense position on these missiles and warheads.

Senator THURMOND. I just wondered how you arrived at these figures.

Mr. SEWELL. In the President's stockpile memorandum we get direction for the first 3 years explicitly, 1980, 1981 and 1982. For the years 1983 and 1984, we are given authority for long term purchase of materials. The years 1985, 1986 and 1987 are for planning purposes. The President makes note of our plans for these last 3 years, but they are not explicit requirements on us.

I assumed that the Department of Defense would request those warheads that are in the Presidential stockpile memorandum beyond 1985 when we developed our funding requirements, but they still have the decision to make.

Dr. WADE. Senator Thurmond, a key element in DOE planning is the Presidential nuclear weapons stockpile memorandum. As Mr. Sewell indicated [deleted] those planning figures of the Department of Defense. The need for long-lead items and the requirement for long-lead planning have been recognized by the NSC and are currently under review. There are a series of [deleted]. These are certainly closer to being firm for deployment than 5 years ago. Therefore the DOD feels there [deleted].

Senator THURMOND. In other words if we are going to meet our commitments to guarantee safety to the people of this country, as I understand, you gentlemen feel that this ought to be done?

Dr. WADE. Yes, sir. There is a need for additional capacity. We are reviewing within the NSC, as I indicated earlier, what action should be taken and when. But, there is no question as to the need.

Senator THURMOND. There is no question as to the need. It is just when it should come on.

Dr. WADE. Yes, sir.

Senator THURMOND. Do you feel that it is wise to go forward now and get in at once and not delay this matter?

Dr. WADE. Yes. It is wise to start moving out on the problem.

Senator THURMOND. Do you feel that what you have prepared here is adequate? Is this sufficient?

Dr. WADE. I have not seen the document per se that Mr. Sewell was talking about. However we need to turn on Purex—

Senator THURMOND. We will give you a copy of this. You have not seen this?

Dr. WADE. I am probably familiar with its general content. In general terms, I support this outline. The question that remains is to determine when the system should come on line and in what order. The general thrust of this paper is correct in the context of the need as seen by the Department of Defense.

Senator THURMOND. In view of the world situation as it is now do you feel Congress should move on this at this time and not delay the matter?

Dr. WADE. Before answering your question, it would be necessary for me to personally review the details of the document.

Senator THURMOND. In view of the volatile situation throughout the world today, no one can tell when we are going to need weapons and how many weapons. Why take a chance on the freedom of the people of this country who are dependent on these nuclear weapons more than any one thing?

#### TESTING LEVELS AND RESTORATION

Dr. WADE. That is absolutely right. However, I would suggest that the problem is broader [deleted]. There is a need to modernize the DOE nuclear weapon complex across the board; the technology base, the testing requirements, and the ability to make sure that the production complex is going to do this job [deleted] rather not address this problem in isolation. It is appropriate that the Department of Defense, together with the DOE, look at the total problem and then be prepared to provide a recommendation. We are working together on this matter now.

Senator THURMOND. We had people from the Armed Services Committee for instance—I am more familiar with Savannah River plant since it is in my home country—to visit that plant and I was just startled to hear what they had to say about the tremendous need there. It seems to me this is something we can't afford to put off.

Dr. WADE. We should not put off upgrading those facilities.

Senator THURMOND. The staff that went there said the plant needs upgrading and need it at once. It would take considerable money to do it, but it has to be done if we are going to insure the safety of the people of this country. General, do you have any remarks?

General ALLEN. Only a couple that might have some value. I am not competent to address the funding levels that are on the fact sheet prepared by DOE, but with regard to the planning basis for them, and the forcestructure that was assumed—I would believe that it is necessary for the country to have the capability of producing the weapons that were used as that planning base, and, as a matter of fact, that includes the [deleted]. If there is any particular lesson to be drawn from that, it would be that the world situation as we have faced it over the last 7 or 8 months has caused us to look at additional requirements.

We have been obliged to make statements with regard to how we could increase strategic nuclear weapons if we were required to do that. [Deleted.]

Senator THURMOND. You may have good planes and good pilots but they have to have the weapons, don't they?

General ALLEN. That is right.

Senator THURMOND. We can't take a chance on not having those weapons. That is all I have right now.

Senator JACKSON. Senator Cohen?

#### ENHANCED RADIATION WEAPONS

Senator COHEN. I have some questions pertaining to enhanced radiation weapons. Would you review briefly the President's position on enhanced radiation weapons.

Dr. WADE. Senator Cohen, we are currently moving into production on both the W-70, Lance warhead, and the W-79, 8-inch artillery projectile. We are keeping open the option of providing an ER capability downstream.

That is, the components that are needed to provide that additional capability are being produced, but not installed. As of now, a decision has yet to be made [deleted] the weapons systems currently moving into production.

Senator Cohen [deleted].

Senator COHEN. You are prepared to do that [deleted].

Dr. WADE. Yes, sir.

Senator COHEN. I would like to ask Mr. Sewell, if it is delayed—

Dr. WADE. If it is delayed several years you have two problems. First, the time frame to put it in the force could be [deleted].

Senator COHEN. [Deleted.]

Dr. WADE. [Deleted.]

Senator COHEN. Doesn't that have to be made by [deleted].

Dr. WADE. Yes sir, [deleted].

Senator COHEN. [Deleted.]

Mr. SEWELL. [Deleted.]

Therefore, the delays that are built into giving the Department of Defense what they require at a later time varies from zero delay [deleted].

Senator COHEN. [Deleted.]

Dr. WADE. It depends on how much you accelerate it. The capability exists to produce at [deleted].

Senator COHEN. What is the Joint Chiefs recommendation as far as ER?

General ALLEN. [Deleted.]

Senator COHEN. [Deleted] wouldn't that substantially improve the capability of deploying ER?

Mr. SEWELL. It would cut a number of months off of it and I will call on Dr. Gilbert again. [Deleted.]

Dr. GILBERT. The potential maximum delay of about [deleted] would occur for a late decision like 1985 or 1986 to make these weapons have the ER capability. [Deleted.]

Senator COHEN. How much would it cost [deleted].

Dr. GILBERT. We would need a few million. I think it is on the order of \$2 million [deleted]. There would really be no additional costs over and above that [deleted].

## NUCLEAR TESTING

Senator COHEN. In 1979 the Soviet Union conducted a total of [deleted] nuclear tests that we are aware of. In 1978 they had [deleted]. And their rate for this year has been quite high. Last year we conducted [deleted] nuclear tests. This year funding could limit the United States to [deleted]. Mr. Sewell, in your judgment, what is the reason for the dramatic increase in Soviet testing?

Mr. SEWELL. I do not have any information on the reasons why they went up.

Senator COHEN. What is your opinion?

Mr. SEWELL. I really don't know why they did that. The only thing I can look at is the political situation and the comprehensive test ban discussions. For some reason they may have had to increase their testing.

Senator COHEN. In view of the fact we may not have a comprehensive test ban treaty in the immediate future, why are we decreasing our testing?

Mr. SEWELL. We have put together a proposal for an augmented test program that will span a 5-year period. That is now being considered in a study by the National Security Council. That is the one that I referred to, I believe, in past testimony. The study recommends that the level get up to about [deleted] per year. That is the level that has been recommended repeatedly by the two weapons design laboratory directors to the Congress and to the administration.

Senator COHEN. In other words, if you knew or believed that a comprehensive test ban treaty would not be signed for 5 years you would recommend that we go to [deleted]?

Mr. SEWELL. That is what we are recommending right now.

Senator COHEN. What if you knew that in a 2-year time frame, you expected to have a treaty. Would you recommend the same sort of testing? [Deleted.]

Mr. SEWELL. The recommendation is the same. To preface that, I don't know whether we could get up to a rate of [deleted] immediately because we are at the lower rate, as you mentioned. It will require funding, laboratory and field preparation, that sort of thing; and it requires time.

Senator COHEN. What kind of testing would you recommend?

Mr. SEWELL. The type nuclear testing—I assume this is in reference to your 2-year time frame to a comprehensive test ban.

Senator COHEN. Two and five.

Mr. SEWELL. Putting together a total 5-year picture, we first tried to look at it from the standpoint of doing those things most useful to maintaining a stockpile during a CTB if it were to come about in 2 years. The types of tests that are included are stockpile warhead performance tests and tests of those warheads that are undergoing final design for the systems that we are going to produce in the immediate future. Beyond the later time frame we are starting to do some experiments that would give us fundamental information of fixes. That would help us during a CTB to determine fixes for problems that we might find in the stockpile as we sampled; that is, took out and examined weapons in the stockpile.

Senator COHEN. I will tell you why I am raising these questions. It seems to me there is a parallel between decisions on other systems to either delay or defer IOC's in anticipation of a SALT agreement. The same thing is true with the comprehensive test ban treaty. We seem to be expecting a fairly rapid ratification and signing of a treaty.

We are reducing the number of nuclear tests we are conducting while the Soviets are dramatically increasing. It seems to me that the two countries have been following just the reverse type of policy. I suggest in this line that we make a dramatic change in the policy we are pursuing; instead of reducing testing, increase it as we approach a comprehensive test ban, much as the Soviets are doing.

It seems to me there is a parallel here. We tend to delay, defer, or cancel systems in anticipation of trying to sway the Soviet Union into following suit when in fact, all the evidence of the SALT hearings reveals that just the opposite occurs.

We make concessions, we defer, we delay, we cancel, and they don't. It seems to me there is a distinct parallel here as far as nuclear testing is concerned.

#### MINUTEMAN WARHEADS

One final question, Mr. Chairman. I would like to discuss the recent Senate Armed Services Committee action to authorize \$10.4 million for 100 Minuteman III's and substituting them for Minuteman II's. The question I have for Secretary Sewell is What is the planned production rate for Mark 12-A warheads which are replacing the Mark 12 warheads on Minuteman III?

Mr. SEWELL. Just 12-A irrespective of this 100 missiles?

Senator COHEN. For the time being?

Mr. SEWELL. Let me turn to Ralph Caudle of the Military Application Office. I believe he can give the numbers.

#### STATEMENT OF RALPH CAUDLE, OFFICE OF MILITARY APPLICATION, DEPARTMENT OF ENERGY

Mr. CAUDLE. We began production of W-78 warheads for the Mark 12-A reentry vehicle in fiscal year 1979 [deleted].

Senator COHEN. Could this production rate be increased?

Mr. CAUDLE. [Deleted.]

Senator COHEN. If no changes were made in the present warhead requirements, what is the minimum number of Mark 12-A warheads that could be made available for the deployment of additional Minuteman III missiles in fiscal 1981, 1982, and 1983?

Mr. CAUDLE. We are talking about the W-78 MK-12A, the new warhead for Minuteman III. [Deleted.]

Senator COHEN. Have you made any assumptions about the number of Poseidon warheads deployed in calculating out Mark 12-A warheads?

Mr. CAUDLE. Yes; we have looked at that more particularly relative to the Mark 12 warhead—the Mark 12 reentry vehicle with the W-62 warhead. Some considerations have been discussed relative to 100 additional Minuteman III's being put into Minuteman II silos using W-62 warheads in a Mark 12 reentry vehicle. We have looked at that.

Senator COHEN. That could be done in your judgment?

Mr. CAUDLE. In the 1982 time frame. Right now we are in the process of retiring W-62 warheads as the W-78 is built to go into the new Mark 12-A reentry vehicle. We will be doing those retirements in 1980, 1981, and 1983. As we look at our ability to provide the additional warheads for the additional Minuteman III missiles, the thing we would do is just not retire some of those W-62 warheads. Now, how does that impact us? Two potential impacts.

[Deleted.]

Senator COHEN. Couldn't you retire some of the older systems?

Mr. CAUDLE. That is an option that is also available [deleted].

Senator COHEN. Couldn't you have additional warheads as you have spares? We talked earlier about the material in spares. Couldn't you take additional warheads currently being held as spares to meet this replacement of the Minuteman II with Minuteman III? [Deleted.]

Mr. CAUDLE. We looked at spares which we have identified for the quality assurance program. Those are prebuilt and are the same as any other W-62 warhead. We would be using those warheads for stockpile sampling for our quality assurance program in the outyears. There is another type of spare that should be addressed though. There is, I think a [deleted] factor that we provided to DOD, spares that they use during the time they are doing limited life component exchanges on the warheads. They will take a warhead out, put a different one on the missile [deleted.] The number depends on how the force is postured at various locations, various wings, various flights, and just how those spares need to be utilized.

The numbers I gave you included making available for operational use only those which have been built for the quality assurance program.

Senator COHEN. [Deleted.]

Mr. CAUDLE. [Deleted.]

Mr. WADE. [Deleted.]

Senator COHEN. [Deleted.] How is it that OMB is able to make this cut even after the JCS, Department of Defense, and Department of Energy made a recommendation. Suddenly, it is cut?

Dr. WADE. I would say two things. I believe OMB recognizes that they misjudged the situation last year. Just as important, however, is the problem that developed in the DOE complex and Mr. Sewell can describe in greater detail. The complex is aging. This is a problem that has taken place over the last 10 years. We talk about additional capacity through new facilities not yet on line. [Deleted.]

#### CTB TREATY

Senator COHEN. I have more questions for General Allen. I will defer for the time being, Mr. Chairman.

Senator JACKSON. I just have a couple of questions here. There has been a rumor floating around that the administration is hopeful of getting a CTB treaty put together by the end of July. Do you know anything about it?

Mr. SEWELL. I heard nothing.

Dr. WADE. No, sir.

Senator JACKSON. It is hard for me to believe. Have the Chiefs heard anything about that?

General ALLEN. I certainly have not.

## NUCLEAR WEAPONS DEPLOYMENT PLAN

Senator JACKSON. We were talking about the stockpile memorandum earlier. I understand there is a nuclear weapons deployment plan approved by the President that is the authority to deploy nuclear weapons outside the United States. When was this last deployment plan approved and when does its authority expire?

Dr. WADE. The last deployment plan was approved, I believe, last September. There is a new deployment plan which addresses the next 2 years in final draft right now. The plan basically remains in effect until the next one is approved.

Senator JACKSON. What is the status of the current plan?

Dr. WADE. The plan approved last September is currently in effect. The new plan is being put together by my office. I received and approved it for consideration by the Secretary of Defense this morning.

Senator JACKSON. Just this morning?

Dr. WADE. Yes, sir.

Senator JACKSON. It is not being held up?

Dr. WADE. It has been through a lengthy coordination process that includes both the DOD and the State Department.

Senator JACKSON. That is what I was going to ask next. I understand State acted. It has been holding it up because it involved the [deleted].

Dr. WADE. There was an issue there, yes, sir.

Senator JACKSON. I defer.

## NUCLEAR WEAPONS STOCKPILE MEMORANDUM

Senator COHEN. I would like to follow up on that stockpile memorandum. Will a copy of that go into the record, Mr. Chairman? We don't have it.

Mr. SEWELL. I am not sure which memorandum you are talking about.

Senator JACKSON. The memorandum that I referred to was the deployment plan.

Senator COHEN. Could I have your answer as to whether you would be willing to present the stockpile plan to the committee?

Dr. WADE. I will take that under advisement.

Senator COHEN. We would await the answer from Dr. Wade as to whether or not we could have a copy of the stockpile memorandum.

ANSWER. The nuclear weapons stockpile memorandum is executive correspondence. As such, I am not at liberty to provide a copy for the record.

Senator COHEN. In other words, you cannot assert executive privilege?

Dr. WADE. I am not sure whether it has been previously given to the Congress or not. I have to go back and look.

Senator COHEN. You have submitted a report which summarizes your views as contained in the stockpile memorandum, is that correct?

Dr. WADE. That is basically correct.

Senator COHEN. As of April 25, 1980. Is that an accurate statement in that it reflects your views and do you think it is useful for us to have?

Dr. WADE. The deployment plan?

Senator COHEN. The summary of the report on adequacy of DOE's resources to support the nuclear weapons stockpile memorandum requirement. Congress does not have your stockpile memorandum, at least officially. We have been given a report instead. I am going to ask each of you whether or not this report accurately reflects your individual views or the views of your Departments.

Dr. WADE. Let me address your question first, Senator Cohen.

There are several reasons for that. First, as I indicated earlier, the report assumed an inflation rate that is higher today than it was when the study was prepared earlier this year. Second, that the study basically was formulated in a pre-Afghan world. We all know the Afghanistan situation has changed the world scene and to a significant extent.

Senator COHEN. It was formulated—

Dr. WADE. As of last fall, when preparation of the study was started.

Senator COHEN. It was not updated to reflect the Afghanistan situation?

Dr. WADE. No, it was not. It was also formulated on the basis of a SALT II force posture. Finally, it was based on an assumption [deleted], as I indicated, we are, through the NSC process, reviewing the matter in some detail.

Senator COHEN. Did NSC send back the report and the stockpile memorandum?

Dr. WADE. The report or stockpile memorandum?

Senator COHEN. First the memorandum. Did they send it back with objections?

Dr. WADE. Not that I recall.

Senator COHEN. I think the answer is yes. I would like to know why.

Dr. WADE. I will have to provide a response for the record. I do not recall.

Senator COHEN. Who revised the stockpile memorandum?

Dr. WADE. In the White House?

Senator COHEN. I don't know who revised it.

Dr. WADE. If it came back to my office I revised it; and it was probably done several months ago. I am not fresh on that.

Senator COHEN. You are not familiar with what changes you might have made?

Dr. WADE. I don't recall. I will have to put that in the record.

[The information follows:]

The recommended 1980-82 Nuclear Weapons Stockpile Memorandum submitted to the National Security Council on January 17, 1980, was based, in part, on the [deleted]. These changes were made and the revised Nuclear Weapons Stockpile Memorandum was resubmitted on February 1980.

#### REPORT ON DOE RESOURCES

Senator COHEN. Let me come back to the report itself. You say it is not adequate because it is based upon the pre-Afghanistan situation and also making certain SALT II assumptions?

Dr. WADE. Yes, sir.

Senator COHEN. Those are the [deleted].

Dr. WADE. Yes, sir. In addition, it assumed that there would be no problem in the DOE complex as far as doing the job as required by the DOD.

Senator COHEN. As far as what?

Dr. WADE. It was based on a highly success-oriented management philosophy. Nothing will go wrong. As I indicated, it was a SALT II world, pre-Afghan world, inflation of about 8 percent [deleted]. There are several pieces of that study that today contribute to its being out of date.

Senator COHEN. Why were the Joint Chiefs unhappy with the report, General Allen?

General ALLEN. We felt the report did not adequately reflect the concerns that we had which are really identical to the ones Dr. Wade just described. We expressed our concerns in this regard and they have at least contributed to NSC the decision to study nuclear weapons stockpile projections and materials requirements and the action which the Secretary of Defense took with the Secretary of Energy.

Senator COHEN. So the record will be clear, on April 11, 1980, Secretary Brown wrote to Secretary Duncan that he remained concerned and recommended the issue of inadequacies be raised with the NSC. I would like to know, to your knowledge, Secretary Wade, have Secretary Brown's concerns been formally raised with the President?

Dr. WADE. I don't know whether they have been formally raised with the President. However, the NSC has turned on a high level intensive review of these areas. The study is now close to being completed. I expect that the next step will be for option papers to be prepared and the issue to be discussed with the NSC and thereafter with the President.

Senator COHEN. General Allen, were your objections and those of the Joint Chiefs made known to the President?

General ALLEN. I don't know whether they have been made known to the President. They were certainly made known to the Secretary of Defense.

Senator COHEN. The Joint Chiefs recommended that we alert Congress to the current situation?

General ALLEN. That is right.

Senator COHEN. Is that what you are doing now, Dr. Wade, preparing a report to alert us to the current deficiencies in the program?

Dr. WADE. Senator Cohen, what is underway right now is a recognition that further and immediate attention at the highest level is required. In part, our testimony here is to indicate that fact. I believe that the DOE program is, indeed, inadequate. You have seen a recent letter from OMB that provides an additional request for \$132 million. There are, in addition broader problems that need addressal and are now being addressed; including what the testing level should be, the need for modernization of the complex as a whole, and the need for improving the technology base within DOE. These matters are closely related and are being examined in a disciplined manner.

Senator COHEN. Part of the confusion has resulted because, on the one hand you have submitted a report required by Congress but then, on the other hand, you have briefed DOD on April 10 of this year [deleted] calling for something like \$250 million in add-ons. So it is rather inconsistent. On one hand, we receive a report that summarizes the presidential stockpile memorandum, and on the other hand, we have a situation in which you brief the Military Liaison Committee, are saying that [deleted] you need more. So, on one hand, you are saying to us that things are all right. [Deleted.]

How does Congress take appropriate action if we don't know what information to rely upon? That is one of the reasons why a report was requested in the first place. We don't have official access to the stockpile memorandum, so Congress called for a report, summary of it, and that report seems to be inconsistent with existing facts.

Dr. WADE. Senator, the report to Congress was started in the December time frame.

Senator COHEN. As of that time, Afghanistan had been invaded. As of that time, SALT II had been put on the shelf.

Dr. WADE. An effort was made to respond to the February 1 deadline. All I am indicating here is some of the assumptions the study was based on are no longer true. Time has marched on. Our judgment today is that the resources as indicated in that report are inadequate and we are addressing both within the executive branch and the Congress.

Senator COHEN. The problem is that the deterioration of those plants that need repair has been known for some time. The 8 percent inflation rate used in calculations was wholly unrealistic all during last year. We heard testimony before the Armed Services Committee with projections of 8 percent inflation when, in fact, inflation was 18 percent. While it does not necessarily mean the military would have as high as the 18 percent rate, the fact was that 8 percent was wholly unrealistic even at that time. So we have had a series of conclusions presented to the committee which none of us believe to be realistic. I won't belabor the point further.

#### MINUTEMAN

General Allen, I would like to come back to Minuteman III substitution. Assuming that this is authorized and appropriated, how long would it take the Air Force to implace the first Minuteman III in a silo and how long would it take to convert the entire 100 Minuteman II's to Minuteman III's?

General ALLEN. I don't have that. I will provide it for the record.  
[The information follows:]

#### DEPLOYMENT OF ADDITIONAL MINUTEMAN III'S

Assuming an October 1980 decision to begin a conversion program, actual deployment could start in October 1981 with the first 50 Minuteman III launchers being operational in February 1982 and the last missiles operational by July 1982. However, if Poseidon submarines are retained in the force and entry of the Trident boats proceed as currently planned, the SALT II MIRV sublimit would be exceeded before the deployment of the 100 Minuteman IIIs could be completed. Additionally, the deployment of the extra Minuteman IIIs would require the retention of more MK12/W62 warheads in the stockpile than currently planned; this would impact the Department of Energy plan for production of new warheads and would exacerbate the potential shortfall in strategic nuclear materials in the long term.

#### REPLACEMENT OF MINUTEMAN II'S

Senator COHEN. What would be the advantages and disadvantages of replacing 100 Minuteman II's with III's?

General ALLEN. The advantage that led to that proposal is it places additional warheads against the Soviets in a fairly short period of time. The disadvantages I think are considerable which is what has

led me to recommend against this proposal. The main point is that you would be adding warheads into a fixed land-based ICBM force structure which is already highly vulnerable and—

Senator COHEN. It is going to be vulnerable for 10 years.

General ALLEN. It will be vulnerable for the foreseeable future, thus our energy should be not to add to the reliance we place on that un-survivable part of the Triad but it should be to remedy the problem. Therefore, my focus is in getting a survivable basing system for those ICBM warheads, not to put more of them in fixed silo-based ICBM's.

Senator COHEN. Is that the principal objection we should be dealing with, the mobile MX as opposed to the—

General ALLEN. Yes, sir. In our calculations of weapons effectiveness, deployment of additional Minutemen III's does not cost much relatively it also does not add very much because of the low probability of launch survival in the retaliatory mode.

Senator COHEN. Do all Minuteman III's carry three warheads?

General ALLEN. I believe Minuteman III's are capable of carrying [deleted] warheads. We have loaded [deleted] the Minuteman III's such that they [deleted]. I should point out the way the SIOP is arranged at the present time, the [deleted] warhead of the present Minuteman II's is effectively employed and under the present plans there are targets for the weapons. And the additional warheads, again with the low launch survivability, are no more effective under those conditions than the Minuteman II's, so the benefit turns out to be marginal.

Senator COHEN. If under the proposed SALT II Treaty, if the United States were forced to deactivate Minuteman III missiles and the Trident comes on line to reach the full MIRVed missile ceiling, do you think it would then be desirable to return to Minuteman II's?

General ALLEN. To return to Minuteman II's?

Senator COHEN. Put Minuteman II's back in service; yes, sir.

General ALLEN. It would—I need to think about the answer. I will be able to give you a more thoughtful answer for the record. It would have to do a little with how many Minuteman II's we had and how convenient it was to do. There certainly would be some advantage to having additional ones in the targeting capability even with a low PLS, but it would not be much of an overall advantage so it would be a matter of whether you could do that without having much in the way of production.

Senator COHEN. Is there a SALT complication factor here? Does SALT II allow for the substitution of non-MIRVed systems for MIRVed systems without counting as an—

General ALLEN. I don't honestly know. In terms of supplement it would be all right.

Senator COHEN. The launchers would not count as MIRV launchers.

Dr. WADE. The complication that could occur downstream is that our approach has been "once a MIRV launcher, always a MIRV launcher." In this context, once you put a MIRV missile into a non-MIRV launcher, you would need new verification procedures established with the Soviets if you would convert back. We would not want him to be in a position of being able to change from non-MIRV to MIRV and not being able to understand what he is doing. It is the "two-way street" we have to worry about.

Senator COHEN. That is why I would like General Allen to give me a more thoughtful answer.

General ALLEN. I will clarify it for the record. The prospect of pulling out the III's to put the II's back in is not an overly attractive one, but you deserve a more detailed answer.

Senator COHEN. For the record.

[See information supplied by General Allen, p. 200.]

REPORT ON [DELETED] DOE RESOURCES

Senator COHEN. For the record, Secretary Sewell, would you respond to my questions as to whether the agencies represented here agree with the accuracy of the report submitted to Congress as of April of this year concerning the stockpile situation?

Mr. SEWELL. At the time the report was submitted, there was an agreement. Let me add to that. We tried to be very explicit in the report, as you noted, with respect to the inflation numbers. Certainly we recognized at the time that there was reasonable chance of inflation numbers being different. We emphasized and reemphasized that a number of times.

Furthermore, the report did not go beyond mid-1980 in making statements about the ability to support the Presidential stockpile memorandum. Therefore it did not take into account things that happened beyond 1985 and I believe there is a statement in the report that alluded to the fact that the requirement for nuclear materials may increase [deleted] or there may be more demands following 1985. That was not addressed in this report. Most of the problems that we are looking at here today in the materials area turn out to be for the requirements beyond 1985.

The reason this was not addressed, as Dr. Wade mentioned earlier, was that there was to be the following NSC study. The study is just about complete in NSC. The NSC study examines problems and tries to come to grips with the idea of making decisions as to what warheads would be produced and, therefore, how much material would be needed in the 1985-90 time frame.

Senator COHEN. Mr. Chairman, I have a request from Senator McClure and he would like to ask the Department of Energy to provide answers to his questions for the record.

Senator JACKSON. Without objection it is so ordered.

[The questions with answers supplied follow:]

QUESTIONS SUBMITTED BY SENATOR JAMES A. MCCLURE, ANSWERS SUPPLIED BY DUANE C. SEWELL, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS, DEPARTMENT OF ENERGY

*Question.* I understand for fiscal year 1981 the field request was \$23 million for the Transuranic Waste Treatment Facility. DOE reduced the field request to \$18 million. President Carter's budget request included only \$5 million and, if I understand it correctly, this \$5 million is not designated specifically for the Transuranic Waste Treatment Facility (TWTF).

*Answer.* Your understanding is correct with respect to the basic facility. However, the \$5 million will be spent primarily on the Reedy Creek Demonstration Plant which is a full-scale nonradioactive prototype of the TWTF incinerator.

*Question.* What part of the \$5 million is for TWTF, if any?

*Answer.* Of the \$5 million, \$500,000 will be pooled with another \$2 million of Transuranic Waste Technology funds to support limited TWTF development work and provide engineering support for the Reedy Creek Demonstration. The balance of \$4.5 million will cover our share of this Demonstration Project (see Q. 4).

*Question.* If there is money for TWTF, what will it fund?

Answer. TWTF work to be accomplished in fiscal year 1981 will be funded from the \$2.5 million mentioned in Question 2 above. Work includes TWTF project/program management, architect-engineer (4-E) services, in-house technology development and safety analysis, and technology development contracts.

*Question.* If there is money for TWTF, what will this reduced effort do to the overall project?

Answer. This reduced effort will enable DOE to continue the Reedy Creek Demonstration. It will also maintain the core program/project staff at EG&G-Idaho and some technology development. A core architect-engineer (A-E) staff will also be retained to provide continuity.

*Question.* If there is money for TWTF, what will be the effect on the budget?

Answer. The only TWTF money is that outlined in Question 3.

*Question.* What is the feasibility of funding it next year?

Answer. The project could be funded next budget year and our plans for fiscal year 1981 provide for maintaining the staff required to proceed in an orderly manner.

*Question.* What will be the impact as a result of the President's cut in Idaho and elsewhere?

Answer. The impact of delaying the TWTF will be continued interim storage of transuranic waste from defense-related activities. Project staff will be reduced to a minimum and about 300 jobs will not materialize with the A-E (R. M. Parsons of Pasadena, Calif.).

*Question.* What was the reason for the difference between the field request of \$23 million and DOE's request of \$18 million?

Answer. The \$23 million request for a fiscal year 1981 capital line item was reduced to \$18 million. Budget priorities required a reduction in the amount of funds allocated to this project and it was felt that the lower level would still allow the basic project to proceed.

*Question.* What are the factors involved in removing these wastes from Idaho to the Federal repository if they are not first processed as they would be in the TWTF?

Answer. The wastes could be shipped to a repository after processing or they could be overpacked and shipped without processing.

*Question.* What is the volume of wastes in Idaho waiting for processing through the TWTF and how long will it take to process them once and if the TWTF is in place?

Answer. About 1.3 million cubic feet of transuranic waste are stored at Idaho. By the time a facility would be able to start processing, another 1.0 to 1.3 million cubic feet will be received. It would take about 10 years to process the total volume.

*Question.* What reasons did OMB give for cutting this project so drastically?

Answer. The OMB's judgment was made based on National priorities in an austere budget situation.

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QUESTIONS SUBMITTED BY SENATOR HENRY M. JACKSON, ANSWERS SUPPLIED BY DUANE C. SEWELL, ASSISTANT SECRETARY FOR DEFENSE PROGRAMS, DEPARTMENT OF ENERGY

#### ADVANCED PRODUCTION REACTOR

*Question.* It is my understanding that the existing production reactors at Savannah River and Hanford will reach their expected life by about 1990. What is being done to come up with a replacement production reactor? How much money do you have in the fiscal year 1981 budget toward this end?

Answer. The Office of Nuclear Materials Production (ONMP), Defense Programs (DP), would plan to spend at least \$1 million in fiscal year 1981 to initiate evaluation of alternative replacement production reactor concepts. It is our intent to conduct an independent evaluation of viable alternatives leading to concept selection and initiating Title I and Title II engineering design on the most promising concept in fiscal year 1982.

*Question.* When the current approved stockpile memorandum was forwarded to the President in January 1980, was there a recommendation with respect to an advanced production reactor?

Answer. The January 1980 stockpile memorandum stated that the design of new production facilities for the 1990's will be undertaken.

*Question.* Was this recommendation changed by the NSC directed revisions?

*Answer.* The NSC comments on the January 1980 stockpile memorandum were related to reconciling the stockpile memorandum with the President's fiscal year 1981 budget. Specifically, the NSC comments addressed only the near-term options of N Reactor conversion, Purex startup, and L and R Reactor startup.

*Question.* What does [deleted] say about the advanced production reactor? What does this mean to you?

*Answer.* [Deleted] does not address an advanced production reactor. However, since such a reactor would not be operational until after the Nuclear Weapons Stockpile Memorandum planning period, we would not expect the advanced production reactor to be addressed.

*Question.* Wouldn't it make a lot of sense to build two new production reactors, one at Savannah River and one at Hanford? From a national security standpoint, such geographical separation would seem prudent. In addition, two new reactor concepts—perhaps [deleted] could be supported.

*Answer.* The historical policy relative to materials production facilities critical to nuclear weapons production has been to maintain the capability at two sites that were geographically separated. In the case of nuclear production reactors, it has also been prudent to have both diversity and redundancy; i.e., it has been prudent to have two reactors with the flexibility to produce either tritium or plutonium, with each reactor being of a different design. The diversity of reactor design precludes a situation where both reactors would be shut down due to a generic safety problem.

*Question.* Let me suggest a schedule for a new production reactor and ask you to comment.

- a. Reactor type selection—fiscal year 1982.
- b. Reactor site(s) selection—fiscal year 1983.
- c. Start construction—fiscal year 1985.
- d. Start operation—fiscal year 1990.

*Answer.* Your proposed schedule for a new production reactor appears appropriate with the following additional definitions:

a. *Reactor type selection—fiscal year 1982*

It is our intent to conduct an independent evaluation of viable alternatives leading to concept selection and initiating Title I and Title II engineering design on the most promising concept in fiscal year 1982.

b. *Reactor site(s) selection—fiscal year 1983*

Site selection in fiscal year 1983 appears consistent with finalizing the fiscal year 1985 budget for initiating construction of the reactor in fiscal year 1985.

c. *Start construction—fiscal year 1985*

The start of construction in fiscal year 1985 is considered prudent to allow construction activities to be completed by fiscal year 1990.

d. *Start operation—fiscal year 1990*

Startup and testing of the replacement production reactor would be completed in the period fiscal year 1990 to fiscal year 1992. Production operation could start in fiscal year 1993.

*Question.* I would assume that any new production reactor would provide for cogeneration of steam for electrical power. Is that accurate?

*Answer.* It is accurate to assume that a new production reactor could provide both the required nuclear materials for the weapons stockpile and electric power which would enable the production site to be independent of vulnerable off-site power, reduce operating costs, and conserve energy.

#### NUCLEAR MATERIAL RESERVE

*Question.* For many years the stockpile memorandum required and the budget supported a [deleted]. What was the origin of [deleted] how long has it been a requirement?

*Answer.* [Deleted.]

*Question.* I would like the position of each of our witnesses on this question. Do you think that it is a good idea [deleted]?

*Answer.* [Deleted.]

*Question.* Did the last stockpile memorandum (for the fiscal year 1980 budget) [deleted]?

Answer. The fiscal year 1980-82 stockpile memorandum [deleted] than [deleted].

Question. What is the status of [deleted]?

Answer. [Deleted.]

Question. When the current approved stockpile memorandum was forwarded to the President, in January 1980, was there a recommendation [deleted]?

Answer. The fiscal year 1980-82 Nuclear Weapons Stockpile Memorandum, forwarded to the President in January 1980, recommended the [deleted].

Question. When the stockpile memorandum was revised at the direction of the NSC was [deleted]?

Answer. The revised fiscal year 1980-82 Nuclear Weapons Stockpile Memorandum, as forwarded to the NSC, did not change [deleted].

Question. What does [deleted]? What does this mean to you?

Answer. [Deleted.]

Senator COHEN. I assume, Mr. Chairman, that this report dated April 25, 1980, will be made part of the record.

Senator JACKSON. It is so ordered.

[The information follows:]

[This classified report has been previously sent to the committee and is retained in committee files.]

Senator COHEN. We await an answer from Dr. Wade as to whether or not we could have a copy of the stockpile memorandum.

[The information follows:]

The Nuclear Weapons Stockpile Memorandum is Executive Correspondence. As such, I am not at liberty to provide a copy for the record.

QUESTIONS SUBMITTED BY SENATOR WILLIAM S. COHEN, ANSWERS SUPPLIED BY DR. JAMES P. WADE, ASSISTANT TO THE SECRETARY OF DEFENSE (ATOMIC ENERGY)

[Question submitted for the record with answers supplied follow:]

Question. For many years the stockpile memorandum required and the budget supported [deleted]. What was the origin of [deleted] how long has it been a requirement?

Answer. [Deleted.]

Question. I would like the position of each of our witnesses on this question. Do you think that it is a good idea [deleted]?

Answer. [Deleted.]

Question. When the current approved stockpile memorandum was forwarded to the President, in January 1980, was there a recommendation [deleted]?

Answer. [Deleted.]

Question. When the stockpile memorandum was revised at the direction of the NSC, was the requirement for [deleted]?

Answer. The revised fiscal year 1980-82 nuclear weapons stockpile memorandum, as forwarded to the NSC, did not change the recommendation for [deleted].

Question. What does [deleted] say [deleted]? What does this mean to you?

Answer. [Deleted] does not direct a [deleted]. We are currently engaged within the NSC system in a review of the entire nuclear materials issue, to include [deleted].

Question. When the current approved stockpile memorandum was forwarded to the President in January 1980, was there a recommendation with respect to an advanced production reactor?

Answer. [Deleted.]

Question. Wouldn't it make a lot of sense to build two new production reactors, one at Savannah River and one at Hanford? From a national security standpoint such geographical separation would seem prudent. In addition, two new reactor concepts—perhaps [deleted] could be supported.

Answer. By the early 1990's, the current production reactors will be more than 35 years old. As was indicated in the DoE testimony, the requirement for replacement facilities to meet requirements downstream for reactor products is currently being examined. At present, DOE has the capability to produce reactor products at two different sites utilizing two different fuel cycles. Over the years, this approach has offered flexibility with increased confidence of

providing a continuing supply of material to meet national security needs. It would appear prudent to continue to have geographically separated facilities utilizing different reactor concepts to ensure diversity and flexibility to meet unforeseen events, such as a technological failure resulting in the closing of a facility.

I strongly support efforts to be in the position of replacing the current production reactors by no later than the early 1990's.

*Question.* Was this recommendation changed by the NSC-directed revisions?

*Answer.* [Deleted.]

*Question.* What does [deleted] say about the advanced production reactor? What does this mean to you?

*Answer.* [Deleted.]

Senator JACKSON. Thank you, gentlemen.

That will conclude our hearing this afternoon. We appreciate your cooperation. We are anxious to mark up this bill right away which we will proceed to do at once.

We will stand in recess.

[Whereupon, at 4:10 p.m. the subcommittee adjourned.]



