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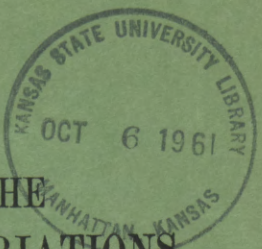
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# PUBLIC WORKS APPROPRIATIONS, 1962

GOVERNMENT

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## HEARINGS BEFORE THE SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS UNITED STATES SENATE

EIGHTY-SEVENTH CONGRESS  
FIRST SESSION

ON

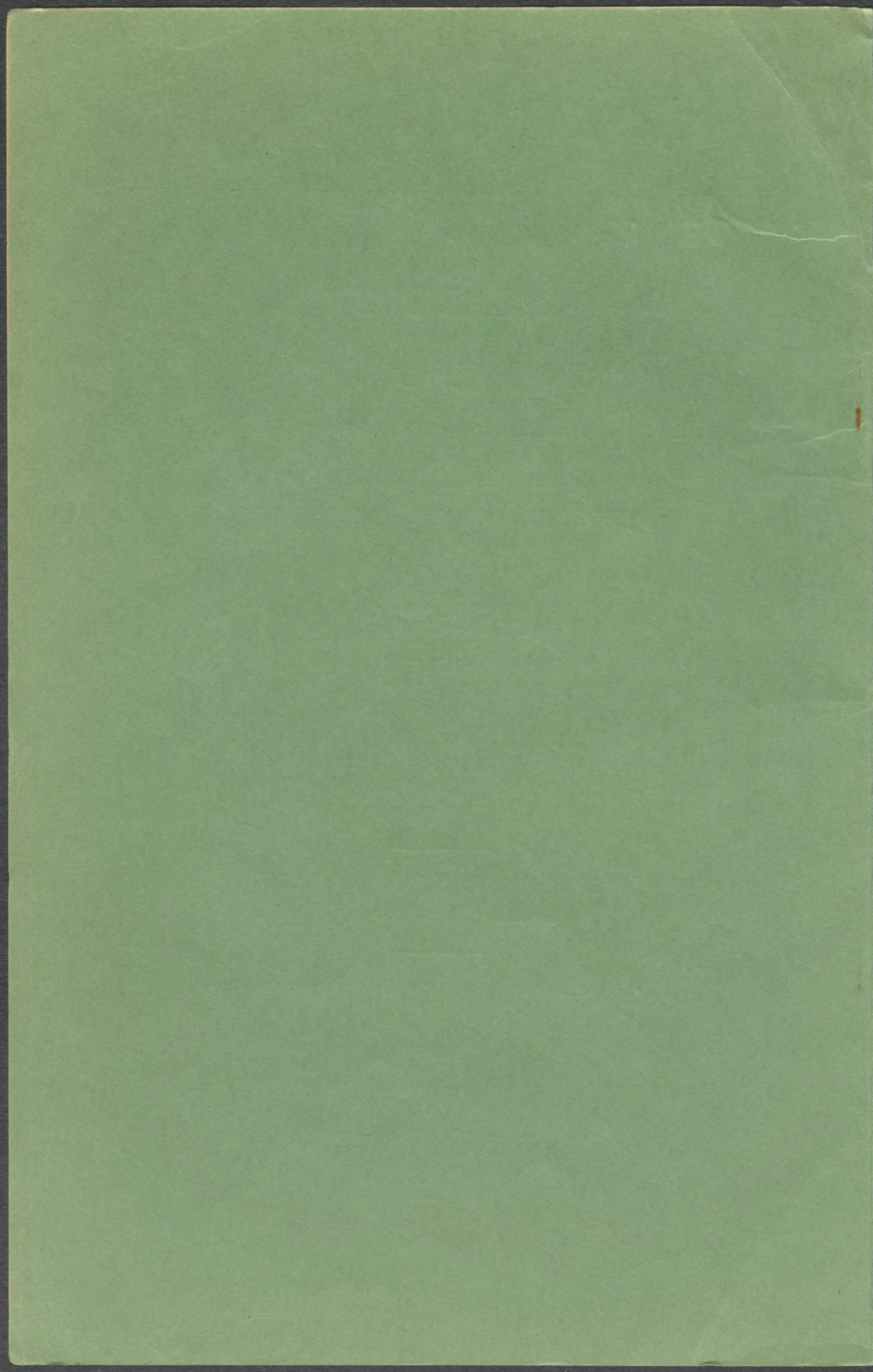
### H.R. 9076

MAKING APPROPRIATIONS FOR CIVIL FUNCTIONS ADMIN-  
ISTERED BY THE DEPARTMENT OF THE ARMY, CERTAIN  
AGENCIES OF THE DEPARTMENT OF THE INTERIOR, THE  
ATOMIC ENERGY COMMISSION, THE TENNESSEE VALLEY  
AUTHORITY, AND CERTAIN STUDY COMMISSIONS, FOR  
THE FISCAL YEAR ENDING JUNE 30, 1962, AND FOR OTHER  
PURPOSES

ATOMIC ENERGY COMMISSION  
TENNESSEE VALLEY AUTHORITY

Printed for the use of the Committee on Appropriations



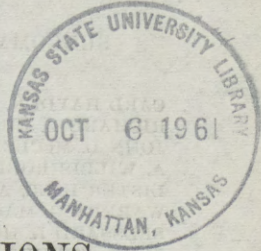


# PUBLIC WORKS APPROPRIATIONS, 1962

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HEARINGS  
BEFORE THE  
SUBCOMMITTEE OF THE  
COMMITTEE ON APPROPRIATIONS  
UNITED STATES SENATE  
EIGHTY-SEVENTH CONGRESS  
FIRST SESSION



ON  
**H.R. 9076**

MAKING APPROPRIATIONS FOR CIVIL FUNCTIONS ADMINISTERED BY THE DEPARTMENT OF THE ARMY, CERTAIN AGENCIES OF THE DEPARTMENT OF THE INTERIOR, THE ATOMIC ENERGY COMMISSION, THE TENNESSEE VALLEY AUTHORITY, AND CERTAIN STUDY COMMISSIONS, FOR THE FISCAL YEAR ENDING JUNE 30, 1962, AND FOR OTHER PURPOSES

**ATOMIC ENERGY COMMISSION  
TENNESSEE VALLEY AUTHORITY**

Printed for the use of the Committee on Appropriations



PUBLIC WORKS APPROPRIATIONS, 1962

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## PUBLIC WORKS APPROPRIATIONS FOR 1962

FRIDAY, SEPTEMBER 8, 1961

U.S. SENATE,  
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,  
*Washington, D.C.*

The subcommittee met, pursuant to notice, at 10:10 a.m., in room 6-39, U.S. Capitol Building, Hon. Lister Hill (chairman of the subcommittee) presiding.

Present: Senators Hill, Ellender, Hayden, Stennis, Kefauver, and Dworshak.

Also present: Senators Pastore and Hickenlooper.

### ATOMIC ENERGY COMMISSION

STATEMENT OF DR. GLENN T. SEABORG, CHAIRMAN OF THE U.S. ATOMIC ENERGY COMMISSION; ACCOMPANIED BY JOHN S. GRAHAM, COMMISSIONER; DR. ROBERT E. WILSON, COMMISSIONER; LOREN K. OLSON, COMMISSIONER; DR. LELAND J. HAWORTH, COMMISSIONER; A. R. LUEDECKE, GENERAL MANAGER; NEIL D. NAIDEN, GENERAL COUNSEL; DON S. BURROWS, CONTROLLER; GEORGE F. QUINN, ASSISTANT GENERAL MANAGER FOR PLANS AND PRODUCTION; BRIG. GEN. A. W. BETTS, DIRECTOR, DIVISION OF MILITARY APPLICATION; R. L. FAULKNER, DEPUTY DIRECTOR, DIVISION OF RAW MATERIALS; DR. FRANK K. PITTMAN, DIRECTOR, DIVISION OF REACTOR DEVELOPMENT; DR. PAUL W. McDANIEL, DIRECTOR, DIVISION OF RESEARCH; DR. CHARLES L. DUNHAM, DIRECTOR, DIVISION OF BIOLOGY AND MEDICINE; E. EUGENE FOWLER, DEPUTY DIRECTOR, DIVISION OF ISOTOPES DEVELOPMENT; A. A. WELLS, DIRECTOR, DIVISION OF INTERNATIONAL AFFAIRS; F. J. McCARTHY, JR., ASSISTANT CONTROLLER FOR BUDGETS, OFFICE OF THE CONTROLLER; AND V. CORSO, DEPUTY ASSISTANT CONTROLLER FOR BUDGETS, OFFICE OF THE CONTROLLER

#### OPENING STATEMENT BY THE CHAIRMAN

Senator HILL. The committee will kindly come to order.

Mr. Chairman, we are very happy to have you here with us, and we welcome you.

You are sure, since this is a closed session, everybody in here has been checked and you know who they are.

Dr. SEABORG. They all seem to be legitimate.

Senator HILL. We are all satisfied with everybody in the room then.

I may say, Mr. Chairman, it has been the practice of this committee since it has been handling these appropriations for the Atomic Energy Commission to have this hearing in closed session. Your testimony is going to be taken down, but if at any time Senator Pastore and I wish to ask you some questions and you don't think it ought to be taken down, you say so.

In addition, before this testimony is released or published for the public you will have an opportunity to go over it yourself and see that there is nothing in there that ought not be in there. You see what I mean.

Mr. SEABORG. Yes.

Senator HILL. We will place in record at this time the summary statements from the budget documents and any additional information that might be helpful to the committee.

(The information referred to follows:)

#### SUPPLEMENTAL ESTIMATE

[H. Doc. No. 125]

#### ATOMIC ENERGY COMMISSION

Budget page	Heading	Original estimate	Revised estimate	Increase (+) or decrease (-)
119	Operating expenses.....	\$2,423,100,000	\$2,359,400,000	-\$63,700,000
123	Plant acquisition and construction.....	174,950,000	268,750,000	+93,800,000

The net reduction in the estimate for "Operating expenses" results from reductions in the procurement of uranium concentrates and in the production of special nuclear materials and nuclear weapons and from termination of the aircraft nuclear propulsion program, offset in part by increases for the acceleration of the development of reactors for naval ships, earth satellite power sources, and nuclear rocket propulsion (Project Rover), and for an expansion of research in the physical and life sciences and research and development in the fields of high temperature materials and high performance reactors.

The increase in the estimate for "Plant acquisition and construction" results from requests for funds for the Stanford linear electron accelerator, for the conversion of the new production reactor at Hanford to the generation of byproduct electric power, for Project Rover test facilities, for an experimental reactor for possible future use as a merchant ship nuclear powerplant, for an expansion in the scope of the experimental gas-cooled civilian power reactor at Oak Ridge, and for an atomic power reactor at Byrd Station in the Antarctic.

## OPERATING EXPENSES

## Object classification

[In thousands]

	1960 actual	1961 estimate	1962 estimate
Atomic Energy Commission:			
11 Personnel compensation:			
Permanent positions.....	\$48,410	\$54,302	\$54,804
Positions other than permanent.....	398	418	412
Other personnel compensation.....	2,000	1,965	1,784
Total personnel compensation.....	50,808	56,685	57,000
12 Personnel benefits.....	3,506	4,279	4,309
21 Travel and transportation of persons.....	3,177	3,650	3,800
22 Transportation of things.....	7,330	9,391	9,617
23 Rent, communications, and utilities.....	217,031	214,294	203,496
24 Printing and reproduction.....	514	654	654
25 Other services.....	1,274,496	1,395,685	1,411,752
Services of other agencies.....	28,028	29,765	27,434
26 Supplies and materials.....	729,504	679,105	595,664
31 Equipment.....	103,970	118,221	107,468
41 Grants, subsidies, and contributions.....	5,371	6,596	3,856
42 Insurance claims and indemnities.....	62	67	67
Unvouchered.....		100	100
Total Atomic Energy Commission.....	2,423,797	2,518,492	2,425,217
Allocation accounts:			
11 Personnel compensation:			
Permanent positions.....	374	430	453
Positions other than permanent.....	11	14	19
Other personnel compensation.....	15	14	15
Total personnel compensation.....	400	458	487
12 Personnel benefits.....	22	30	31
21 Travel and transportation of persons.....	9	8	10
22 Transportation of things.....	1	2	2
23 Rent, communications, and utilities.....	4	5	5
24 Printing and reproduction.....		1	1
25 Other services.....	24,922	22,995	28,166
26 Supplies and materials.....	66	116	122
31 Equipment.....	5	2	2
Total allocation accounts.....	25,429	23,617	28,826
Total obligations.....	2,449,226	2,542,109	2,454,043
Obligations are distributed as follows:			
Atomic Energy Commission.....	2,423,797	2,518,492	2,425,217
Defense.....	25,097	22,645	28,351
Bureau of Mines.....	332	436	475
Maritime activities.....		536	

## Personnel summary

	1960 actual	1961 estimate	1962 estimate
Atomic Energy Commission:			
Total number of permanent positions.....	7,333	7,288	7,259
Full-time equivalent of other positions.....	62	61	60
Average number of all employees.....	6,745	6,881	6,915
Number of employees at end of year.....	6,907	6,948	6,927
Grades established by the Atomic Energy Commission:			
Average grade.....	8.9	9.0	9.0
Average salary.....	\$7,341	\$8,029	\$8,066
Allocation accounts:			
Total number of permanent positions.....	62	67	69
Full-time equivalent of other positions.....	3	3	4
Average number of all employees.....	65	69	72
Number of employees at end of year.....	65	70	74
Average GS grade.....	7.1	7.3	7.3
Average GS salary.....	\$5,983	\$6,495	\$6,598

## PUBLIC WORKS APPROPRIATIONS, 1962

## Program and financing

[In thousands]

	1960 actual	1961 estimate	1962 estimate
Program by activities:			
1. Raw materials.....	\$715,929	\$636,011	\$562,559
2. Special nuclear materials.....	553,300	567,284	557,493
3. Weapons.....	499,612	520,000	561,200
4. Reactor development.....	387,446	436,665	432,845
5. Physical research.....	135,283	163,732	177,834
6. Biology and medicine.....	47,645	54,381	61,140
7. Training, education, and information.....	11,843	14,530	14,170
8. Civilian applications of isotopes and nuclear explosives.....	10,409	10,780	12,000
9. Communities.....	14,248	9,502	8,583
10. Program direction and administration.....	50,595	57,755	57,950
11. Security investigations.....	7,057	6,946	6,517
12. Cost of work for others.....	6,350	7,512	4,802
13. Adjustment to prior year costs.....	136		
Total program costs <sup>1</sup> .....	2,439,853	2,485,098	2,457,093
14. Relation of costs to obligations: Obligations incurred for costs of other years, net.....	9,373	57,011	-3,050
Total program (obligations).....	2,449,226	2,542,109	2,454,043
Financing:			
Unobligated balance brought forward.....			-66,943
Advances and reimbursements from non-Federal sources (revenue applied) (appropriation act).....	-30,371	-32,025	-27,700
Unobligated balance carried forward.....		66,943	
Unobligated balance lapsing.....	120,817		
New obligational authority.....	2,539,672	2,577,027	2,359,400
New obligational authority:			
Appropriation.....	2,389,114	2,451,210	2,359,400
Transferred to "Salaries and expenses," National Science Foundation (73 Stat. 364).....	-2,000		
Transferred from "Plant acquisition and construction," Atomic Energy Commission (74 Stat. 752).....		5,000	
Appropriation (adjusted).....	2,387,114	2,456,210	2,359,400
Reappropriation.....	152,558	120,817	

<sup>1</sup> Includes capital outlay for equipment: 1960, \$100,832,000; 1961, \$112,823,000; 1962, \$118,793,000.

PLANT ACQUISITION AND CONSTRUCTION

Object classification

[In thousands]

	1960 actual	1961 estimate	1962 estimate
<b>Atomic Energy Commission:</b>			
22 Transportation of things.....	\$1	\$3	\$3
25 Other services.....	15,682	19,397	15,737
Services of other agencies.....	162		
26 Supplies and materials.....	394	1,000	750
32 Lands and structures.....	274,768	265,154	358,029
42 Insurance claims and indemnities.....	63	75	75
<b>Total, Atomic Energy Commission.....</b>	<b>290,746</b>	<b>285,629</b>	<b>374,594</b>
<b>Allocation accounts:</b>			
11 Personnel compensation:			
Permanent positions.....	9	73	
Other personal services.....		5	
<b>Total personnel compensation.....</b>	<b>9</b>	<b>78</b>	
12 Personnel benefits.....	1	6	
23 Rent, communications, and utility services.....		1	
25 Other services.....	852	606	700
Services of other agencies.....	3		
32 Lands and structures.....	3,686	3,295	
<b>Total, allocation accounts.....</b>	<b>4,551</b>	<b>3,986</b>	<b>700</b>
<b>Total obligations.....</b>	<b>295,297</b>	<b>289,615</b>	<b>375,294</b>
<b>Obligations are distributed as follows:</b>			
Atomic Energy Commission.....	290,746	285,629	374,594
Army.....	822	1,668	700
Maritime activities.....	3,726	2,318	
Bureau of Public Roads.....	3		

Personnel summary

	1960 actual	1961 estimate	1962 estimate
<b>Allocation accounts:</b>			
Total number of permanent positions.....	2	15	
Average number of all employees.....	2	14	
Number of employees at end of year.....	5	5	
Average GS grade.....	6.0	5.8	
Average GS salary.....	\$4,846	\$5,109	

The following table summarizes the personnel data for the Atomic Energy Commission, Army, Maritime activities, and Bureau of Public Roads for the years 1960, 1961, and 1962. The data is presented in thousands of dollars.

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The following table summarizes the personnel data for the Atomic Energy Commission, Army, Maritime activities, and Bureau of Public Roads for the years 1960, 1961, and 1962. The data is presented in thousands of dollars.

## Program and financing

[In thousands]

	1960 actual	1961 estimate	1962 estimate
<b>Program by activities: Facilities for—</b>			
1. Raw materials.....	\$0	\$60	\$60
2. Special nuclear materials.....	101,257	84,638	101,125
3. Weapons.....	28,330	32,178	24,000
4. Reactor development.....	115,848	110,130	161,369
5. Physical research.....	41,781	53,164	78,510
6. Biology and medicine.....	2,376	5,160	3,260
7. Training, education and information.....	632	277	150
8. Civilian applications of isotopes and nuclear explosives.....	2,174	1,476	-----
9. Communities.....	2,200	1,932	6,620
10. Administration.....	690	600	200
<b>Total obligations.....</b>	<b>295,297</b>	<b>289,615</b>	<b>375,294</b>
<b>Financing:</b>			
Unobligated balance brought forward.....	-209,916	-182,831	-106,544
Recovery of prior year obligations.....	-5,712	-2,778	-----
Unobligated balance transferred from "Research, development, test, and evaluation, Air Force" (74 Stat. 751).....	-----	-6,300	-----
Unobligated balance carried forward.....	182,831	106,544	-----
<b>New obligational authority.....</b>	<b>262,600</b>	<b>204,250</b>	<b>268,750</b>
<b>New obligational authority:</b>			
Appropriation.....	262,600	212,750	268,750
Transferred to—			
"Operating expenses," Atomic Energy Commission (74 Stat. 752).....	-----	-5,000	-----
"Other procurement," Navy (74 Stat. 752).....	-----	-3,500	-----
<b>Appropriation (adjusted).....</b>	<b>262,600</b>	<b>204,250</b>	<b>268,750</b>

## GENERAL STATEMENT FOR OPERATING EXPENSES

*Estimate of appropriation*

This book contains the budget estimates for the appropriation "Operating expenses" for fiscal year 1962. The estimates provide for total obligations of \$2,454,043,000 to be funded by: (1) a new appropriation of \$2,359,400,000; (2) the utilization of an unobligated balance of \$66,943,000 estimated to be available at the end of the fiscal year 1961; and (3) an estimated \$27,700,000 to be received as revenues from non-Federal sources during the fiscal year.

*Estimates of costs and obligations*

The budget estimates for this appropriation are stated in terms of accrued costs for each of the AEC's 12 operating programs. "Accrued costs" denotes the actual application of labor, materials, equipment, and services to the program during the year, but excludes depreciation of facilities used in the operations. The AEC does, however, maintain accounts for depreciation for the purpose of determining total costs of production and for use in establishing prices for services rendered or products sold to others.

The costs of operation are reconciled to the total obligations to be incurred during the year by estimating the buildup or decrease during the year of the resources that are to be applied to future years' operations. These estimates are included in the section titled, "Increase or Decrease (—) in Selected Resources" and include inventories and undelivered orders.

From total obligations are deducted the revenues estimated to be obtained from non-Federal sources in order to arrive at the amount of appropriations required. These revenues are obtained from AEC-owned community and housing operations, from the sale of products, from services performed for others, and from miscellaneous sources. These revenues are identified and summarized under the tab "Revenues applied."

The following table summarizes the accrued costs for each program, and the total obligations for fiscal year 1960, 1961, and 1962. The detailed justifications, beginning on page 13, present the programs in the same order as they appear on this summary table.

*Summary of accrued operating costs by program reconciled to net obligations*

	Actual fiscal year 1960	Estimate fiscal year 1961	Estimate fiscal year 1962
<b>Accrued costs by program:</b>			
Raw materials.....	\$715,928,966	\$636,011,000	\$562,559,000
Special nuclear materials.....	553,300,321	567,284,000	557,493,000
Weapons.....	499,611,675	520,000,000	561,200,000
Reactor development.....	387,446,177	436,665,000	432,845,000
Physical research.....	135,283,231	163,732,000	177,834,000
Biology and medicine.....	47,644,730	54,381,000	61,140,000
Training, education, and information.....	11,842,535	14,530,000	14,170,000
Civilian applications of isotopes and nuclear explosives.....	10,408,588	10,780,000	12,000,000
Community.....	14,247,686	9,502,000	8,583,000
Program direction and administration.....	50,594,773	57,755,000	57,950,000
Security investigations.....	7,056,739	6,946,000	6,517,000
Cost of work for others.....	6,350,432	7,512,000	4,802,000
Adjustment to prior year costs.....	136,532	0	0
Total accrued program costs.....	2,439,852,385	2,485,093,000	2,457,093,000
Changes in selected resources.....	9,373,145	57,010,877	-3,050,000
Total obligations for operating expenses.....	2,449,225,530	2,542,103,877	2,454,043,000
Less: Revenues applied.....	-30,370,438	-32,025,000	-27,700,000
Net obligations (financed by appropriated funds).....	2,418,855,092	2,510,038,877	2,426,343,000

*Financing of obligations*

The financing of the estimated total obligations of \$2,454,043,000 proposed in the budget estimates for fiscal year 1962, together with comparable data for fiscal years 1960 and 1961, is summarized in the following table:

	Actual fiscal year 1960	Estimate fiscal year 1961	Estimate fiscal year 1962
<b>Funds available for obligations:</b>			
Unobligated balance, beginning of year.....	\$152,557,969	\$120,816,877	\$66,943,000
Appropriation.....	2,389,114,000	2,451,210,000	2,359,400,000
Revenues received from non-Federal sources.....	30,370,438	32,025,000	27,700,000
Transfer from "Plant acquisition and construction," Atomic Energy Commission (74 Stat. 752).....	0	5,000,000	0
Transfer to "Salaries and expenses," National Science Foundation (73 Stat. 364).....	-2,000,000	0	0
Total funds available for obligation.....	2,570,042,407	2,609,051,877	2,454,043,000
Less: Unobligated balance, end of year.....	120,816,877	66,943,000	0
Total obligations incurred.....	2,449,225,530	2,542,103,877	2,454,043,000

The unobligated balance of \$66.9 million estimated to be available at the end of fiscal year 1961 includes \$29.7 million representing that part of the difference between the actual unobligated balance on June 30, 1960, and the estimate included in the 1961 budget estimates which is not required in fiscal year 1961 for attainment of the specific objectives for which it was planned in 1960, and estimated savings in fiscal year 1961 of \$37.2 million representing mainly higher revenues than anticipated in the 1961 budget, and reductions in the weapons and aircraft nuclear propulsion programs in keeping with the projected 1962 budget levels.

*Expenditures for operating expenses*

Expenditures from the "Operating expenses" appropriation for fiscal year 1962 are estimated at \$2,380 million, a decrease of \$35 million from estimated expenditures of \$2,415 million in fiscal year 1961. Actual expenditures for operating expenses in fiscal year 1960 totaled \$2,398,898,728. The estimated amounts available for expenditures in fiscal years 1960, 1961, and 1962, the

expenditures for each year, and the remaining unexpended balances are shown in the following table:

*Expenditure analysis*

	Actual, fiscal year 1960	Estimate, fiscal year 1961	Estimate, fiscal year 1962
Funds available for expenditure:			
Unexpended balance, beginning of year:			
Obligated.....			
Unobligated balance.....	\$815,055,495	\$835,011,859	\$930,095,736
New appropriation.....	152,557,969	120,816,877	66,943,000
Transfer from "Plant acquisition and construction," Atomic Energy Commission (74 Stat. 752).....	2,389,114,000	2,451,210,000	2,359,400,000
Transfer to "Salaries and expenses," National Science Foundation (73 Stat. 364).....	0	5,000,000	0
.....	-2,000,000	0	0
Total funds available for expenditure.....	3,354,727,464	3,412,038,736	3,356,438,736
Less: Expenditures.....	2,398,898,728	2,415,000,000	2,380,000,000
Unexpended balance, end of year:			
Obligated.....	835,011,859	930,095,736	976,438,736
Unobligated balance.....	120,816,877	66,943,000	0
Total unexpended balance.....	955,828,736	997,038,736	976,438,736

HIGHLIGHTS OF OPERATING PROGRAMS

There follows a brief description of each of the programs set forth in the summary on page 2.

1. *Raw materials program.*—Operating costs for the raw materials program are estimated at \$562.6 million in fiscal year 1962, compared with estimated fiscal year 1961 costs of \$636 million and actual fiscal year 1960 costs of \$715.9 million. The raw materials program includes the procurement of uranium concentrates and ores from foreign and domestic sources and related costs for resource evaluation. The decrease in quantities of uranium concentrates to be procured in fiscal year 1962 results primarily from the deferral of Canadian deliveries until after fiscal year 1962.

2. *Special nuclear materials program.*—Operating costs for the special nuclear materials program are estimated at \$557.5 million in fiscal year 1962, compared with estimated fiscal year 1961 costs of \$567.3 million and actual fiscal year 1960 costs of \$553.3 million. The production of special nuclear materials begins with the refinement of uranium concentrates for diffusion plants or reactors. The isotope uranium 235 is extracted in gaseous diffusion plants at Oak Ridge, Tenn., Paducah, Ky., and Portsmouth, Ohio. Plutonium is synthesized in the reactors at Hanford Wash., and Savannah River, S.C. Improvements in processes for each manufacturing step are aimed at decreases in unit costs, increase in yield, and improvements in the quality of products.

3. *Weapons program.*—Operating costs for the weapons program are estimated at \$561.2 million in fiscal year 1962 compared with estimated fiscal year 1961 costs of \$520 million and actual fiscal year 1960 costs of \$499.6 million. The weapons program includes the production of atomic weapons, the maintenance of stockpiled weapons in a state of constant readiness, the development and design of new weapon types, and participation with the Department of Defense in experimental programs for improving the techniques of detecting nuclear detonations at high altitude and underground.

4. *Reactor development program.*—Operating costs for the reactor development program are estimated at \$432.8 million in fiscal year 1962 compared with estimated fiscal year 1961 costs of \$436.7 million and actual fiscal year 1960 costs of \$387.4 million. Emphasis will continue to be placed on advancing power reactor technology in order to achieve large-scale generation of economic electrical energy from atomic reactors. Cooperative endeavors between the Commission and industrial groups, as well as with the European Atomic Energy Community (Euratom) and Canada, will be continued.

The estimates provide for general reactor systems research and development applicable to many reactor designs, fuel cycle development, a program of reactor safety, development of separations systems for processing irradiated fuel elements, development of systems for disposal of radioactive wastes and a program on high temperature materials research and high performance reactors research.

Work will also be continued on reactors to propel merchant vessels, on reactors to meet military needs for power in remote areas, on reactors to propel naval vessels, rockets, and missiles, and on reactors and radioisotopes to provide electric power and heat for satellites. This research also provides information useful in the development of civilian power reactors.

Operation of test facilities and experimental reactors will be continued at the National Reactor Testing Station, Idaho.

5. *Physical research program.*—Operating costs for physical research are estimated at \$177.8 million in fiscal year 1962 compared with estimated fiscal year 1961 costs of \$163.7 million and actual fiscal year 1960 costs of \$135.3 million. The physical research program consists of theoretical and experimental investigations required to support the Commission's immediate and long-range objectives for utilizing nuclear energy. Advances achieved in the past can be traced back to similar laboratory investigations. In the atomic energy program, research plays a relatively more important role than in other industrial operations of comparable size. The phenomena dealt with are close to the fringes of scientific knowledge. Unusual materials are employed and their nuclear, as well as their chemical and physical properties, must be determined. The temperatures and radiation densities at which these materials are used are outside the range of previous experience in industrial technology.

Research will be continued on the controlled thermonuclear project to eventually achieve production of power through the fusion process.

Research is carried on by Commission laboratories, universities, and other independent institutions.

6. *Biology and medicine program.*—Operating costs for research in biology and medicine are estimated at \$61.1 million for fiscal year 1962, compared with estimated costs of \$54.4 million in fiscal year 1961 and actual cost of \$47.6 million in fiscal year 1960. Primary emphasis will continue to be placed on the protection of the health and safety of atomic energy plant workers and the general populace from the hazards of atomic energy operations. Research on radioactive fallout problems and related research in the biological hazards of radiation will continue to be expanded. Additional emphasis will be placed on research efforts of pertinence in the rapidly growing field of industrial uses of atomic energy. Close liaison will continue to be maintained with the Office of Civil and Defense Mobilization as well as with other agencies performing functions interrelated with Commission biomedical interests. Research is carried on by Commission laboratories, universities, and other independent institutions.

7. *Training, education, and information program.*—Operating costs for the training, education, and information program are estimated at \$14.2 million in fiscal year 1962 compared to estimated fiscal year 1961 cost of \$14.5 million and actual fiscal year 1960 costs of \$11.8 million. Primary program emphasis will continue to be placed on broadening the base of nuclear technology at home and abroad. Program efforts are directed toward provision of assistance to colleges and universities in establishing nuclear curriculums; provision of assistance to States for training in radiation control; operation, through contract, of schools and the conduct of specialized courses; offering of graduate fellowships in the nuclear energy field; presentation of international conferences, studies, and exhibits; and development and dissemination of technical information. The radioisotope training activities formerly budgeted under the isotopes development program are now being budgeted under this program.

8. *Civilian applications of isotopes and nuclear explosives.*—Operating costs for this program are estimated at \$12 million in fiscal year 1962 compared to estimated fiscal year 1961 costs of \$10.8 million and actual fiscal year 1960 costs of \$10.4 million.

The program for civilian applications of isotopes consists of research and development activities required to accelerate realization of the potentially vast nonpower uses of atomic energy. The program will provide for expanding the technology and utilization of isotopes with particular attention to civilian applications; encouraging private production of isotopes; developing, through research and development activities, application of high level or massive radiation; and developing, through research and development activities, methods and technology for preservation of foods by irradiation.

The civilian applications of nuclear explosives program (Plowshare) encompasses the development of peaceful uses of nuclear explosives. The program provides for development of special instrumentation and feasibility studies regarding new applications and devices; experimental effort directed toward power

and isotope production; and initiation of an experiment to obtain information on the use of nuclear explosives for excavations.

9. *Community.*—The Commission will continue to operate under contract the community of Los Alamos, N. Mex., and will provide assistance payments for Oak Ridge, Tenn., and Richland, Wash. All houses have been disposed of at Oak Ridge and Hanford and remaining building lots, apartments, and commercial properties are expected to be disposed of during fiscal year 1962. The operation of employee housing at Sandia, N. Mex., has been discontinued. Operating costs of the program are estimated at \$8.6 million in fiscal year 1962 compared to estimated fiscal year 1961 costs of \$9.5 million and fiscal year 1960 costs of \$14.2 million.

10. *Program direction and administration.*—Under the general heading of program direction and administration are grouped together the salary costs and other expenses of Commission personnel engaged in general management, executive direction, and technical supervision of program operations; the negotiation and administration of contracts; and other related administrative activities. The corresponding costs for Commission personnel engaged in nonadministrative activities directly related to a specific program are included in that program, as for example, personnel safeguarding classified shipments or providing fire protection for a community. Expenses of personnel of other Government agencies, including their travel, doing work for the Commission are treated as contractual services, and are therefore not included in the AEC detail of personnel services and travel.

Estimated costs of \$58 million will be incurred in fiscal year 1962 for program direction and administration compared with estimated fiscal year 1961 costs of \$57.8 million and actual fiscal year 1960 costs of \$50.6 million. No increase in staff is budgeted for fiscal year 1962 under this program. The increase of \$0.2 million is required principally for salaries, travel, and other costs associated with the higher average employment, resulting from having on the rolls for all of fiscal year 1962 employees who will be hired during fiscal year 1961. The costs in fiscal year 1962 represent 2.4 percent of the total operating costs, compared with an estimated 2.3 percent in fiscal year 1961, and 2.1 percent in fiscal year 1960.

11. *Security investigations.*—Cost of security investigations in fiscal year 1962 are estimated at \$6.5 million compared with estimated fiscal year 1961 costs of \$6.9 million and actual fiscal year 1960 costs of \$7.1 million. Under provisions of the Atomic Energy Act of 1954, persons to be employed on work involving access to restricted data are required to be cleared for security purposes based on investigations by the Civil Service Commission or the Federal Bureau of Investigation.

12. *Cost of work for others.*—This program includes costs incurred by the Commission in furnishing materials and services to industrial organizations and other private parties apart from those which it provides normally for its own basic program. The costs are incurred only upon the request of others. Charges are made for these materials and services and the revenues derived are included under "Revenues applied." Cost of work for others is estimated to be \$4.8 million in fiscal year 1962, compared with \$7.5 million in fiscal year 1961 and \$6.4 million in fiscal year 1960. The lower estimate in fiscal year 1962 is due principally to an estimated decrease in sales of special reactor materials.

13. *Increase or decrease in selected resources.*—This program includes inventory stocks held by AEC and its contractors, collateral funds, and goods and services on order under contract. The appropriation requirements for these items are based on the changes in balances from the previous fiscal year. Selected resources at the end of fiscal year 1962 are estimated at \$945.2 million as compared with \$948.3 million in fiscal year 1961 and \$891.3 million in fiscal year 1960. The net decrease of \$3.1 million in fiscal year 1962 results principally from a decrease in the balances for the cooperative arrangements program; partially offset by (1) increases in inventory balances for special reactor materials and isotopes based on projected program requirements, (2) increases in goods and services on order related to an expanded level of production in the weapons program, and (3) increases in balances related to procurement of Canadian uranium concentrates, delivery of which is deferred until future years.

14. *Revenues applied.*—This program includes income from sale and lease of products and from services rendered, revenues from communities, and other miscellaneous income items. These revenues are applied against Atomic Energy

Commission appropriation requirements. Revenues are estimated at \$27.7 million for fiscal year 1962, compared to an estimate of \$32 million for fiscal year 1961. The lower estimate in fiscal year 1962 is due principally to an estimated decrease in sales of various products. Revenues for fiscal year 1960 were \$30.4 million.

#### JUSTIFICATION FOR PROPOSED LANGUAGE CHANGES—OPERATING EXPENSES

Proposed changes in language are indicated as follows: language enclosed in black brackets [ ] indicates proposed deletions, and *underscoring* indicates proposed insertion of new language.

1. "[rental in or near the District of Columbia;]"

Rental authority in appropriation language of various agencies is being deleted in fiscal year 1962 since language has been proposed under appropriations to the General Services Administration to authorize that agency to make all necessary rentals in the District of Columbia as may be requested with costs to be reimbursed by the requesting agency.

2. "[not to exceed \$3,650,000 for expenses of travel;]"

"[not to exceed \$53,400,000 for personal services;]"

To eliminate the limitations previously included in the appropriation act. This action would be consistent with the recommendations of the Hoover Commission.

3. "purchase (not to exceed [four hundred and sixty] *four hundred and fifty-two*, of which [four hundred and thirty-seven] *three hundred and fourteen* are for replacement only [including two at not to exceed \$4,000 each]) and hire of passenger motor vehicles"

This change provides for authorization of the procurement in fiscal year 1962 of 452 passenger motor vehicles of which 314 are required for replacement of older vehicles and 138 would be additions to the fleet.

All vehicles to be replaced will meet or exceed the GSA replacement standards. The additional vehicles requested include 128 automobiles, 2 station wagons and 8 buses. Major requirements are 100 automobiles for the Nevada test site to offset a like number of commercial rentals in view of the continuing program at this location and 21 automobiles for the Atomic Bomb Casualty Commission to be substituted for 4-wheel drive truck type vehicles used for passenger and patient transportation.

Contractors are assigned passenger motor vehicles as Government-furnished equipment and operate them in carrying out the Commission's program. With the net addition of 138, the passenger vehicle fleet will number 2,133 at the end of fiscal year 1962.

4. "[~~\$2,451,210,000~~, which, together with the unexpended balances, as of June 30, 1960, of prior year appropriations made available under this head to the Atomic Energy Commission] *\$2,359,400,000*"

To reflect the fiscal year 1962 appropriation amount.

5. "[shall] to remain available until expended"

To reflect language consistently used on appropriations available until expended.

6. "*Provided further, That not to exceed \$7,000,000 of this appropriation may be transferred to the appropriation for 'Plant Acquisition and Construction', if the Commission determines such transfer is necessary to carry out the purpose of such cooperative power reactor demonstration program as may be authorized under the Commission's authorization Act for the fiscal year 1962*"

The fiscal year 1962 authorization bill, as proposed by the Commission, would authorize additional appropriations amounting to \$7 million for the cooperative power reactor demonstration program. Appropriation of these funds is being requested in this appropriation. The above proviso would permit transfer of these funds to the "Plant acquisition and construction" appropriation if the Commission determines such transfer to be necessary to carry out the purposes of the authorized program.



## JUSTIFICATION FOR PROPOSED LANGUAGE CHANGES—GENERAL PROVISIONS

The proposed change in the language for the administrative provisions is described below. Language enclosed in black brackets [ ] indicates proposed deletions; language in italic indicates proposed insertions.

1. "Any appropriation available under this or any other Act to the Atomic Energy Commission may initially be used subject to limitations in this Act during the fiscal year [1961] 1962 to finance the procurement of materials, services, or other costs which are a part of work or activities for which funds have been provided in any other appropriation available to the Commission: \* \* \*"

This change makes the provision applicable to fiscal year 1962.

## GENERAL STATEMENT FOR PLANT ACQUISITION AND CONSTRUCTION

*Summary of requirements for fiscal year 1962*

The budget estimates for the appropriation "Plant acquisition and construction" for the fiscal year 1962 provide for total obligations of \$375,294,000 of which funds in the amount of \$106,544,000 are presently available from prior year appropriations, requiring a new appropriation of \$268,750,000.

Of the total amount of funds presently available, \$94,844,000 is required for prior year projects which were not fully contracted for in fiscal year 1961. The remainder of the funds presently available, \$11,700,000 is a net unobligated balance resulting from the elimination, or deferment beyond fiscal year 1962, of projects or changes in the total estimated cost of projects for which funds were previously appropriated.

The prior year projects which have not been fully contracted and for which \$94,844,000 of funds presently available are carried forward for obligation in fiscal year 1962 are identified in section B under each program throughout this document. The newly authorized projects and the residual funding of previously authorized projects requiring obligation of \$280,450,000 in fiscal year 1962, which are to be funded by the new appropriation of \$268,750,000 and the \$11,700,000 of funds presently available, are identified in section A under each program throughout this document.

A summarization of the fiscal year 1962 obligations by program, showing the application of funds presently available and the derivation of the new appropriation requirement is shown on the following page.

*Summary of obligations for fiscal year 1962 by program*

Program	Fiscal year 1962 obligations		
	Sec. A (funding)	Sec. B (carryover)	Total
Raw materials.....	\$60,000	0	\$60,000
Special nuclear materials.....	98,425,000	\$2,700,000	101,125,000
Weapons.....	24,000,000	0	24,000,000
Reactor development.....	69,225,000	92,144,000	161,369,000
Physical research.....	78,510,000	0	78,510,000
Biology and medicine.....	3,260,000	0	3,260,000
Training, education, and information.....	150,000	0	150,000
Community.....	6,620,000	0	6,620,000
Administrative.....	200,000	0	200,000
Total obligations.....	280,450,000	94,844,000	375,294,000
Unobligated balances brought forward.....	-11,700,000	-94,844,000	-106,544,000
Appropriation.....	268,750,000	0	268,750,000

*Three-year summary of obligations and financing of obligations*

The following tables summarize the total obligations incurred for each of the AEC's major construction programs for fiscal year 1960, fiscal year 1961, and fiscal year 1962, and the sources of funding these obligations:

## Summary of obligations by program

Program	Actual, fiscal year 1960	Estimate, fiscal year 1961	Estimate, fiscal year 1962
Raw materials.....	\$8,624	\$60,000	\$60,000
Special nuclear materials.....	101,256,751	84,638,000	101,125,000
Weapons.....	28,329,977	32,178,000	24,000,000
Reactor development.....	115,847,555	110,129,727	161,369,000
Physical research.....	41,781,009	53,164,000	78,510,000
Biology and medicine.....	2,375,909	5,160,000	3,260,000
Training, education, and information.....	632,584	277,000	150,000
Civilian applications of isotopes and nuclear explosives.....	2,174,108	1,476,000	0
Community.....	2,200,163	1,932,000	6,620,000
Administrative.....	690,093	600,000	200,000
Total obligations.....	295,296,773	289,614,727	375,294,000

## Summary of financing

	Actual fiscal year 1960	Estimate fiscal year 1961	Estimate fiscal year 1962
Funds available:			
Unobligated balance at beginning of year.....	\$209,915,500	\$182,830,727	\$106,544,000
Recovery of prior year obligations.....	5,712,000	2,778,000	0
Appropriation.....	262,500,000	212,750,000	268,750,000
Transfer from "Research, development, test, and evaluation, Air Force" (74 Stat. 751).....	0	6,300,000	0
Transfer to "Operating expenses, Atomic Energy Com- mission" (74 Stat. 752).....	0	-5,000,000	0
Transfer to "Other procurement, Navy" (74 Stat. 752).....	0	-3,500,000	0
Net amount available for obligations.....	478,127,500	396,158,727	375,294,000
Unobligated balance at end of year.....	182,830,727	106,544,000	0
Total obligations.....	295,296,773	289,614,727	375,294,000

## Expenditures for plant acquisition and construction

Expenditures for plant acquisition and construction for fiscal year 1962 are estimated to be \$290 million, an increase of \$45 million over the estimate of \$245 million in fiscal year 1961. Actual expenditures in fiscal year 1960 totaled \$223,939,277. Unexpended balances are expected to decrease from \$515,157,516 at the beginning of fiscal year 1960 to an estimated \$498,018,139 at the end of fiscal year 1962 as shown in the following table:

	Actual, fiscal year 1960	Estimate, fiscal year 1961	Estimate, fiscal year 1962
Unexpended balance, beginning of year.....	\$515,157,516	\$553,718,139	\$519,268,139
Appropriation.....	262,500,000	212,750,000	268,750,000
Transfer from "Research, development, test and evaluation, Air Force" (74 Stat. 751).....	0	6,300,000	0
Transfer to "Operating expenses, Atomic Energy Com- mission" (74 Stat. 752).....	0	-5,000,000	0
Transfer to "Other procurement, Navy" (74 Stat. 752).....	0	-3,500,000	0
Total funds available.....	777,657,516	764,268,139	788,018,139
Less expenditures.....	223,939,377	245,000,000	290,000,000
Unexpended balance, end of year.....	553,718,139	519,268,139	498,018,139

## HIGHLIGHTS OF CONSTRUCTION PROGRAMS

As shown in the table on page 366, estimates are presented on an obligation basis for construction requirements for each of the AEC's functional programs. The highlights of the estimates for new projects and previously authorized projects for which appropriations are required in fiscal year 1962 are as follows:

1. *Raw materials*.—Obligations for raw materials facilities in fiscal year 1962 are estimated at \$60,000 to provide for minor modifications and improvements

to existing plant or installations of the Grand Junction, Colo., Operations Office.

2. *Special nuclear materials.*—Obligations for special nuclear materials facilities in fiscal year 1962 are estimated at \$101.1 million and will provide \$91.2 million for new projects proposed for authorization if fiscal year 1962, \$7.2 million for increased cost of the new production reactor at Hanford (now estimated at \$152.2 million), and \$2.7 million for rescheduling obligations of a previously funded project. The \$91.2 million proposed for new projects includes \$60 million for electric energy generating facilities for the new production reactor (total estimated cost, \$95 million); \$9 million for improvements to production reactors, \$2.6 million for replacement of Oak Ridge facilities affected by TVA construction of Melton Hill Dam, \$0.6 million for feed plant modifications, \$7.5 million for modifications to production and supporting installations, and \$11.5 million for general plant projects.

3. *Weapons.*—Obligations for weapons facilities in fiscal year 1962 are estimated at \$24 million to provide \$14.5 million for additional production capability and research and development facilities, and \$9.5 million for general plant projects.

4. *Reactor development.*—Obligations for reactor development facilities in fiscal year 1962 are estimated at \$161.4 million which will provide \$41.7 million for new projects to be authorized and \$27.6 million for funding on previously authorized projects and \$92.1 million for rescheduling obligations of previously funded projects. The new projects provide \$15.5 million for the civilian power program, including test loops for the experimental organic cooled reactor at National Reactor Testing Station, Idaho, a fuels recycle pilot plant at Hanford, Wash., a building at Los Alamos Scientific Laboratory, N. Mex., to house an ultrahigh temperature reactor experiment, and a supporting laboratory and radioactive liquid waste system at Oak Ridge; \$8 million for an experimental beryllium oxide reactor utilizing an advanced high temperature, compact, gas-cooled system for maritime and civilian power requirements; \$3.4 million for a test plant for testing reactor systems and components for power systems for satellites; \$3.8 million for laboratory support buildings; and \$11 million for general plant projects. The funding on previously authorized projects provides \$7 million for test plants for the rocket propulsion reactors program (Project Rover); \$6 million for test plants for the missile propulsion reactors program (Project Pluto); \$7 million for a power reactor plant for the Antarctic; \$4 million for the natural circulation test plant under the naval propulsion reactors program; and \$3.6 million for the advanced test reactor at National Reactor Testing Station, Idaho (on which authorized total cost is increased from \$24 million to \$40 million).

5. *Physical research.*—Obligations for physical research facilities in fiscal year 1962 are estimated at \$78.5 million, consisting of \$20.6 million for new projects to be authorized including \$6.9 million for a high energy physics building and \$6 million for a chemistry laboratory; \$56.9 million for additional funding on previously authorized projects including \$26 million for initiating construction of a linear electron accelerator (total estimated cost, \$114 million) and \$5.6 million for a materials research laboratory; and \$1 million for general plant projects.

6. *Biology and medicine.*—Obligations for biology and medicine facilities in fiscal year 1962 are estimated at \$3.3 million to provide \$2.8 million for the construction of new projects to be authorized for support of biomedical research projects in atomic energy, and \$500,000 for general plant projects.

7. *Training, education and information.*—Obligations for training, education, and information facilities in fiscal year 1962 are estimated at \$150,000 to provide for general plant construction at the Nuclear Training Center at Puerto Rico.

8. *Civilian applications of isotopes and nuclear explosives.*—No obligations for facilities for civilian applications of isotopes and nuclear explosives are planned for fiscal year 1962.

9. *Community.*—Obligations for community facilities in fiscal year 1962 are estimated at \$6.6 million to provide for the following at Los Alamos: \$2.5 million for additional school and library facilities; \$3.5 million for house construction, real estate development, and community support facilities; and \$0.6 million for general plant projects.

10. *Administrative.*—Obligations for administrative facilities in fiscal year 1962 are estimated at \$200,000 for general plant projects at headquarters.

EXPLANATION OF PROPOSED LANGUAGE CHANGES—PLANT ACQUISITION  
AND CONSTRUCTION

Proposed changes in language are indicated as follows: language enclosed in black brackets indicates proposed deletions, and italic indicates proposed insertion of new language.

1. "~~[\$212,750,000]~~ \$268,750,000".

To delete the amount appropriated in fiscal year 1961 and to insert the amount of the fiscal year 1962 appropriation request.

2. "~~]:~~ *Provided*, That not to exceed \$10,000,000 of this appropriation, may be transferred to the appropriation for 'Operating expenses', if the Commission determines such transfer is necessary to carry out the purposes of the cooperative power reactor demonstration program authorized under the Commission's authorization act for the fiscal year 1961: *Provided further*, That, in addition to the amounts appropriated herein, there is authorized to be transferred to this appropriation and merged therewith, the amount of \$6,300,000 from the appropriation 'Research, development, test, and evaluation, Air Force', for construction of test and developmental facilities under the aircraft nuclear propulsion program: *Provided further*, That not to exceed \$3,500,000 of this appropriation shall be transferred to the appropriation 'Other Procurement, Navy', solely for construction of power reactor plants for the Antarctic~~]~~".

To eliminate language in the fiscal year 1961 Appropriation Act which is not required.

*Proposed amendments to the Public Works Appropriation Act, 1962, Atomic Energy Commission (H.R. 9076)*

(As reported by the House Appropriations Committee)

## Amended estimate of appropriations submitted to the House:

Operating expenses.....	\$2,359,400,000
Plant acquisition and construction.....	268,750,000

Total.....	2,628,150,000
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## Bill as reported by the House Appropriations Committee:

Operating expenses.....	2,352,601,000
Plant acquisition and construction.....	( <sup>1</sup> )

Change by House Appropriations Committee: Operating expenses.....	-6,799,000
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<sup>1</sup> The House Appropriations Committee took no action on this appropriation in their report.

## PROPOSED AMENDMENT

(1) Page 20, line 9, strike out "\$2,352,601,000" and insert in lieu thereof "\$2,359,400,000".

## HOUSE REPORT No. 1125

## PUBLIC WORKS APPROPRIATION BILL, 1962

## ATOMIC ENERGY COMMISSION

*Operating expenses*

Appropriation, 1961-----	\$2, 451, 210, 000
Estimate, 1962-----	2, 359, 400, 000
Recommended, 1962-----	2, 352, 601, 000
Comparison:	
Appropriation, 1961-----	-98, 609, 000
Estimate, 1962-----	-6, 799, 000

Funds recommended for appropriation under this heading are distributed as follows:

Raw materials-----	562, 559, 000
Special nuclear materials-----	557, 493, 000
Weapons program-----	591, 200, 000
Reactor development program-----	430, 180, 000
Physical research program-----	175, 000, 000
Biology and medicine-----	61, 140, 000
Training, education, and information-----	14, 170, 000
Civilian application of isotopes and nuclear explosives-----	10, 700, 000
Community program-----	8, 583, 000
Program direction and administration-----	57, 950, 000
Security investigations-----	6, 517, 000
Other costs-----	4, 802, 000
Selected resources-----	-3, 050, 000
Revenues received from non-Federal sources-----	-27, 700, 000
Unobligated balance brought forward-----	-96, 943, 000
Appropriation-----	2, 352, 601, 000

## CHANGES IN BUDGETED ITEMS

*Weapons program.*—The increase of \$30 million in this item is to be used exclusively for nuclear weapons testing. These funds are now available as a part of unobligated balances carried over from the 1961 appropriations and can be used immediately.

*Reactor development program.*—The budget estimate for this program was \$432,845,000. The committee has made a reduction of \$2,665,000 which is to be applied to the nuclear technology research programs. The amount allowed for these programs is an increase of \$1,885,000 above fiscal year 1961 appropriation and over \$6 million above the 1960 level. The reduction does not effect the budgeted amounts for the separations and radioactive waste processing programs.

*Physical research programs.*—The committee recommends a reduction of \$2,834,000 in the budget estimate of \$177,834,000. This reduction is to be applied against the general research programs under this heading for which a total of \$84,841,000 is recommended in the bill. This is an increase for these activities of \$5,091,000 over the 1961 appropriation and an increase of \$17,771,000 over the 1960 level. No reduction is proposed for the budgeted programs for high energy physics and controlled thermonuclear power research activities.

*Civilian application of isotopes and nuclear explosives.*—The budget estimate of \$12 million has been reduced in the amount of \$1,300,000. The balance of \$10,700,000 will continue the program at the 1961 level.

Amendment (1): Increase of \$6,799,000 in the appropriation for operating expenses.

The Commission requests restoration of \$6,799,000, the reduction made by the House Appropriations Committee. The following summary tabulation shows for each item involved in this amendment the amount included in the budget estimate, the reduction made by the House Appropriations Committee, and the amount requested for restoration.

Program	AEC request	House committee change	Restoration requested
1. Weapons.....	\$561,200,000	+\$30,000,000	0
2. Reactor development.....	432,845,000	-2,665,000	+\$2,665,000
3. Physical research.....	177,834,000	-2,834,000	+2,834,000
4. Civilian application of isotopes and nuclear explosives.....	12,000,000	-1,300,000	+1,300,000
5. Unobligated balance brought forward.....	-66,943,000	-30,000,000	0
Total.....		-6,799,000	+6,799,000

An explanation of the reasons for the request for restoration for each item follows.

### 1. Reactor development

The House committee has made a reduction of \$2,665,000 which is to be applied to the nuclear technology research programs. The House committee indicated that the reduction does not effect the budgeted amounts for the separations and radioactive waste processing activities.

The nuclear technology program is directed to the resolution of problems that pertain to military, space, and civilian power reactors. In addition to the activities in separations and radioactive waste processing, it includes major activities in reactor physics, materials, and components development which apply to long-range reactor problems and problems that are common to several concepts. At this point, in time, major emphasis is still required on the development of materials and components for use in advanced and economically competitive reactor systems, and there are still major gaps in our knowledge of reactor physics.

Most of the activities performed in nuclear technology are unique in that they are not being carried out elsewhere, and represent areas that are frequently major technical bottlenecks impeding further progress in advancing reactor technology. For example, physics data are still lacking in areas required to predict whether or not certain reactor systems fueled with plutonium or  $U^{233}$  will in fact constitute important advanced power systems.

In fiscal year 1962, there will be a major requirement for in-pile evaluation of materials developed under the fuel cycle program which was initiated about 2 years ago. This in-pile work is expected to peak in fiscal year 1963. It is also necessary to intensify the development of fuels, etc., for the advanced test reactor (ATR) in order to assure meeting the schedule contemplated for this machine, which will be principally used in the naval reactors fuel development program. Accordingly, full restoration of the House committee cut is requested.

### 2. Physical research

The House Appropriations Committee reduced by \$2,834,000 the amount required for the physical research program in fiscal year 1962. The committee indicated in its report that the reduction was not to be applied to high energy physics or to the controlled thermonuclear programs but was to be applied to the other programs in physics, mathematics, chemistry, and metallurgy. The committee report further indicated that the amount recommended for these latter programs totals \$84,841,000 and represents an increase of \$5,091,000 over the fiscal year 1961 appropriation.

If the full amount requested, namely \$177,834,000, is not provided it will be necessary to reduce certain programs, about as follows:

Other physics and mathematics.....	\$350,000
Chemistry research.....	1,434,000
Metallurgy and materials research.....	1,050,000
Total.....	2,834,000

The impact of such a reduction in other physics and mathematics would be to delay and inhibit the achievement of full and effective utilization of a number of new low-energy accelerators presently scheduled for full operation in fiscal year 1962 and, in addition, impair our ability to provide for adequate computer support.

Programs planned and underway in chemistry research would be adversely affected since planned increases in fundamental chemical engineering materials chemistry (particularly high temperature) and protactinium chemistry would

not be possible. Furthermore, under the committee reduction it may not be possible to fully exploit research capability planned for various research machines at Commission installations. Chemical flow-sheet development and target fabrication studies for the transplutonium production program would also suffer.

Finally, research programs in metallurgy and materials would be impaired. Actions made necessary by such a reduction would include (a) reduction of planned emphasis on magnetically hard superconductors whose development could play a significant role in other areas of the physical research program and elsewhere; (b) constrict the planned level of pure materials effort thereby delaying the ultimate objective of increasing the efficiency and scientific meaningfulness of the overall materials program; and (c) reduced programs in radiation effects, basic research on plutonium, rare earths, and other areas affecting both the national laboratories and many highly qualified university laboratories.

### 3. Isotopes development

The reduction of \$1.3 million proposed in the committee report, if sustained, would seriously interfere with the isotopes development program by requiring actual curtailment in essential program work already initiated. The budget as submitted by the Commission effectively constitutes a request for funds at the fiscal year 1961 level with the exception that:

1. There is projected growth and related special equipment to support the national program of research on radiation preservation of foods; and
2. Some increased funds for effective use of the newly constructed high intensity radiation development laboratory at Brookhaven National Laboratory and the radioisotope process development laboratory at Oak Ridge National Laboratory.

It is considered, therefore, that the \$5.5 million requested for the isotopes development program is essential to sustain an orderly and effective effort in this highly beneficial and promising area of peaceful atomic energy development.

### GENERAL STATEMENT

Senator HILL. We hoped, when we scheduled this hearing today, the House would have passed the authorization bill carrying your construction funds. We understand they won't pass that until Tuesday or Wednesday of next week. But don't let that interfere with your giving us the full story, because we want the full story.

Mr. Chairman, you may proceed in your own way.

Dr. SEABORG. Mr. Chairman and members of the committee. As Chairman of the Atomic Energy Commission I express my pleasure at appearing before your committee for the first time in this capacity. I have also with me today another new Commissioner, Commissioner Leland Haworth who is sitting in the row behind me.

Senator HILL. Would you like to bring up a chair, Dr. Haworth?

Dr. SEABORG. And he is, therefore, making his initial appearance before your committee.

Senator PASTORE. You may already know Dr. Haworth is one of our distinguished scientists and was the head of the Brookhaven Laboratory.

Senator HILL. Senator Pastore and I are looking for all the brains we can find. We certainly welcome you this morning.

Dr. SEABORG. My other colleagues on the Commission, Mr. Graham, Mr. Wilson, and Mr. Olson, you of course have met in previous years.

I have a statement which outlines briefly the appropriations requested by the President for the Commission for the fiscal year 1962. As you know, the public works appropriations bill for 1962, which provides funds for the Commission, was reported to the House on Wednesday. In the absence of final action on the 1962 authorization bill, the House Appropriations Committee reported out a bill

which provides only operating funds for the Commission, and no funds for plant acquisition and construction. I trust that the Congress will take action, prior to its adjournment, to provide funds for such construction, since the inability of the Commission to proceed with a number of the projects proposed would have a serious effect on our program.

Senator HILL. I am sure Senator Pastore has an answer to this question. On the next page of your statement, that is the amount of the appropriations that the Budget has recommended for your construction.

#### APPROPRIATION REQUEST

Dr. SEABORG. Yes. The appropriations requested in the budget for the Atomic Energy Commission for fiscal year 1962 would provide for \$2,359,400,000 for operating expenses and \$268,750,000 for plant acquisition and construction. By our major programs, the amounts requested and the purposes which they cover are as follows:

#### RAW MATERIALS

The \$563 million requested for the raw materials program is considerably less than has been spent for this purpose in each of the past 2 years. Our purchases of uranium concentrates will total 29,975 tons. More than half of our costs will represent purchases from U.S. producers. The cost of purchases from Canada and overseas declined about \$73 million in 1961 and will show a further decline of about \$60 million in 1962, as provided under our contracts with each of these sources. Foreign purchases will continue to decline in each of the next several years, while purchases at home will remain relatively stable. In fiscal year 1966 foreign procurement will have dwindled to about 2,100 tons, while domestic purchases will be about 16,000 tons.

#### REASON FOR DECLINE IN FOREIGN PURCHASES

Senator HILL. Mr. Chairman, I don't believe in interrupting too much, but could you briefly tell us the reason for this? Of course we are glad to see it.

Dr. SEABORG. This is the result of our own deliberate planning in order to give our domestic uranium industry the maximum benefit, Senator. We have built up, as a result of requests from the Atomic Energy Commission, a rather substantial uranium industry that has become dependent upon us, and we are doing the best we can to keep them in a healthy position.

That is the reason for it.

Senator PASTORE. May I ask a question at this point, Mr. Chairman? Now the House committee did not disturb this item?

Dr. SEABORG. No, sir.

Senator PASTORE. They granted it to you as you asked for it?

Dr. SEABORG. That is right.

Senator PASTORE. And you are not asking for any change?

Dr. SEABORG. We are not asking for any change. No deletions were suggested.

Senator PASTORE. All right.

Dr. SEABORG. However, I should emphasize that none of our purchase commitments extend beyond December 1966.

## POSSIBILITY OF URANIUM SURPLUS

Senator DWORSHAK. Mr. Chairman, at this point may I ask, I have been reading some newspaper publicity recently indicating that we may have a surplus of uranium already. Is there any possibility of that?

I realize the military importance, strategic importance, of stockpiling uranium and yet I wonder, as we see how much we are investing in uranium whether we are going beyond the point of reality.

Dr. SEABORG. Of course, no one can know, particularly today in view of the events of the last week or two, what our needs will be, but we have reached the position where we have a substantial stock of uranium and have been deliberately cutting back to the extent possible consistent with our contractual commitments.

Senator DWORSHAK. The material has a real value even though it has been acknowledged we have been paying somewhat excessive prices on the earlier contracts?

Dr. SEABORG. Yes, and it can be stored indefinitely.

Senator DWORSHAK. It does not deteriorate?

Dr. SEABORG. It does not deteriorate.

## SOURCES OF SUPPLY IN THE UNITED STATES

Senator HILL. Where do we find our major sources of supply of uranium in this country?

Dr. SEABORG. In the Colorado Plateau.

Senator HILL. In the plateau?

Dr. SEABORG. In Colorado, New Mexico and Wyoming.

Senator HILL. So far as we know, we don't have any east of the Mississippi, do we, that you could get at a price that would warrant you trying to get it. Is that right?

Dr. SEABORG. Nothing economically feasible at this time. There are very low concentration sources which we had had our eye on for some time as something we might exploit in the future. But the need for uranium has been such and the price from the concentrated source is so much less that it hasn't been considered feasible or even sensible to develop these other sources at this time.

Senator PASTORE. Isn't it a fact, Mr. Chairman, that one time there was a lot more enthusiasm and impetus in stockpiling more raw materials, that is especially uranium, in contemplation of better development of our reactor program?

Dr. SEABORG. A faster development of our civilian nuclear power program.

Senator PASTORE. We found as we proceeded that we were not going as fast as we had hoped and that in some way accounts for the slowdown as well—

Dr. SEABORG. That accounts for the slowdown.

Senator PASTORE. It isn't we overestimated ourselves, but the field itself in the peaceful uses of atomic energy didn't develop with the acceleration we had hoped in the beginning.

Senator DWORSHAK. That is the peacetime uses?

Dr. SEABORG. Yes.

Senator ELLENDER. Where is your other source of supply outside of Canada? Do you get any from the Congo, Belgian Congo?

## SOUTH AFRICAN SOURCES OF SUPPLY

Dr. SEABORG. The Congo source has been depleted or stopped, and is not commercially competitive, but we do get a substantial amount from South African sources.

Senator ELLENDER. South Africa, Johannesburg. I think from the tailing of their mines.

Dr. SEABORG. From gold mining.

Senator ELLENDER. Yes. I have visited there.

Dr. SEABORG. It is connected with the byproducts.

Senator ELLENDER. Yes, on tailings of the gold mines.

How does the price of that compare with what you buy in this country?

Dr. SEABORG. They are comparable, the prices are all comparable.

Senator ELLENDER. Delivered?

Dr. SEABORG. Delivered.

## DEPLETION OF URANIUM IN THE CONGO

Senator HILL. Now, you speak of the depletion of the uranium in the Congo. Who got most of that remainder? Did we get it or did the Russians get it?

Dr. SEABORG. We did.

Senator HILL. We did?

Dr. SEABORG. Yes.

Senator HILL. I thought we did, but I just wanted to make that clear for the record.

Dr. SEABORG. I might say that so far as the prices are concerned, I said they are comparable. However, the price of uranium from our domestic sources has been continuously going down so that now the domestic source is cheaper.

## SOURCES OF RUSSIAN SUPPLY

Senator HILL. Where do the Russians get their uranium?

Dr. SEABORG. I believe they get—

Senator HILL. From their own countries?

Dr. SEABORG. Substantially all from their own country, or their satellites. They do get some from Czechoslovakia.

Senator DWORSHAK. Doctor, do you know whether in the United States any purchases are being made of atomic minerals, concentrates, rather, by anyone other than the Government?

Dr. SEABORG. Uranium?

Senator DWORSHAK. Yes, uranium and its concentrate.

Dr. SEABORG. A very small amount. There are some nonnuclear uses. Of course, the Government exercises license control over all of this.

Senator DWORSHAK. But that consumption is very limited?

Dr. SEABORG. Very limited, yes.

## SPECIAL NUCLEAR MATERIALS

The special nuclear materials program requires \$557 million to produce enriched uranium 235, plutonium, tritium, and other products needed for weapons production, other military requirements, and the

civilian uses of atomic energy. This production is carried out at such major installations as Oak Ridge, Paducah, Portsmouth, Hanford, Savannah River, Fernald, and Weldon Spring. The steady performance of these plants continues to provide the solid foundation for this Nation's preeminent position in nuclear weapons and reactors.

Senator PASTORE. I would like to ask you the same question so far as this item was concerned. It is granted exactly by the House as requested by the Commission and the administration?

Dr. SEABORG. Yes, sir.

Senator PASTORE. And your recommendation is that it be left the way it stands?

Dr. SEABORG. That it be left the way it stands.

#### WEAPONS

For the weapons program the amount of our request is \$561 million. This provides for continuing the production of current models of a variety of nuclear weapons, including thermonuclear bombs and both fission and thermonuclear warheads. Nuclear weapon research and development will continue in our weapons laboratories at Los Alamos and Livermore, and the development and engineering of nonnuclear components at the Sandia Laboratory.

#### RESUMPTION OF UNDERGROUND TESTING

The budget did not provide for carrying out any nuclear testing during fiscal year 1962. In the light of the President's determination on Tuesday that underground nuclear testing is to be resumed, the House has added \$30 million of operating funds to enable us to initiate this activity. This amount was provided from unobligated balances available to the Commission last June 30, which we had indicated to the House committee were available and which would otherwise have been applied to reduce the amount of new appropriation required for fiscal year 1962.

Senator HILL. Did the House get that \$30 million figure from you?

Dr. SEABORG. Yes, sir, we suggested that.

Senator HILL. In other words, you think that figure is sufficient, for the time being anyway?

Dr. SEABORG. So far as we can estimate, this will probably carry us through the first 6 months, and then we will have to come in for a supplementary appropriation. This figure may even be a little short for that, it is a little hard for us to tell, but we would have the financial ability through rearrangements of funds to carry on until—

Senator PASTORE. Doctor, at the time you had presented this to the House did you foresee this situation which has developed in the last few days with regard to resumption of testing.

Dr. SEABORG. That is it.

Senator PASTORE. I mean this was done in contemplation of that?

Dr. SEABORG. This was done since that time.

Senator PASTORE. Since that time?

Dr. SEABORG. Since Tuesday.

Senator PASTORE. In other words, this is predicated upon the announcement made by the President?

Dr. SEABORG. Yes.

Senator PASTORE. And you feel for the time being these funds are sufficient to carry it out?

Dr. SEABORG. Yes.

Senator PASTORE. Sufficient to carry out our program?

Dr. SEABORG. Yes, this will let us launch the program and enable us to carry on until Congress reconvenes, at which time I am confident we would have to have a supplementary appropriation.

Senator PASTORE. So as this figure stands as reported by the House committee, you are satisfied with it and you are asking for no modification?

Dr. SEABORG. Right, sir.

Senator HILL. Now, you speak about when Congress reconvenes. We will be back here in January, as you know, but supplemental bills don't always pass what I call a la Sears, Roebuck, by Saturday night. There might not be any controversy about the Atomic Energy Commission item, but there might be some other items that would bring about some lengthy discussion and cause delay. You think, then, this \$30 million would carry you, even bearing in mind if we had to get a supplemental you might not get it the first week or two in January? Is that right?

Dr. SEABORG. Well, I think so. February, or some such date.

#### FUNDS AVAILABLE FOR TRANSFER

Senator PASTORE. May I put the chairman's question another way: In the event that an emergency did arise which could not be taken care of by a supplemental bill, are there enough funds here that could be transferred from one to another with the permission of the committees of the Congress on the request of the President?

Dr. SEABORG. I believe so with a budget of this magnitude.

Senator PASTORE. Yes.

Dr. SEABORG. And we are, frankly, sort of counting on that.

Senator PASTORE. Then it could be filled in at a later time?

Dr. SEABORG. That is right. We could ask for a rather generous amount here to be overly—

Senator PASTORE. No, I think you are rather wise in doing it this way.

Dr. SEABORG. I would say this is deliberately on the short side of what we feel we need.

Senator PASTORE. But again there are large funds in a large budget of this kind that would not deter our activity at all?

Dr. SEABORG. That is right.

Senator HILL. And we know this program is not going to suffer.

Dr. SEABORG. That is what we suspect. It is too soon to say what total amount will be required in fiscal year 1962 to initiate the nuclear testing. I say it is probable, I would say it is almost certain, that additional amounts will be required in the current year which would require us to seek a supplemental appropriation upon the return of Congress for the next session. In the meantime, we believe that the \$30 million together with other funds, as have been described, which may possibly become available will be sufficient to enable us to proceed with the immediate program without delay.

Senator PASTORE. And you feel for the time being these funds are sufficient to carry it out?

Dr. SEABORG. Yes.

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Senator HILL. Most of them today are operating pretty satisfactorily?

Dr. SEABORG. Yes, sir.

Senator HILL. All right.

Dr. SEABORG. There is little change from 1961 in the projected total cost of the reactor program for 1962. Growth is planned for several areas, but the program for nuclear propulsion of manned aircraft has been discontinued in accordance with the decision of the President as announced in March.

In that portion of our reactor program directed to civilian nuclear power, technical achievements have been mingled with some disappointments in regard to reactor construction. A number of projects have been postponed or in some instances canceled altogether. The present state of knowledge and experience in this still relatively new industry has not permitted us to approve several of the sites proposed for prototype power reactors as being suitable from the standpoint of public safety. We have also found that fewer utility companies are now ready to risk capital on new reactor projects than was true in earlier years.

#### PRIVATELY OWNED POWER REACTORS

On the brighter side, the successful operation of such privately owned power reactors as Dresden and Yankee is a source of great satisfaction. While there have been delays in the completion of several projects, we can expect a succession of power reactors to begin operation during the next 2 years.

Senator PASTORE. Yankee is not producing now, is it?

Dr. SEABORG. Yes, sir; it is operating.

Senator PASTORE. How much?

Dr. PITTMAN. It is operating at 110 megawatts. During August, for instance, it operated essentially at a hundred percent on stream, and extremely successful.

Senator PASTORE. How long has it been going on, Dr. Pittman?

Dr. PITTMAN. It has been operating for the last 3 or 4 months.

Senator PASTORE. And the operation has been as expected?

Dr. PITTMAN. It has been extremely successful, on-stream availability of that reactor has been phenomenal.

#### COST PER KILOWATT

Senator PASTORE. Have you any figure on what the cost is, per kilowatt?

Dr. SEABORG. Oh, yes, we have the figures.

Senator PASTORE. I don't want you to go into any detail.

Dr. PITTMAN. It is in the order of 9 to 10 mills.

Dr. SEABORG. 9 mills. It is going down.

Dr. PITTMAN. It is. Originally it was estimated—

Senator PASTORE. Isn't that considered quite a success?

Dr. PITTMAN. Yes, sir; it certainly is. We originally thought it would be in the range of 11 to 12 mills and it is going down and it looks like it is going to be closer to 10.

Dr. SEABORG. It may be closer to 9 than 10.

Senator PASTORE. Do you know anything at all about the attitude of the people in the acceptance of that project in the site at Massachusetts?

Dr. PITTMAN. So far as I know, it has been completely accepted. They did a very good job for preparing the people for the reactor before it was ever put in public; so far as I know it has been completely accepted.

Senator HILL. No dangers have developed on that particular reactor?

Dr. PITTMAN. No, sir, this reactor has operated very, very well, sir.

Dr. SEABORG. These operating results will be watched closely by the Commission and industry, and can be expected to afford a basis for many new construction starts in the years to come.

#### ARRANGEMENT WITH SOUTHERN CALIFORNIA EDISON CO.

A recent major development is the tentative negotiation of a basis of arrangement between the Commission and the Southern California Edison Co. for the privately financed construction of a very large 375,000-electric-kilowatt nuclear powerplant. The Government's financial participation in this cooperative venture would be the support of research and development to be undertaken by the Westinghouse Electric Corp. and the waiver of fuel use charges for an initial operating period of 5 years.

Senator ELLENDER. What would that amount to?

Dr. SEABORG. How much money does that amount to?

Senator ELLENDER. You say the initial operating 5 years.

Dr. SEABORG. I think that is something of the order of \$8 million. The waiver of the fuel use charge?

Senator ELLENDER. Yes.

Dr. SEABORG. Something of the order of \$8 million.

Dr. PITTMAN. That is about right, sir. I don't have the exact figure.

Senator ELLENDER. And thereafter?

Dr. SEABORG. This is over the 5-year period. Thereafter, we don't have an arrangement. We don't have an arrangement or commitment that we would subsidize in this manner.

The major obstacle faced by the company at this time is the acquisition of a suitable site. The company is attempting to acquire a portion of Camp Pendleton Marine Base in California.

#### PROPULSION POWER FOR MERCHANT SHIPS

Reactors can ultimately be expected to provide economic propulsion power for merchant ships. Our first demonstration in this field is the *NS Savannah*. This ship has been undergoing tests prior to a period of dockside operation at low power. Assuming that all goes well, including our continuing review of the safety aspect, full power tests will be completed in the early part of next year off the coast of Virginia. Other development work is focused on a more advanced gas-cooled reactor system which is believed to be more likely to become competitive with conventional ships in the long term. This concept also has potential for other applications.

## DEVELOPMENT OF SMALL MOBILE POWERPLANTS

In cooperation with the Army, we are developing relatively small powerplants for use in remote areas, some of which would be transportable, or even mobile. A prototype reactor for a 300- to 500-electrical-kilowatt, trailer-mounted, nuclear powerplant is now undergoing low-power tests at our Idaho testing station.

A reactor is now providing power and heat for Camp Century in northern Greenland. Another is under construction for delivery to McMurdo Sound in Antarctica in November 1961 and will be in operation by March 1962. Our budget provides for work to begin on the reactor for another Antarctic location in fiscal year 1962.

Senator ELLENDER. What is the advantage of a trailer-mounted facility?

Dr. SEABORG. The mobility.

Senator ELLENDER. To be used in various—

Dr. SEABORG. To be used in various areas, readily available to move it in and turn it on and provide electrical power. This, of course, is for military requirements.

Senator ELLENDER. Yes.

## NUCLEAR-POWERED NAVAL VESSELS

Dr. SEABORG. The rapid expansion of our nuclear Navy is a familiar and reassuring fact. The Congress has authorized 61 nuclear-powered submarines and 4 nuclear-powered surface ships, including an aircraft carrier powered by 8 reactors. Twenty-two of these submarines and the nuclear-powered cruiser, U.S.S. *Long Beach*, are now in operation. We are also developing major improvements for naval reactors which will provide greater economy and inherent safety, increased simplicity and reliability, and a number of other operating advantages.

## MISSILE PROPULSION

In the areas of missile propulsion, we are successively testing a series of reactor cores at the Nevada Test Site, designed to give us very high power density and temperature. This development work is known as Project Pluto. Results to date encourage us to believe that a flight-size reactor can be fabricated and tested in fiscal year 1962. These efforts are directed to achieving a method of low-level weapon delivery against which countermeasures would be exceedingly difficult to devise.

## OPERATION OF SATELLITE INSTRUMENTS

Nuclear sources developed under our SNAP program are already providing power to operate satellite instruments and to transmit data from unattended weather stations suitable for remote areas. The devices now in use are powered by radioisotopes. Larger devices powered by very compact reactors are expected to be ready in the spring of 1963 for launching in space vehicles.

## PROJECT ROVER

Vehicles for space missions of great distance will almost certainly have to be propelled by nuclear power. The development of nuclear rocket engines under Project Rover is being accelerated in 1962, looking to flight test in the 1966-67 period. On the basis of encouraging

results in reactor tests to date, we plan in 1962 to test a series of five experimental reactors aimed at achieving power levels of the magnitude required for an operational vehicle.

#### ABANDONMENT OF NUCLEAR AIRPLANE PROGRAM

Senator ELLENDER. Mr. Chairman, speaking of the Army and Navy, as I recall we appropriated over a period of time some nearly \$1 billion for a nuclear airplane and then it was decided not to go forward with that airplane. What was the reason? Are you familiar with that? All that happened before you came to the Commission.

Dr. SEABORG. Yes, sir, I am very familiar with it. The analysis seemed to show that it didn't have the capability, even if it were developed, to accomplish useful missions in the military field. It didn't have the load capability. The reactor was so large and demanded so much shielding that the weight of the powerplant became excessive and these factors tended to remove whatever asset it projected. Pluto, of course, is another matter.

#### RESEARCH AND DEVELOPMENT

Senator DWORSHAK. Dr. Seaborg, are you requesting any funds for this fiscal year to carry on research and development by Pratt & Whitney on what remains of the ANP?

Dr. SEABORG. Yes, sir, we are continuing to develop what appears to be the better aspects of one of the reactors that was under investigation in the ANP program, continuing to develop this for—

Senator DWORSHAK. Other purposes?

Dr. SEABORG. Non-ANP uses. Other purposes, yes, sir. A concentrated high power density source of this type will have application in many other ways.

Senator DWORSHAK. How much are you asking for in the budget?

Dr. SEABORG. We are asking for \$25 million to carry on the various aspects of this.

Senator DWORSHAK. Is that all to be used by Pratt & Whitney or is some of it to be used by General Electric and elsewhere?

Dr. SEABORG. Some of it by General Electric to carry on certain basic research and development.

Senator DWORSHAK. Where would it operate? At Idaho or Evandale?

Dr. SEABORG. They are to carry on basic research for materials at Evandale.

#### IDAHO PLANT

Senator DWORSHAK. The Idaho plant has been virtually eliminated, has it?

Dr. SEABORG. Yes, sir.

Senator DWORSHAK. There is still some mopping up or some consideration of the use of some of the facilities which were installed for the ANP program?

Dr. SEABORG. Yes.

Senator DWORSHAK. But no additional research of any kind.

Mr. LUEDECKE. Part of the project personnel are there and some of the facilities are being used in connection with the work we are doing on the SL-1 reactor, and other projects. One other reactor experiment is going into some of the other facilities.

Senator DWORSHAK. Is General Electric doing very much at Evendale or is that going to be used for other purposes? You had a large payroll there, didn't you, for the ANP?

Mr. LUEDECKE. Yes, sir, we did. The facilities were primarily Air Force facilities. We are retaining some of those people to carry on a program that we are going forward with at Evendale.

Senator DWORSHAK. Is that research and development related to any aspect of ANP?

Mr. LUEDECKE. In the sense that it is research and development on advanced ceramic fuel which was one of the promising avenues in the ANP. It could be, but it is not for that purpose.

Senator DWORSHAK. All of your research and development or other activity requested this year or planned this year at any of these installations will in no way be related to reviving ANP?

Mr. LUEDECKE. That is correct.

#### EXPENDITURES ON REQUESTS FROM ARMED SERVICES

Senator ELLENDER. Mr. Chairman, could you give the committee an idea percentagewise of the amount of money spent in order to accommodate requests from the armed services?

Dr. SEABORG. Percentagewise in the reactor program?

Senator ELLENDER. No, no, money you are asking for here.

Dr. SEABORG. Did you mean to include weapons?

Senator ELLENDER. Everything.

Dr. SEABORG. Then it is about 70 percent.

Senator ELLENDER. Seventy percent.

Is any of this done by you on a reimbursable basis, or do you get all of your appropriations direct as do other agencies?

Dr. SEABORG. It is all carried out under contract.

Mr. McCARTHY. No, it is appropriated here.

Senator ELLENDER. It is appropriated here.

Dr. SEABORG. I thought you were asking how we carried on the AEC operation.

Senator ELLENDER. No. There are some agencies of Government that do work for the other departments on a reimbursable basis.

Dr. SEABORG. Oh, no. This is all direct.

Senator ELLENDER. As I understand, this is all direct?

Dr. SEABORG. Yes.

Senator ELLENDER. You don't get any funds from any other source?

#### REIMBURSABLE WORK

Mr. McCARTHY. There is some reimbursable work we do for the Defense Department. For instance, for their training weapons, we produce them and they reimburse us for them, but those weapons which go into the stockpile are built under our appropriations at their request. So there is some reimbursable work, but the major portion of our work is all financed through appropriations to the Atomic Energy Commission.

Senator ELLENDER. Then the question is how much of it is on a reimbursable basis?

Mr. McCARTHY. I would say in Defense it may run anywhere from \$10 million to \$15 million a year for training equipment and research and development. The major portion is in the training weapons which we produce for them.

Senator ELLENDER. You produce the prototype, do you?

Mr. McCARTHY. It is a training weapon for use in the field for the three services, but no nuclear parts are involved in them.

Senator ELLENDER. When a request is made by the Armed Services for a particular weapon, let's say, do you build the prototype of that weapon or anything they request?

Mr. LUEDECKE. Senator, we develop weapons with the Department of Defense in terms of establishing the characteristics of the things that they want. Then we proceed with the research, development, production, testing, if appropriate, and stockpiling of that weapon.

#### CONSTRUCTION OF BOMBS

Senator ELLENDER. Well, now, do you construct them, also, and stockpile them?

Mr. LUEDECKE. Yes, sir, and produce them.

Senator ELLENDER. You mean bombs?

Mr. LUEDECKE. As bombs.

Dr. SEABORG. As bombs, yes.

Senator ELLENDER. As bombs?

Dr. SEABORG. Yes.

Senator ELLENDER. But not the instrument that carries the bombs?

Mr. LUEDECKE. No, sir, there is an agreed division of responsibility on each project, and our responsibility is confined to the warhead or the bomb itself.

Senator ELLENDER. So in direct answer to my question, the only part that you are reimbursed by the armed services would be about from \$10 to \$15 million?

Mr. McCARTHY. It varies, Senator Ellender, over the years. But this is a minor part and represents items for which they have responsibility and budget for.

Senator ELLENDER. Do you get funds from any other source than the armed services and the Congress?

#### REIMBURSABLE WORK FOR OTHER AGENCIES

Mr. McCARTHY. We do some small research at the request of other agencies which is reimbursable. For instance, in the past, in connection with testing we did at Nevada they would want to have some tests done which our contractors would carry out and they would, in effect, pay us.

Senator ELLENDER. All of those are Government agencies?

Mr. McCARTHY. Yes, sir.

Senator ELLENDER. You don't do anything for outside, do you?

Mr. McCARTHY. Well, we do some testing on reactors.

Senator ELLENDER. How much, in round figures, do you obtain from that source?

Mr. McCARTHY. From the Defense Department or from entirely—  
 Senator ELLENDER. Yes. You gave us 10 to 15 million from the  
 armed services. Now what do you get, how much additional funds,  
 if any, do you get by way of reimbursable money in round figures?  
 If you haven't got it now, put it in the record.

Mr. McCARTHY. Yes, sir.

Senator ELLENDER. Thank you.

Senator HILL. Will you supply that for the record then?

Mr. McCARTHY. Yes, sir.

Senator HILL. It will be put in the record at this point, Senator  
 Ellender.

(The information referred to follows:)

*Advances and reimbursements, fiscal year 1962*

Advances and reimbursements from other Federal agencies :	
Training equipment and research and development for DOD_	\$13, 500, 000
Fabrication of Navy reactor cores_	31, 200, 000
Other services or sale of products_	15, 300, 000
Subtotal_	60, 000, 000
Advances and reimbursements from non-Federal sources (42 U.S.C. 2011)_	17, 500, 000
Total_	77, 500, 000

MILITARY BUDGET

Senator PASTORE. In other words, when we talk about our military  
 budget over and above what we appropriate to the Defense Department  
 this is appropriated and supplements that? It isn't a question of  
 where it is filled in by any moneys that are given to you by the De-  
 fense Department outside of these small items that have been talked  
 about here?

Mr. LUEDECKE. Yes, this is correct.

Senator PASTORE. This is the appropriation which actually furnishes  
 the weapons for the nuclear and thermonuclear, is that correct?

Dr. SEABORG. That is correct.

HOUSE ACTION

Senator PASTORE. I know the House cut down on this particular  
 item by \$2,665,000 and this is being allocated, the cut is being allocated,  
 applied to, nuclear and technology research programs. What does  
 that do to you, and can you live with the cut, or are you asking for  
 restoration, and, if so, why?

Dr. SEABORG. We are asking for restoration and I am going to refer  
 to it later.

Senator PASTORE. Later on?

Dr. SEABORG. Yes, sir.

PROJECT ROVER

Senator PASTORE. All right. Now, another question I would like to  
 ask you. In the resumption of our weapons tests, will this affect the  
 ROVER project or are we determined to go forward expeditiously on  
 all phases?

Dr. SEABORG. It won't have any substantial effect on the ROVER project. We are determined to go ahead on all phases of it.

Senator PASTORE. Full steam ahead?

Dr. SEABORG. Full steam ahead.

#### EXPERIMENTAL PROJECT IN IDAHO

Senator DWORSHAK. General, I notice in the authorization bill project 62-d-2 experimental beryllium oxide reactor, National Reactor Testing Station, Idaho, \$8 million. Do you have any definite plans to utilize any of the ANP facility for that project?

Mr. LUEDECKE. Yes, sir, this was the project to which I referred a moment ago. We plan to put it in one of the ANP facilities.

Senator DWORSHAK. Would you be able to absorb any of the manpower which was made idle because of terminating the ANP program?

Mr. LUEDECKE. Some in this sense, they will not be the same people in the sense of GE. This will involve construction and modification, instrumentation, and other work.

Senator DWORSHAK. Do you know yet who will operate that reactor?

Dr. PITTMAN. That reactor will be operated by General Atomics and it will be operated in the shield pool test facilities, sir. It is the facility in Idaho which was used by GE for shielding work and had two pools in it and we plan to put the reactor in one of those pits.

Senator DWORSHAK. That was an ANP facility?

Dr. PITTMAN. It was an ANP facility, yes.

Senator DWORSHAK. Will that save considerable money?

Dr. PITTMAN. We estimated that it will save approximately a million dollars in construction, which was taken into account in our estimate of \$8 million for project 62-d-2.

#### PHYSICAL RESEARCH

Dr. SEABORG. The next program in our budget is physical research, for which we requested \$178 million in 1962. Under this program we support investigations at AEC-owned laboratories and about 150 colleges and universities, in the fields of physics, chemistry, metallurgy, mathematics, and computer research, and controlled thermonuclear reactions.

The largest segment of the program is in high energy physics. Its support is expensive because it requires the construction and operation of particle accelerators of such great size and complexity that we are only now learning how to build them. In fact, the successful construction and operation of each new major machine represents in itself a scientific and engineering achievement of the highest order. These machines enable us to study the 30-odd elementary particles thus far identified which are believed to make up all matter. Not to pursue these studies vigorously would be to neglect what is perhaps our most promising opportunity to gain clearer insight into the nature of nuclear energy.

## LINEAR ELECTRON ACCELERATOR AT STANFORD

In 1962 the budget provides for initiation of construction of the largest machine undertaken to date. This is the linear electron accelerator to be built at Stanford University at a cost of \$114 million. Our operating budget in 1962 provides for \$4.5 million to carry out associated development work on the machine, and our plant budget includes \$26 million to initiate construction.

Other areas of physical research also need to be expanded and in 1962 modest increases are provided for low energy physics, computer research and development, the study of solid materials, and several fields of chemistry.

We will continue to study the basic problems associated with controlled thermonuclear research aimed ultimately at achieving a net thermonuclear power producer. We are gratified at progress achieved this past year in obtaining plasma temperatures of the order of 30 million degrees centigrade and confinement times of several thousandths of a second, but we have a long, long way to go before we will be in a position to assess the likelihood of achieving economical power from thermonuclear reactions.

SENATOR ELLENDER. In the construction of this linear electron accelerator at Stanford, to what extent does the university cooperate with you in providing funds or any other—

DR. SEABORG. They provide the land and, of course, the key personnel.

SENATOR ELLENDER. And the professors?

DR. SEABORG. And the professors.

SENATOR ELLENDER. Are they paid by you?

DR. SEABORG. Well, on the project the professors are paid by the university, but—

SENATOR ELLENDER. By the university?

DR. SEABORG. By the university. There are a number of professors involved because it is sited at the university. However, costs to the university are reimbursable under our contract.

## OPPOSITION TO ACCELERATOR

SENATOR HILL. Let me ask you this question. I have two telegrams sent to Senator Hayden, who is chairman, as you know, of the full committee, which says—

Urgently request that Senate approval of the 2-mile linear accelerator for Stanford University be delayed until all reasons for change of site provided in AEC final report, ML Report 682 have been investigated and until thousands of area residents vitally affected can present their case.

Signed "Samson and Elsa Knoll," of Menlo Park, Calif.

I have another telegram of the same import from Mr. Inge Uppman, Menlo Park, Calif.

What would be your comment on that, Mr. Chairman?

DR. SEABORG. Well, we have been contacted, I believe, by those same people.

DR. MCDANIEL. This is a new contact.

DR. SEABORG. We have investigated the situation. We believe that the machine as now contemplated meets the objections. The objections are along the lines that they want to have maximum assurance

that they have full protection from any possible dangers, which they certainly have, and along the lines that they don't want to deface the landscape, and every possible effort is made in the planning to also make the machine acceptable from that point of view.

Senator HILL. I understand the Joint Committee on Atomic Energy representatives from both Houses have gone into this pretty fully, too.

Dr. SEABORG. Yes, sir.

#### NUCLEAR ACCELERATOR AT UNIVERSITY OF WASHINGTON

Senator HILL. While I have interrupted you, Mr. Chairman, I have had some correspondence from two Senators from Washington, Senator Magnuson and Senator Jackson, with reference to the proposal of the University of Washington for support of a nuclear accelerator of the tandem Van De Graaff type operating 20- to 24-million-volt range. Is that within your active jurisdiction here or is that entirely with the National Science Foundation?

Dr. SEABORG. That could very well be within our jurisdiction. It could be supported by either agency.

Senator HILL. Do you know, does anybody here know just what the relationship is between your agency and the National Science Foundation on this matter?

Dr. SEABORG. I don't believe the National Science Foundation is supporting it in fiscal 1962.

Dr. McDANIEL. In fiscal year 1962 we don't have any funds in this budget request for the University of Washington proposal.

Dr. SEABORG. The question is does either agency?

Dr. McDANIEL. I don't believe the National Science Foundation has funds.

Dr. SEABORG. I don't believe the National Science Foundation has any funds for it in 1962. That is my impression.

#### APPROVAL OF NATIONAL SCIENCE FOUNDATION

Senator HILL. I have a letter here from Dr. Waterman, who is Director, and they indicate they are currently considering, they say the National Science Foundation is currently considering this nuclear accelerator, and that the proposal has been favorably reviewed and approval recommended to the National Science Board which must approve grants of this magnitude.

Dr. SEABORG. Let me amplify. I understand they have a limited amount of funds, something of the order of \$6 million, and an over-subscription of requests so that support is not assured. They may choose to support this. I am—

Senator HILL. Well, would there be any conflict there?

Dr. SEABORG. Not at all.

Senator HILL. With any of your aims or purposes of programs with that which you think the Commission should do and must do if the National Science Foundation saw fit to go forward with this?

Dr. SEABORG. None at all.

Senator HILL. None at all?

Dr. SEABORG. And I would be pleased to see that project undertaken under whatever auspices are available. I think it is a very worthwhile project.

## STANFORD ACCELERATOR

Senator PASTORE. I am sorry I was not here. I had to make a long-distance call, Mr. Chairman, at the time you talked about the Stanford accelerator. What is this about the objection as to the site?

Dr. SEABORG. Well—

Senator PASTORE. Aren't these the telegrams we have received some time ago?

Dr. SEABORG. I am not familiar with that particular telegram.

Senator HILL. That is July 18, both of them are July 18.

Senator PASTORE. Yes.

Dr. SEABORG. I don't know that the Atomic Energy Commission received them.

Dr. McDANIEL. I don't recall it, sir. But the case has come up several times before.

Dr. SEABORG. We have received correspondence, not so much objecting as asking us to assure them that we are taking every precaution possible to see that the machine doesn't deface the landscape and cause deterioration in the residential value.

Senator PASTORE. Are they satisfied with that assurance?

Dr. SEABORG. I think there was no further response to the letter in which I gave that assurance.

Senator PASTORE. Well, the reason I bring this matter up is that the Joint Committee on Atomic Energy has analyzed and gone into this thing quite thoroughly and we are, of course, familiar with the objections raised, and, as a matter of fact, we had a meeting at the White House as you well know.

Dr. SEABORG. That is right.

Senator PASTORE. And we know the attitude not only of this administration but of the previous administration to construct this accelerator, and at one time it was thought that it would be a tunnel and then it was, I understand, a cut and fill.

Dr. SEABORG. Cut and fill.

Senator PASTORE. Cut and fill. That has all been decided and after that decision was made we, of course, got these telegrams.

I am just trying to find out how far we have gone in exploring these objections that have been raised because I wouldn't want it to appear that because we have two objections now we ought to stop this project.

Dr. SEABORG. No. I think the other letter that raised this question really asked us to assure them that we were taking every possible precaution in this regard.

Senator PASTORE. You know that from a very technical and expert sort of a way when we have gone over this proposition and our engineers and architects have determined what we are doing is the right thing to do?

Dr. SEABORG. Yes.

Senator HILL. You also have some nuclear physicists in on this examination here?

Dr. SEABORG. Oh, yes.

Senator PASTORE. The man who speaks quite knowledgeably on this matter is Dr. Haworth here who is a very strong advocate of this, and I guess you are quite familiar with these objections.

Dr. HAWORTH. Yes, and as Dr. Seaborg said, my belief is that, after he answered the letters, we have letters similar to the telegram but in more detail, there was no further answer from them. So we have assumed they were at least reasonably well satisfied with our response.

Senator PASTORE. And you are asking for \$26 million for initial obligation on construction on this new budget?

Dr. HAWORTH. That is right.

Dr. SEABORG. That is right.

Senator PASTORE. And the obligation was \$114 million?

Dr. SEABORG. \$114 million is the total funds to be authorized.

Senator PASTORE. How long will it take to construct this?

Dr. SEABORG. Five years.

Dr. HAWORTH. Well, with the design and construction, probably 6 years.

Senator PASTORE. Six years. It will be the biggest one in the world.

Dr. HAWORTH. Yes.

#### BIOLOGY AND MEDICINE

Dr. SEABORG. The next budget program is biology and medicine. We are now focusing our attention on the long-range hazards associated with nuclear radiation and have withdrawn from certain monitoring and surveillance activities which have been taken over by the Department of Health, Education, and Welfare. The major scientific challenge is to determine the effect on human beings of long-term exposure to the very low level of radiation to which people might conceivably be accidentally subjected from time to time as nuclear energy activities are expanded over the coming decades.

#### RESEARCH ON CANCER

In our biomedical program we continue to carry on specialized research on cancer involving the use of nuclear radiation. The program also deals with radiation genetics, dosimetry and instrumentation, development of beneficial applications of radiation, and combating the detrimental effects of radiation received. In addition and of particular significance, we are providing assistance in civil defense research to the Department of Defense and the Office of Emergency Plans. This includes research related to nuclear civil effects such as conduct of special field and laboratory studies in shielding characteristics of shelters against fallout.

#### TOTAL FUNDS FOR PROGRAM

We propose to spend \$61 million for the biomedical program in 1962. Somewhat more than half of this work will be performed in our own AEC laboratories and the remainder under contract with about 190 colleges, universities, research foundations, and hospitals.

Senator ELLENDER. Doctor, do you know to what extent if any, that other departments of Government, carry on such studies as we are now talking about? I notice that you said here that you are now focusing attention on the long-range hazards associated with nuclear radiation and have withdrawn from certain monitoring and surveillance activity which have been taken over by the Department of Health.

Dr. SEABORG. Yes.

Senator ELLENDER. Do you know of any other department that carries on such work?

Dr. SEABORG. This sort of work, the effect on human beings of long-term exposure?

Senator ELLENDER. Yes.

Dr. SEABORG. No; I would say we have the major research program there, although the field is so broad that there is some work carried on in the National Institutes of Health.

Senator ELLENDER. Do you know whether or not—

Dr. SEABORG. And the Department of Defense as well.

Senator ELLENDER. Do you know whether the Department of Agriculture carries on any as well?

Dr. SEABORG. I don't believe they carry on anything substantial so far as human beings are concerned in the Department of Agriculture.

Dr. DUNHAM. No.

Senator ELLENDER. How about on cattle?

Dr. DUNHAM. Most of the studies on the effects of radiation on cattle and farm animals are conducted under AEC auspices and funding, some are done at experiment stations in cooperation with the Department of Agriculture, but we do practically all of it.

#### COORDINATION OF EFFORTS

Senator ELLENDER. In any event, if any work is done by the department it is coordinated with yours, I presume.

Dr. SEABORG. Yes, in the way that science is coordinated.

Senator PASTORE. That question Senator Ellender has just raised is a very vexing one especially to the members of the subcommittee and members of the full Appropriations Committee, and usually it is directed to me because I happen to be a member of the Atomic Energy Committee.

How well are the efforts coordinated?

The argument is constantly made that there might be constant overlapping and duplication. We have about every department in Government as to radiation and safety as to fallout and everything else. Do we have a very effective coordinated program?

Dr. SEABORG. Yes; we have two ways of being protected there. One is we deliberately coordinate, that is our directors of research keep in touch with each other. But in my mind almost more importantly, we have ability in self-regulating mechanism, that is the scientists don't find it profitable to duplicate the work.

#### FUNCTIONS OF VARIOUS AGENCIES

Senator PASTORE. Is there any documentation of this whole system or network of the various functions of the various departments or does it have to be fetched out by testimony? I was wondering if there is—

Dr. DUNHAM. I didn't hear the question.

Dr. HAWORTH. He asked if there was any document that described it.

Senator PASTORE. Except the report that the Joint Committee published after we had extensive hearings on the subject.

Dr. DUNHAM. I think we have provided you with material that we provided to the Bureau of the Budget a year or two ago.

Senator PASTORE. Is it quite voluminous?

Dr. DUNHAM. We abstracted it on coordination for the Joint Committee, and I think it gives all the ramifications and the working relationships and working through interagency committees.

Senator PASTORE. Could you send a copy of it to this subcommittee?

Dr. DUNHAM. I think this can be arranged, it is the same material we gave the joint committee.

Senator PASTORE. I would like to have included by reference, not for the record, and have it in our office so if the question came up, there it is.

Senator HILL. Without objection, so ordered.

#### FALLOUT SITUATION

Senator PASTORE. I would like to ask on the situation as to fallout, the relative situation, it was before these tests whether we expected it might be diminishing and not saturating the atmosphere as well as we thought it might and what is the situation now that the Russians have conducted these tests. Do we have any information on it?

Dr. SEABORG. Well, we don't have experimental information measuring the amount of radioactivity yet as it will finally accrue from these tests. But since we have estimates as to the magnitude of the tests we can predict what the effect will be. There will be an effect in two ways, of course. One is the addition to the general background and the overall body radiation, and the other is more specific, having to do with such things as strontium 90 and so forth in the ingestion. I would like to call on Dr. Dunham to elaborate further, if you would like to have it.

Dr. DUNHAM. On Senator Pastore's questions, first on the situation prior to last week—the level of fallout coming down, that decreased very, very greatly so it was coming down at only slightly greater rate than the decay of strontium 90. So that probably within a year or two the total amount of radioactivity on the earth would have been decreasing.

These tests add radioactivity, as Mr. Seaborg indicated, in two ways: One, this general rise in background, and I think HEW has put out records that the actual amount in the air of fallout material measured in air is about 30 times, 35 times what it was. But that is primarily short-lived material. In terms of strontium 90, the amount one would expect from these tests would be probably not more than 1 percent from the information I have today of what the total amount produced in all previous tests.

#### EXPLOSION OF 100 MEGATON BOMB

Senator PASTORE. What if they explode that 100 megaton bomb?

Dr. DUNHAM. That would change the picture quite a bit.

Senator PASTORE. That would boost it up pretty bad?

Dr. SEABORG. That would increase it about 60 percent.

Senator HILL. How much?

Dr. SEABORG. Sixty-percent, from one 100 megaton bomb.

Senator PASTORE. One explosion.

Senator HILL. Senator Pastore has brought up a most interesting field here and one that I had on my mind. If they explode one of

these hundred megatons over in Asia about where they exploded the others, how much danger would there be for that fallout to hit over here?

Dr. DUNHAM. It would get here just as the material they exploded in 1958 got here and it gets here faster than such as the explosions detonated about the Equator.

Senator ELLENDER. It would effect Russia, too, would it not?

Dr. DUNHAM. Yes.

Senator ELLENDER. I noticed the other day in the newspapers that some tests were made in Taiwan as well as Alaska wherein the air was charged with a good deal more of this fallout.

Dr. SEABORG. Yes.

Senator ELLENDER. Who did that, you or somebody else?

#### REPORTS FROM SAMPLING STATIONS

Dr. DUNHAM. Some of the reports are from the Public Health Service sampling stations which were set up several years ago.

Senator ELLENDER. You did it?

Dr. DUNHAM. No. The Public Health Service.

Dr. SEABORG. The Public Health Service has a station in Alaska, as I understand it.

Senator ELLENDER. And the one in Taiwan, Formosa?

Dr. DUNHAM. I am not familiar with that one, as to whose station that is.

Senator PASTORE. Mr. Ramey here seems to have the answer for it.

Senator ELLENDER. I presume if ever the Russians do shoot one of these big ones, it will be against someone. They won't do it experimentally, will they?

Dr. SEABORG. You mean will they make an experimental explosion?

Senator ELLENDER. I mean a big one, would they shoot one off just to experiment?

Dr. SEABORG. It is conceivable they would detonate a hundred megaton bomb just to test it as a proof test and for whatever other purposes.

Senator ELLENDER. Have we done that? I thought we did it on a small scale and then were able to figure out that a bigger one would do it.

Dr. SEABORG. We have tested devices in the multimegaton range when we were testing.

(Discussion off the record.)

Senator ELLENDER. Could you tell us what was the strength of the largest one you ever tested?

Dr. SEABORG. That probably should be off the record.

(Discussion off the record.)

Senator HILL. Let me ask you this, Mr. Chairman, how far from Moscow are these tests being made by the Russians?

Dr. SEABORG. Semipalatinsk is about 2,500 miles from Moscow. I think it is 2,000. It is 2,000, at least, maybe 2,500 miles from Moscow.

Senator HILL. All right, thank you, sir.

Dr. SEABORG. Russia is a large country.

## COOPERATION WITH THE PUBLIC HEALTH SERVICE

Senator HILL. May I say one word. Most of us on this subcommittee serve also on the Appropriations Committee for Health, Education, and Welfare. I think it is tremendously important that there be the closest cooperation between the AEC and the Public Health Service because they not only have the responsibility in the field of preventive medicine for the health of our people, but then they have all these contacts with the State health departments and in the county health units and city health units and they built up this relationship through a good many years as now.

Dr. SEABORG. We agree, and I might mention that members of the Commission have met with Secretary Ribicoff in order to strengthen these lines of communication and methods of cooperation.

## BROOKHAVEN LABORATORY

Senator DWORSHAK. Dr. Seaborg, you say that you are proposing to spend \$61 million for the biomedical program in cooperation with the 190 colleges. I have never visited Brookhaven but that is your largest biomedical part?

Dr. SEABORG. Yes, more than half of that \$61 million is spent in our laboratories.

Senator DWORSHAK. How much?

Dr. SEABORG. More than half of the \$61 million is spent in our own laboratories at such places as Brookhaven, at the Lawrence Radiation Laboratory in Berkeley, and Los Alamos.

Senator DWORSHAK. And I understand nine associated universities are cooperating with Brookhaven. To what extent do they provide assistance? Do they have manpower or does AEC assume full financial responsibility for that operation?

Dr. SEABORG. I will call on the former Director of the Brookhaven Laboratory.

Senator DWORSHAK. I think he would like to give us a little information anyway.

Dr. SEABORG. He is anxious to speak.

Senator HILL. All right, sir, proceed.

## COOPERATION WITH UNIVERSITIES

Dr. HAWORTH. As you know, Senator, Brookhaven operates very much in cooperation with not only the nine universities but universities throughout the country, and about half of the actual research is done by people who come from the universities or other institutions.

Senator DWORSHAK. Paid by the universities or AEC?

Dr. HAWORTH. The salaries are paid by the universities or wherever they come from, with a few exceptions where they have taken leave of absence.

## TOTAL EMPLOYEES

Senator DWORSHAK. How many were employed there?

Dr. HAWORTH. They even bring technicians with them often. The material and equipment and so forth is, of course, provided by Brookhaven. There are in the course of a year in the whole program, I can't put a number on biomedicine but in the whole program there are some

500 scientists from the other institutions that actually come and work, not just to visit but actually come to work for from a month to the full year.

Senator DWORSHAK. How many personnel does AEC have there?

Dr. HAWORTH. In full-time scientists and engineers, we have about 350 to 400. Now, understand, these visitors are part-time. They average out to about 200 on the average, actually, there.

Senator DWORSHAK. I hesitate to ask you the question regarding the use of the information and the research that you develop there. Is that used outside of these colleges or to what extent is there some beneficial use made of that?

#### PUBLICATION OF RESEARCH INFORMATION

Dr. HAWORTH. It is all published in the scientific literature, in the regular scientific journals.

Senator DWORSHAK. I never have been there and I certainly would like to visit there, but it seems I am always too busy.

Senator ELLENDER. How does the work which you do differ from that which is done by the colleges?

Dr. HAWORTH. The emphasis at the national laboratories, and Brookhaven, for example, is on work for which the institution in some way is particularly well qualified because it has particular equipment such as a reactor, an accelerator or things of that sort or because there happens to be some individual who is especially well qualified in a particular field. But there is no sharp division that the universities work in one field and the laboratories in the other, except, of course, that the laboratories do feel a greater responsibility for the radiation protection, health hazards, and that sort of aspect of biology and medicine. In the more basic research, which is endeavoring to find out things, the division is more a division of convenience and skill and experience.

Senator ELLENDER. I guess a good deal of that work is more or less exploratory.

Dr. HAWORTH. That is right. Yes, I think one of the important points, and one of the things that is well recognized between the Department of Health, Education, and Welfare, and the Atomic Energy Commission, is that there is a great virtue, of course, for much of this work of having it done in the context of an Atomic Energy Commission laboratory with all the backup of special skills and experience of other scientists in addition to the scientists themselves.

#### STATE AGRICULTURAL STATIONS AND RADIOBOTANY FACILITIES

Senator PASTORE. How do you cooperate with the State agricultural stations and others in the radiobotany facilities?

Dr. HAWORTH. Perhaps I could best illustrate by an example at Brookhaven. There is the large so-called gamma field, where a large cobalt source is placed in the center of the field and can be raised above ground or lowered down, and this is used to irradiate plants all the way from little things up to fair-sized trees.

The experiment stations, for example, bring plants, including fruit trees and things of that sort, expose them at the laboratory, will do some observation there, sometimes they take them back after they expose them, and do more work at the experiment station.

Other examples are to bring seeds and expose them in a nuclear reactor to neutrons and then take them back and grow them and see what genetic changes have been made and various things of that sort. So there is a very definite service function as well as cooperative research provided by the laboratory.

Senator PASTORE. Are facilities for this adequate at the present time?

Dr. HAWORTH. Are you speaking of the Commission in general, the Commission's facilities in general?

Senator PASTORE. No, no, at Brookhaven.

Dr. HAWORTH. At Brookhaven, no. We have been hoping, of course, we, the Commission, have been hoping to increase specifically those facilities.

Senator PASTORE. This field has shown tremendous progress.

Dr. HAWORTH. That is right, sir.

Senator PASTORE. All right. You may proceed.

#### TRAINING, EDUCATION, AND INFORMATION

Dr. SEABORG. All right. For training, education, and information our budget provides \$14 million. The Commission's training activities supplement and assist the efforts of established educational institutions to prepare increasing numbers of young people for careers related to nuclear technology. This is a small but significant contribution toward meeting the enormous challenge our Nation faces in the educational field today. The Commission's program in this area represents a vital step we can take today to meet tomorrow's needs for adequately trained personnel in the nuclear energy field. Our dissemination of technical information on research and development represents mainly the prompt channeling of experimental results to the scientist whose work may be directly affected by knowledge of what is being learned elsewhere.

Senator ELLENDER. Do you have any schools or colleges of your own, that you manage yourself?

Dr. SEABORG. No, not schools or colleges. We sponsor or support institutes, and also there is the Oak Ridge Institute for Nuclear Studies that involves cooperation of a number of universities in the southeastern part of the United States, and also there is a similar cooperative effort built around the Argonne National Laboratory and then Commissioner Haworth has just described the situation at Brookhaven.

Senator ELLENDER. But that is not—

Dr. SEABORG. No, no, we don't operate any educational—

Senator ELLENDER. You did at one time and you were in the process of expanding that, and I think Admiral Strauss, we kind of nipped that in the bud a little bit.

#### TRAINING OF STUDENTS ABROAD

Tell me about the training of scientists, students abroad; do you have any program that you carry on for them?

Dr. SEABORG. Yes, sir. The Argonne National Laboratory has an international school.

Senator ELLENDER. Is that included in this training, education, and information?

Dr. SEABORG. Yes, sir.

Senator ELLENDER. That is in the \$14 million?

Dr. SEABORG. That is in the \$14 million.

Senator ELLENDER. How much of that money is actually used to train foreigners?

Mr. McCARTHY. Well, the total cost of operating the Institute of Nuclear Science and Engineering at Argonne is \$775,000, Senator. The major enrollment has been students from foreign countries.

Dr. SEABORG. Many from South America.

Mr. McCARTHY. Yes.

#### TOTAL FOREIGN STUDENTS

Senator PASTORE. Can you give that in numbers for 1 year?

Mr. McCARTHY. The total foreign students in 1960 was 97. In 1961, 89. And estimated in 1962, the current year, is 101.

Senator ELLENDER. Now this \$775,000 is to do what, pay for the operation of this Institute?

Mr. McCARTHY. This pays for the cost of the instructors' salaries, the technicians salaries, the materials and supplies, and the administration by the Argonne National Laboratory of the Institute.

Senator ELLENDER. How much do the students pay?

#### TUITION FEE

Mr. McCARTHY. The student enrollment is \$2,000 a semester.

Senator ELLENDER. Now, that covers what?

Mr. McCARTHY. Well—

Senator ELLENDER. The tuition and board and lodging?

Mr. McCARTHY. They pay their own board and lodging. This is tuition only.

Senator ELLENDER. I see.

Mr. McCARTHY. It is tuition cost only and it was established in line with what similar institutes would charge.

Senator ELLENDER. Well, since when have you been charging this kind of tuition fee?

Mr. McCARTHY. Well, there always has been a tuition fee throughout its operation.

Senator ELLENDER. I know, but not that big.

Mr. McCARTHY. I think it has been very similar.

Senator ELLENDER. From the beginning?

Mr. McCARTHY. \$2,000. I am pretty sure, sir.

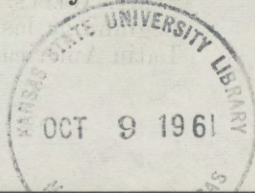
Senator ELLENDER. I thought it was nominal.

Mr. McCARTHY. I beg your pardon, I said \$2,000 a semester, it is \$1,000 a semester, it is \$2,000 for the course for the year. It is \$2,000 for a year's tuition.

Senator ELLENDER. Nine months?

Mr. McCARTHY. I think it runs 10 months.

Senator ELLENDER. As I recall the program years ago, a good deal of it was carried on free. There was no charge. That is why I asked the question.



Mr. McCARTHY. Well, the type of school has changed. Initially, as you will recall, we were in cooperation with universities who provided the basic course and then the advanced course was given at the Institute. We now only have the advanced courses there.

Senator ELLENDER. Well, I recall that quite a large program was in the offing, to educate these foreigners at our expense, and some of us put our foot down on that and I am glad it has been changed in the way you are now handling it.

Mr. McCARTHY. I think you have in mind the proposal to build a new school.

Senator ELLENDER. Yes, that is what I am talking about.

Mr. McCARTHY. As it is now, they have integrated the institute in buildings at the laboratory.

Senator ELLENDER. You remember the plan, don't you?

Mr. McCARTHY. Yes.

Senator ELLENDER. We won't go into details of it now, but it was very ambitious.

Senator PASTORE. This is all graduate work?

Dr. SEABORG. Yes.

Dr. HAWORTH. And very specialized.

Senator PASTORE. Very specialized?

Dr. SEABORG. Very specialized.

#### TRAINING PROGRAM IN PUERTO RICO

Senator DWORSHAK. Do you have a training program in Puerto Rico?

Dr. SEABORG. Yes, we have a nuclear center in Puerto Rico.

Senator DWORSHAK. That is for South American students?

Dr. SEABORG. It is primarily for students from South and Central America.

Senator DWORSHAK. How large is it? What is the enrollment?

Dr. SEABORG. 170.

Senator DWORSHAK. Is that a 1-year course?

Dr. SEABORG. I think so. Mr. Wells?

Mr. WELLS. Senator, the 170 students which we expect to have in the Puerto Rican center this next fiscal year will be the total number of students who register for either some of the graduate courses or some individual courses, radioisotopes, radioisotopes in medical therapy, that sort of thing.

Senator DWORSHAK. Are we providing all of the funds to operate that school?

Mr. WELLS. Yes, sir.

Senator ELLENDER. Any tuition?

Mr. WELLS. Yes, sir, the tuition is the current tuition at the University of Puerto Rico for students, which works out to \$6.25 a semester hour.

#### STUDENTS FROM SOUTH AMERICA

Senator ELLENDER. Do we attract many students from Latin America?

Mr. WELLS. We are going to. As you know, Senator, it is just beginning; last year we had seven or eight students representing the Latin American countries, some from India and other countries. The

bulk of the students to date, of course, have been the Puerto Ricans themselves and some from continental United States.

Senator DWORSHAK. I presume you don't enroll any students from Communist countries.

Mr. WELLS. No, sir.

Senator HILL. Get many from the satellite countries?

Mr. WELLS. We don't have any, Senator. We have no students from the U.S.S.R. or the satellite countries.

Senator HILL. Or any of their satellites?

Mr. WELLS. No, sir.

Senator HILL. Mr. Chairman, you had better go ahead now.

#### CIVILIAN APPLICATIONS OF ISOTOPES AND NUCLEAR EXPLOSIVES

Dr. SEABORG. There remain to be mentioned two additional small programs concerned with the application of nuclear energy to civilian purposes. The program dealing with the application of radioisotopes is budgeted at \$5.5 million in 1962. In this activity we are engaged in developing the use of radioisotopic energy for a wide variety of purposes, including small electrical power units, heat sources, industrial quality control devices, tracing the flow of fluids, etc. A major effort is to recover, package, and utilize isotopes from reactor wastes, thus achieving a cheap source of radiation and reducing storage problems. This request also provides for the implementation of a program to increase the shelf life of perishable food—such as fish and fruit—through low-level radiation.

#### PLOWSHARE PROGRAM

The other program is PLOWSHARE, which deals with the use of nuclear explosives for civilian purposes. Preparations for limited experimentation and the exploratory study of potential applications are proceeding at a rather deliberate pace, as indicated by our request of \$6.5 million.

Senator HILL. Where you go in and do one of these projects, does the local community, or State, county and city put up some of their funds, too?

Dr. SEABORG. For the PLOWSHARE program?

Senator HILL. Yes.

Dr. SEABORG. No, sir.

Senator HILL. I may not have a clear picture of PLOWSHARE but as I recall the testimony we had 2 or 3 years ago you use this if you want to deepen a harbor or widen a river, or something of that kind.

Mr. LUEDECKE. Two or three years ago, Senator, we had one such project—

Senator HILL. That was the project.

Mr. LUEDECKE. On one of our projects, there was some local cooperation present, the oil companies.

Senator HILL. You did get cooperation?

Mr. LUEDECKE. They had indicated they would provide some cooperation.

Senator HILL. You indicated at the hearing, as I recall at the time, you would get some cooperation from them and you did get cooperation.

- Mr. LUEDECKE. No, sir, we have not gone forward.  
 Dr. SEABORG. We are not budgeting for that.  
 Senator HILL. I see, you are not budgeting for that project.  
 Dr. SEABORG. We are not asking for funds for that project.  
 Senator HILL. I see. All right, sir, you may proceed.  
 Dr. SEABORG. All right.  
 Administration, then, is next.

## ADMINISTRATION

Senator ELLENDER. That is the important part.

Dr. SEABORG. Yes, of course, for us.

The remaining 1962 expenses shown in our budget are in the nature of administrative costs. We have provided for subsistence payments to the newly incorporated communities of Oak Ridge, Tenn.; and Richland, Wash., as provided in the Atomic Energy Community Act of 1955. The expenses for operating the community of Los Alamos are largely offset by related revenues. There is the usual provision for conducting security investigations for Government and contractor employees engaged in atomic energy work. Finally, there is our request for about \$58 million to cover the salaries and other costs of AEC personnel engaged in general direction and administration of our programs. This amount is based upon maintaining the average employment level at the ceiling of 4,940 in effect at the end of last year. The increasing workload in regulatory and licensing activities reduces the number of people available for our technical programs, and accommodation of this situation is proving very difficult.

Senator ELLENDER. Mr. Chairman, I know here that you make the statement that the expenses for operating the community of Los Alamos are largely offset by related revenues. How about the other communities?

## COMMUNITY ACT PROGRAM

Mr. LUEDECKE. Senator, the community of Los Alamos is the only community that we now operate. The other communities have been or are almost completely disposed of.

Senator ELLENDER. Self-sustaining?

Mr. LUEDECKE. Under the Community Act they are eventually to be self-sustaining, yes, sir; except that for a short time we do provide some financial assistance to those communities as provided in the Community Act. But Los Alamos is the only remaining community that the Commission has.

Senator ELLENDER. Is what you furnish other communities by way of subsidy for rents or municipal government?

Mr. McCARTHY. That is right.

## ASSISTANCE PAYMENTS TO MUNICIPALITIES

Mr. LUEDECKE. I might point out, Senator Ellender, under the Community Disposal Act for both Oak Ridge and Hanford, for a period of 10 years until they became self-sustaining, there was provision for assistance. At Oak Ridge, we make an assistance payment to the municipality. In other words, based on their deficit at the moment. This is to provide assistance until they get on a self-sustaining basis.

Senator ELLENDER. Have we established a time limit?

Mr. LUEDECKE. The act provides for a 10-year period.

Senator ELLENDER. All right.

Mr. LUEDECKE. I think in this case about 2 years have run at Oak Ridge and Hanford. At Hanford, we do make assistance payments to the municipality and also some payment to the school system at Hanford so these are the two ways in which they get the financial assistance.

Senator ELLENDER. That is paid out of funds directly appropriated for—

Mr. LUEDECKE. Directly appropriated for in this budget, in the community program.

Senator ELLENDER. All right.

#### PLANT ACQUISITION AND CONSTRUCTION

Dr. SEABORG. I would now propose, Mr. Chairman, to review briefly our requirements for plant acquisition and construction. As I stated previously, the House bill provided no funds for this purpose. We requested appropriations for \$268,750,000 in our 1962 budget, which together with the estimated \$106,544,000 of unobligated fiscal year 1961 funds, will make a total of \$375,294,000 available for obligation.

The following are the major construction projects for which new appropriations are being requested.

#### UNOBLIGATED BALANCE

Senator ELLENDER. Will you tell us why it is that you didn't obligate \$106 million?

Mr. McCARTHY. These were slippages in getting the contracts underway, Senator, for projects which are still going forward. It was simply a slippage from contracting last year and into this year. These present projects are all going forward, but we predicted—

Senator ELLENDER. Why do you put that in the category of unobligated?

Mr. McCARTHY. When we reviewed our budget last spring, at the time the new administration came in, we determined what we would probably obligate and then, to the extent we felt they were going to slip, we showed the probable underruns in the new budget in a manner to reflect the incurring of obligations in 1962.

Senator ELLENDER. Will this \$106 million be used in order to construct facilities that you contemplated when you asked for this money?

Mr. McCARTHY. This is correct, sir.

Senator ELLENDER. And this additional sum you are asking for is for additional?

Mr. McCARTHY. It is for new projects, in the current authorization bill or for projects previously authorized but not fully funded.

#### SPECIAL NUCLEAR MATERIALS

Dr. SEABORG. Approximately \$101.1 million was requested for the special nuclear materials program. Included in this amount is \$60 million for fiscal year 1962 obligations associated with power con-

version of the new production reactor at Hanford and \$9 million for improvements to production reactors at Hanford and Savannah River.

Senator PASTORE. Now on that, since it will come down if the House accepts the conference report of 58 instead of 60 to what extent—

Dr. SEABORG. The cost of the project included in the conference report is estimated at \$58 million so there will be a reduction of \$2 million if the conference report is accepted and the full amount is funded in fiscal year 1962.

Mr. LUEDECKE. We are reporting to the Joint Committee on Atomic Energy on our estimates today, and while they are not as firm as we would like to have them because—

Senator PASTORE. Will we have all that before the markup?

Mr. LUEDECKE. Yes, sir. The Joint Committee had it this morning.

Senator PASTORE. How about this committee?

Mr. LUEDECKE. We would plan to submit it to this committee when we have knowledge of the action of the House on the conference report.

Senator PASTORE. All right.

#### HANFORD PLANT POWER

Senator ELLENDER. Will this new power that you propose to provide be used directly by you or will you wheel it through other facilities that now furnish you electricity?

Dr. SEABORG. Well, the original proposal is the latter.

Senator PASTORE. But the compromise, of course, requires that all the current produced by this one turbine or generator will be used exclusively at the Hanford plant.

Mr. LUEDECKE. This is the way we understand it.

Senator ELLENDER. So it will be used directly, all of it.

Dr. SEABORG. In my previous answer I was speaking to the original proposal.

Senator ELLENDER. But in the one you contemplate constructing, because of the compromise, would all electricity generated be used by you directly?

Dr. SEABORG. So I understand.

Senator PASTORE. That will have to be worked out. There may have to be some tie-in, but the fact of the matter is the power that is going to be produced is going to be used for Hanford.

#### TVA POWER

Senator ELLENDER. Well, the reason I asked that, Senator Pastore, is that I expressed the hope that no new ones would be constructed and later on find ourselves in the same category as we now find ourselves with TVA. I am for the TVA, I voted for it up to a certain point. Today about 70 percent or maybe a little over that now of the electricity is being generated for use in the TVA and the facilities around it are produced by steam rather than falling water.

Senator HILL. I am glad these gentlemen are here now because they are taking—they were taking, and I suppose they still are—over 50 percent of that TVA power?

Senator ELLENDER. It started out that way, that is how you got your foot in the door. That is why I am asking, and I would insist that

any electricity that is produced by the Atomic Energy Commission be used by them and not be used to furnish other purposes or other power.

Senator PASTORE. That is right, that is in the report.

Senator HILL. The House makes that very clear.

Senator ELLENDER. I just want to make a little record of it so we won't have repetition of the TVA project.

Senator DWORSHAK. Mr. Chairman, I think on that point we might elaborate on the basis that much of the opposition to the Hanford plant from the private utilities was that this was the first of a series of a number of atomic power generating plants which were being planned by AEC across the country. Now can you give us any assurances as to whether your planning went beyond Hanford?

Dr. SEABORG. It didn't go beyond Hanford, and we didn't have any plans for further plants of this sort.

Senator DWORSHAK. And, you did have here, I noticed on page 6, that you would have waiver of fuel for the Westinghouse Electric Corp. in the new plant agreement with the Southern California Edison Co.

Dr. SEABORG. That is right; as well as support the research and development.

Senator DWORSHAK. That is a private plant?

Dr. SEABORG. That is a private plant and is similar to other cases.

Senator DWORSHAK. It was done at Yankee. You have done it in many cases where private companies—

Dr. SEABORG. Yes; particularly a number under construction now.

Senator DWORSHAK. And you are planning to proceed with that program?

Dr. SEABORG. Yes.

Senator DWORSHAK. To develop the feasible practical use of atomic power to generate electricity?

Dr. SEABORG. That is right; the power demonstration program.

Senator DWORSHAK. And this plant at Hanford is in no way to be a pilot plant for a similar AEC federally owned plant elsewhere in this country?

Dr. SEABORG. No; we regard it as a single case tied to plutonium production in that particular plant.

Senator DWORSHAK. You have no comparable situation where you might propose to use heat now being wasted for generating power?

Dr. SEABORG. Not a comparable situation. We might construct a plant—

Senator DWORSHAK. In the future, but not at the present time?

Dr. SEABORG. For the experimental development of heat.

Senator DWORSHAK. Of course, we have the plutonium plant at Savannah River, but that does not provide a comparable situation.

Dr. SEABORG. We have no plans similar to NPR conversion with respect to our other production reactor plants.

Senator DWORSHAK. Thank you.

#### PROVISION OF EXISTING LAW

Senator PASTORE. As a matter of fact, existing law, and I think it is section 44—I just heard someone say that today; I may be wrong about the number, but I think it is section 44 in existing law provides

that the Atomic Energy Commission shall use any electricity in its research facilities or production plants but cannot use it for commercial purposes, and this compromise that we have made is absolutely consistent with that provision of the law and is within the four corners of that law. What we propose to do—we said so; I was the one who was there when the compromise was worked out and used the word “exclusively” so there would be no question about the fact that what we were using would have to be used at the plant itself. There is no question of commercializing anything and getting into the electrical business, but merely a question of using this heat that will be expelled and generated by the reactor itself, to use it in order to generate the power that will be necessary to be used at the site itself, and it does not go beyond that, and certainly is not a toe in the door.

Senator DWORSHAK. Dr. Seaborg?

Senator ELLENDER. You said a toe instead of a foot.

Senator PASTORE. Well, a toe or a foot.

#### GENERATION OF POWER FOR AEC USE

Senator DWORSHAK. Does AEC generate power for its own use in any other reactor?

Mr. LUEDECKE. Except for minor amounts, no, sir. When the gas-cooled reactor comes in at Oak Ridge we will be generating 23 megawatts and it will go on line and will be utilized in connection with the operation of the diffusion plant.

Senator DWORSHAK. At Oak Ridge, or will it be used elsewhere by AEC?

Mr. LUEDECKE. At Oak Ridge.

Senator DWORSHAK. I recall a few years ago a power-generating plant was proposed at the Idaho installation. Was that finally completed? I know that you buy your power there from Utah and Idaho power companies, private utilities.

Mr. LUEDECKE. May I talk to Dr. Pittman about that? I am not sure.

Dr. PITTMAN. EBR-2, experimental breeder No. 2, which is now nearing completion, will generate power and feed power into the system.

Senator DWORSHAK. Will you repeat that?

Dr. PITTMAN. The power generated will be used at Idaho.

Senator DWORSHAK. How much power?

Dr. PITTMAN. About 17 megawatts.

Senator DWORSHAK. And that will be used at the plant by AEC?

Dr. PITTMAN. Yes; that is right, sir.

Senator DWORSHAK. None of it will be put into use outside of the installation?

Dr. PITTMAN. That is right, sir.

Senator DWORSHAK. Thank you.

Senator HILL. All right, Mr. Chairman; go right ahead.

#### WEAPONS

Dr. SEABORG. Obligations required for the weapons program are estimated at \$24 million, to provide additional production capacity, research and development facilities, and miscellaneous plant projects.

## REACTOR DEVELOPMENT

From the reactor development program obligations are estimated at \$161.4 million, which includes \$92.2 million of projects funded in prior years but which did not get under contract. The \$69.2 million of new funding includes the following major items: \$8 million for an experimental beryllium oxide reactor for maritime and civilian power requirements; \$14.8 million for laboratory support buildings and general plant projects; additional funding of \$13 million for test plants for the ROVER and PLUTO projects; and \$7 million for a power reactor for the Antarctic.

## PHYSICAL RESEARCH

Obligations for the physical research program are estimated at \$78.5 million. The largest items in this total are \$26 million to initiate construction of the Stanford accelerator, and an additional \$13 million for the zero gradient synchrotron at Argonne.

## COMMUNITY PROGRAM

In the course of hearings before the House Appropriations Committee, we indicated that we could give up a project at Los Alamos, which would have provided for the construction of 100 new houses in Los Alamos County at a cost of \$2.79 million. We will not have to proceed with this project because we have been able to get a private contractor who is undertaking to build 200 houses at White Rock Camp, adjacent to Los Alamos.

## REDUCTIONS MADE BY HOUSE APPROPRIATIONS COMMITTEE

Now that I have summarized the Commission's 1962 budget programs in general terms, I would like to address myself briefly to the specific reductions made by the House Appropriations Committee in our budget request.

## REACTOR DEVELOPMENT

The first of these reductions is in the amount of \$2,665,000 against the nuclear technology activities of the reactor development program. The general technology activities represent research into the practical reactor phenomena, the understanding of which is essential to our future progress in developing safe, reliable, and economical reactors for power and propulsion purposes. The amount budgeted for 1962, namely \$47,790,000 was arrived at only after the most searching of reviews and represented tasks which the Commission considered highly essential if we were to advance this technology. Accordingly, it is our conviction that this reduction should be restored.

Senator PASTORE. Could you be a little more specific about that? In what way would it help you?

Dr. SEABORG. I would like to call on Dr. Pittman to respond to that.

Senator PASTORE. Because these are the matters which will be discussed quite thoroughly in conference. We have got to have a complete record. In other words, what we would like to have here is some additional information that you think might have escaped the House when it made its conclusions of making this cut.

Dr. PITTMAN. It is very difficult to say there was any additional information that would not be presented in our budget document or in discussions with the House, sir. It is also difficult to look at this cut and to not specify what area they had in mind to give you a specific answer to a specific project.

#### EFFECT OF HOUSE REDUCTION

Basically, what this does is slow down, and to a considerable extent, the development of the high temperature fuel materials that are so very vital to the future of all of the nuclear engine programs whether they be the civilian program or the space programs or in essence the Navy program because what we are doing in this nuclear energy program is doing the developmental work that is not project directed and that, therefore, can go beyond the needs of a specific project that has to be built next year.

We do long-range developmental work which opens up the future of the nuclear energy program that tells us how far we can go in the future, so a cut in the materials activity, and this would be the activity where the major portion of this cut would fall, would slow down the very important development program. Obviously we have other funds in there so it won't stop it. It will slow down the time when we have solved these material problems which are so important to the overall program.

Senator PASTORE. Would you tie it in a little better for me in our space and military program?

#### EFFECT ON SPACE AND MILITARY PROGRAMS

Dr. PITTMAN. I am saying here in order for the space and military programs to be successful and continue to be successful, the achievement of the high-temperature materials and the high-temperature fuels and long-lived fuels is necessary.

Senator PASTORE. Is this all basic research, this \$47 million?

Dr. PITTMAN. It is all research work. That is not the basic research of the type that the research division does, sir, but it is research work that is aimed at finding the fundamental properties of the materials that we need for the reactor development program. There is another area that would be cut and this is in the area of physics, where we are trying to determine the physics of the nuclear program in order to build better reactor systems and again not only for the civilian power program but also for all of the military and space programs.

#### GEOGRAPHICAL LOCATION OF PROJECTS

Senator PASTORE. How spread out are these projects, I mean geographically?

Dr. PITTMAN. They are spread out quite largely, sir. A large amount of our work is carried out in the laboratories of the Commission, such as Oak Ridge and Brookhaven, also a large segment of work goes on at Hanford, and some at Savannah River. But in addition to that, I would say about a quarter of the work is carried out in many outside institutions and laboratories both university and nonprofit institutions like Batelle and also in the laboratories of industry itself.

So it is an across-the-board effort. It is not projected and this makes it difficult to tie to any one thing, because the developmental program we are carrying out in uranium oxide is work that is applicable to every reactor that uses uranium oxide.

## CONTINUATION OF PROJECTS UNDERWAY

Senator PASTORE. Are these new projects that you contemplate, or is this a continuation of projects already underway?

Dr. PITTMAN. A good deal of this is a continuation of projects already underway and we are just now reaching the point where we have to, where in order to get full advantage of what has been done over the past 3 or 4 years it is necessary to put material into reactors and get irradiation data from the materials in those reactors, and this is actually a cost that we had contemplated all along as coming in fiscal year 1962. If we stay at the level proposed here, we will have to actually cut back on the program of new work.

## CONTRACT WORK

Senator PASTORE. Is this work done by contract?

Dr. PITTMAN. This is all done by contract, either at our laboratories or contracts with private industrial laboratories.

Senator PASTORE. Does this envision on your part that we might have to abandon some contracts?

Dr. PITTMAN. The cut, as proposed, would certainly cause us to have to either abandon some contracts or cut down considerably on them.

Senator HILL. May I interrupt there?

How serious do you think that would be, Doctor?

Dr. PITTMAN. Well, I think it would be very serious.

I believe that this nuclear technology program is the program that gives us the base for the future atomic energy program at the Commission.

Senator DWORSHAK. If you don't get this money you couldn't ask Euratom to do it for you?

## EURATOM PROGRAM

Dr. PITTMAN. The Euratom program is such that we can only do work in that program which is for the project, and this is for water or organic reactors. We coordinate that work.

Senator PASTORE. And you consider this cut quite a serious cut?

Dr. PITTMAN. We consider it a serious cut.

Senator DWORSHAK. Do you have any money in this program for Euratom?

Dr. PITTMAN. Yes, sir, \$2.7 million.

Senator DWORSHAK. What are they going to use that for? Maybe we had better cut that out and restore this. It is about the same figure.

Dr. HAWORTH. Not in this item.

Senator DWORSHAK. I mean in this budget.

Senator PASTORE. He didn't want to confuse them because I know how some people feel about Euratom. Euratom is not about this particular item.

Senator DWORSHAK. I was just a little facetious because I thought where we drag our feet on technical research we could probably ask them for their assistance.

Senator HILL. Go ahead, if there are no other questions.

#### PHYSICAL RESEARCH

Dr. SEABORG. The next reduction of \$2,834,000 has been applied to the physical research program. The committee noted, and I most certainly agree, that this reduction was not to be applied against high energy physics or controlled thermonuclear power research activities. This means then that the funds budgeted for low energy physics, chemistry, and materials research would have to bear this reduction. Although these other areas cannot claim the public eye in the same manner as the large accelerators in high energy physics and the sophisticated controlled thermonuclear research devices, these areas of low energy physics, chemistry, and materials research are even more important to our national scientific effort. I mean that in a practical way, and I would like to underline that.

Senator PASTORE. As a matter of fact, this cut is aimed at your personal sensitivity.

Dr. SEABORG. Yes, sir; this is my area. That is right, they are the three areas that I have more personal interest in. Substantial contributions can be made in these fields. In effect, this reduction would slow down our progress on problems the solution of which is fundamental to the development and production responsibilities of the Commission. Again I must say the Commission believes most strongly that these funds should be restored in our 1962 budget. Low energy research is the bread and butter for the type of research we are now engaged in exploiting.

Senator PASTORE. So we may complete the record on this for purposes of further discussion with the House because this is a cut and this is a request for restoration, what way will this cut damage the program?

#### LOW ENERGY PHYSICS MACHINES

Dr. SEABORG. It would mean that we couldn't operate some of our low energy physics machines in the way—

Senator PASTORE. Machines we already have?

Dr. SEABORG. Machines we already have.

Senator PASTORE. We would have to keep them idle?

Dr. SEABORG. Oh, no we would have to curtail their operation and not get the maximum benefit from them. I would like here, again, to ask Dr. McDaniel to elaborate on this because I think it is of sufficient importance for him to do so.

Dr. MCDANIEL. The Commission has recently procured Van de Graaff accelerators at Rice Institute, at the Argonne National Laboratory, at Oak Ridge, accelerators at Duke and MIT would be affected if this cut were allowed to stand.

In general, the cut of \$2.8 million is a serious cut. It may not look serious in the context of the \$178 million request, but when you exclude from places to take the \$2.8 million cut high energy physics and controlled thermonuclear and require it to be made from physics, mathematics, chemistry, and metallurgical materials research, this reduces the planned expansion to a considerable extent.

Considering particularly the increased cost of doing research in universities and in national laboratories it would provide for almost no increase in these programs.

## EFFECT ON SPACE PROGRAM

Senator PASTORE. Does this affect our space program in any way?

Dr. SEABORG. Oh, yes, the materials.

Dr. MCDANIEL. In a long range basic way, yes, sir. The materials being developed under our program are of vital interest to the space people. And as Senator Pastore and the chairman pointed out, it would be necessary, I believe, to curtail some of the activity of the chemical research planned in the long range—in the heavy element chemistry production program which the Joint Committee has considered at great length.

We certainly would have to curtail some planned activities in the low temperature superconducting materials development, which we had planned with some of this money.

In addition, our pure materials research program would be curtailed. In this program, we are trying to produce some extremely pure materials so that these materials may be examined and tested for their chemical and physical properties. Unless we have pure materials the results obtained by research are not so meaningful.

One attempt is to attempt ultra-pure materials. This reduction would require us to reduce our activities on that point.

Senator PASTORE. How about the SNAP program?

Dr. MCDANIEL. The SNAP program is not covered by this item.

Dr. SEABORG. Only in—

Mr. RAMEY. How about research on americium or other elements that might be fuels?

Dr. MCDANIEL. The heavy element research program bears a relationship to the SNAP devices in the fundamental sense, yes, but the specific SNAP programs are not covered.

Dr. SEABORG. Well, again, the materials research work here would certainly benefit the SNAP program.

Dr. MCDANIEL. We do consider this a serious—

Senator PASTORE. Would you like to add anything further, Dr. Seaborg?

Dr. SEABORG. No, except to underline my feeling that I think the United States is not carrying on materials research at the level which our national needs would require. We have been very slow in building up our materials research to the level that I think the national security demands.

Senator PASTORE. Does this envision the size of the budget this year or the estimate, does this envision an acceleration of the entire basic research program or is this merely keeping it more or less constant?

Dr. SEABORG. Yes, and in fact this would cut it below.

Dr. MCDANIEL. When one considers the impact of the increased cost of doing business this reduction would, I believe, reduce it below our 1961 level.

Senator PASTORE. Insofar as operations are concerned?

Dr. MCDANIEL. Insofar as operations are concerned.

Senator PASTORE. Instead of going forward, we would be going somewhat backward?

Dr. SEABORG. Yes.

Dr. McDANIEL. There is a very difficult parameter to measure the increased cost of doing business. Some people would say it is not quite this large. Others would say it is about this size.

Dr. SEABORG. That is, in this area it would be cutting it back.

Senator PASTORE. Yes, that is what we are talking about in this area of restoration.

Dr. SEABORG. Of the low energy physics, chemistry, materials, and so forth.

#### CIVILIAN APPLICATION OF ISOTOPES AND NUCLEAR EXPLOSIVES

Well, the final reduction in the amount of \$1,300,000 is applied against the program of civilian applications of isotopes and nuclear explosives on the basis of continuing this program at the 1961 level.

Since the Commission's 1962 budget already contemplated a decrease from the 1961 level in the nuclear explosives program, the effect would be to have this total reduction fall against the isotopes development program. I would consider such a reduction most unfortunate. As you know, this program has been supported for the past few years at a nominal level. The level projected for 1962 reflected the emergence of several of the most promising applications of isotopes from a feasibility effort to a demonstration of practical applications. This is particularly true in the area of preservation of food by radiation, which accounts for a large part of the increase projected for 1962. If this reduction is sustained, progress on these demonstrations would practically cease. In view of the benefits to all aspects of our economy so readily foreseeable as an outgrowth of our research and development in the utilization of isotopes, especially those derived from otherwise wasted fission products, I again most strongly urge restoration of these funds. If you would like amplification, I will call on Mr. Fowler.

Further data in support of these appeals are contained in our formal submission, copies of which are now before you. I should be most happy to answer any questions you now may have.

Senator HILL. Come up, sir.

#### APPLICATION OF HOUSE REDUCTION

Mr. FOWLER. I think, the committee recognizes and as Chairman Seaborg has stated, the isotopes development program has historically been held, at best, to a minimum level since its inception back in 1958. I think that in no case have the resources available to the program been of a magnitude to permit us to carry out a highly optimized development effort. The moneys that we are talking about here, the House committee reduction, can be specifically identified as principally against the radiation processed foods program of \$1.3 million cut, approximately \$700,000 would have to be applied against this program which has just now come to a level of reasonable productivity.

Of the \$700,000, \$500,000 would have to be applied against special equipment which will permit us to carry out the research program in

the form of research food irradiators and transportable food irradiators.

Three hundred thousand dollars of the House cut, would have to be applied against the programs on high intensity radiation development of the Brookhaven National Laboratory and radioisotope production process research and development at the Oak Ridge National Laboratory. This I consider to be particularly unfortunate in view of the fact that we are just now completing construction of two new laboratory facilities, one at Brookhaven and one at Oak Ridge, and this in effect means that we will not have adequate resources to effectively utilize these brand new facilities. This represents, at least in my mind, a very serious and substantial setback to the program.

The last element of the cut would have to go against special types of equipment required at the Oak Ridge National Laboratory. An example is shipping containers to transport feed materials from the Hanford works to our Oak Ridge fission product separations laboratory, in which we are doing the separations of fission products currently being used to support the SNAP program. This supports our isotopic power systems development program, and the fabrication of medical therapy sources for therapy machines. These represent the element of possible program reductions which will result from the proposed cut.

#### HOUSE REPORT

Senator HILL. The House report states the balance of \$10,700,000 will continue the program at the 1961 level. What have you to say to that?

#### RESEARCH PROGRAM ON FOOD

Mr. FOWLER. Well, our portion of that \$10 million-plus comes out to be \$4.2 million, which is equivalent to the fiscal 1961 level of the isotope development program. This doesn't take into account then, however, commitments and requirements for funds which we have as a consequence of these new laboratories coming into operation or the consequence of the research program on food getting into high gear. You have to recognize that the Commission, insofar as the food program is concerned, has been in this activity only a year and a half and essentially we have just got it to where we are beginning to perform the actual research work.

Senator HICKENLOOPER. Mr. Chairman, who do you mean the food program is only a year and a half old?

Mr. FOWLER. As far as the AEC's part in the radiation of food is concerned, we got into this program about a year and a half ago. The Commission's program is designed to develop the use of low doses of radiation for—

Senator HICKENLOOPER. Who was conducting it before that?

Mr. FOWLER. The Army has been in this effort for the past 7 years.

Senator HICKENLOOPER. Weren't you cooperating with the Army?

#### COOPERATION WITH ARMY

Mr. FOWLER. We have been cooperating with the Army throughout, but the AEC is considering a different aspect of radiation preservation of foods than the Army. The Army is concerned with what we call radiation sterilization of foods, to permit long-term storage

without refrigeration. The Commission's program is what we might term "radiation pasteurization of food"—using very decreased levels of radiation to extend the shelf life of perishable foods, such as fish or fruits, under conditions of refrigeration. In other words, we are trying to achieve, say with strawberries, a useful shelf life of 2 weeks.

Senator HICKENLOOPER. Well, you have been—

Mr. FOWLER. As opposed to 3 or 4 or 5 days, which is the case now.

Senator HICKENLOOPER. You have been irradiating canned goods for quite a while, haven't you?

Mr. FOWLER. But this is with the Army's program, and again for sterilization purposes for which they are using very large quantities of radiation or radiation doses. We are using a very much smaller amount of radiation or radiation doses, simply to extend shelf life of perishable foods. So, there is a marked distinction between what we are doing and what they are doing.

Senator HICKENLOOPER. Well, the fact is that you did not just start in this field a year and a half ago, did you?

Mr. FOWLER. Insofar as the Atomic Energy Commission's deliberate program of research and development, yes; we did start then. We have been cooperating with the Army since the inception of their program, but this cooperation has taken the form primarily of supplying the radiation sources for them to carry out the research and development.

Senator HICKENLOOPER. Thank you.

Senator PASTORE. That is a very, very interesting subject. As I get the distinction now, the Army's program has to do with the sterilization of foods which would be a substitution for refrigeration. What you are talking about now is even with the use of refrigeration you want it to last longer before it becomes bad?

#### TRANSPORTATION OF STRAWBERRIES FROM CALIFORNIA

Mr. FOWLER. That is correct. You can use, as a good example of this, strawberries on the east coast for which the primary sources are berries grown in the State of California. In the process of transporting strawberries from California to New York, as much as 50 percent of these berries are destroyed by deterioration. Now, if we can use low doses of radiation to extend the shelf life of these berries up to 2 weeks, you can immediately see the beneficial effect of this kind of a technical development.

Senator PASTORE. Is there an appreciable difference in the amount of radiation in one process as against the other?

Mr. FOWLER. Well, the Army's program talks in terms of using 5 megarads of radiation. We are talking about a half a megarad, so there is considerable difference in the amount of radiation dose involved.

Senator HILL. Senator Hickenlooper, any other questions you would like to ask?

Senator Pastore, any other questions?

Senator Dworshak?

Mr. Chairman, I believe you had concluded your presentation. Is there something else you would like to add? If there is, don't hesitate.

## CONSTRUCTION PROBLEM

Dr. SEABORG. I would like to mention again the construction problem.

Senator HILL. When you spoke about the appeal, you spoke some, of course, and made reference to the plant acquisition and construction item. As we all know, the House hasn't acted on the conference report on the authorization, but after they have acted then I think it might be well for you promptly to submit to this committee the exact amount requested for plant acquisition and construction, with the supporting tables and other data that will sustain your request.

(The information referred to appears on p. 131.)

Dr. SEABORG. Yes.

Senator HILL. Will you do that very promptly, sir?

Dr. SEABORG. We will do that, and give you all the information and reactions to it that we have.

Senator HILL. Good.

Any of you gentlemen have any further questions?

If not, I must say this has been a most interesting and a most informative hearing so far as I am concerned, and we deeply appreciate it, and we want to thank all of you gentlemen, and you doctors back there, too.

(Whereupon, at 12:20 p.m., the committee recessed.)

(AFTERNOON SESSION, FRIDAY, SEPTEMBER 8, 1961)

Senator HILL. The committee will kindly come to order.

We are very happy to have with us this afternoon the Board of the Tennessee Valley Authority, its Chairman, Mr. Jones, and Mr. Wagner and members of the staff. We are glad to have all of you here.

General, suppose you proceed in any way you see fit with reference to the budgets of the Tennessee Valley Authority.

## TENNESSEE VALLEY AUTHORITY

STATEMENT OF HERBERT D. VOGEL, CHAIRMAN OF THE BOARD;  
ACCOMPANIED BY A. R. JONES, VICE CHAIRMAN OF THE BOARD;  
AUBREY J. WAGNER, DIRECTOR; LOUIS J. VAN MOL, GENERAL  
MANAGER; L. E. ELLIS, CHIEF, BUDGET STAFF; RICHARD KIL-  
BOURNE, DIRECTOR OF TRIBUTARY AREA DEVELOPMENT;  
ROBERT H. MARQUIS, SOLICITOR; LEWIS B. NELSON, MANAGER  
OF AGRICULTURAL AND CHEMICAL DEVELOPMENT; MARGUE-  
RITE OWEN, WASHINGTON REPRESENTATIVE; GEORGE P. PALO,  
CHIEF ENGINEER, AND G. O. WESSENAUER, MANAGER OF POWER

## GENERAL STATEMENT

Senator HILL. The committee will kindly come to order.

We are very happy to have with us this afternoon the Board of the Tennessee Valley Authority, its Chairman, Mr. Jones, and Mr. Wagner and members of the staff. We are glad to have all of you here.

General, suppose you proceed in any way you see fit with reference to the budgets of the Tennessee Valley Authority.

Mr. VOGEL. Thank you very much, Mr. Chairman.

We have been before you and this committee so many times in the past that I am sure you know our people, but just as a matter of record, I would like to indicate that my fellow directors, my colleagues, Mr. Jones and Mr. Wagner, are here today, as is our General Manager, Mr. Van Mol. Mr. Wessenauer is here representing our Office of Power. Mr. Lewis Nelson heads our activities in agricultural development and fertilizer research.

Mr. Richard Kilbourne is the man who heads up our tributaries development staff.

George Palo our Chief Engineer, is here; Robert Marquis, represents the General Counsel, and Mr. Ellis, who is in charge of the Budget Office.

We appreciate very much this opportunity to appear with the subcommittee to discuss the TVA budget program.

As has been our custom in earlier years, we will not present the budget estimates in detail unless of course you wish it. But we would like to point out some of the more significant aspects of our 1962 plans, and of course it goes without saying that we will be happy to respond to any questions that you may have for us.

#### CLINCH RIVER, TENN., PROJECT

Our construction for navigation and power is proceeding as scheduled. We are building a new multipurpose dam and reservoir project on the Clinch River in Tennessee at the location known as Melton Hill.

Senator HILL. Is that getting along pretty well?

Mr. VOGEL. It is moving right along. When completed it will extend the navigation channel to Oak Ridge and to Clinton, Tenn.—an addition of 38 miles of channel. The project will increase the dependable capacity of the power system by some 80,000 kilowatts. Recreation will be an incidental benefit of this reservoir. Because of its nearness to several cities, we expect that boaters, fishermen, and swimmers will make great use of it.

#### ADDITIONAL HYDROGENERATOR UNITS

Our work is also continuing on the addition of six hydrogenerator units at existing powerplants, three of these at Wilson Dam and the other three at Wheeler Dam.

We are making good progress on a new steamplant under construction at Paradise, Ky.

#### STEAM GENERATING UNITS

Two new steam generating units are being installed at existing plants in Alabama. I am sure, Senator Hill, you are acquainted with those plants—Widows Creek and Colbert.

#### KNOXVILLE STEAMPLANT

The major new project scheduled for initiation in 1962 is the steamplant near Knoxville, Tenn., which will have an initial capacity of 900,000 kilowatts. This capacity will be contained in one single unit that is now under contract.

All of our power facilities, as you know, are being financed from power proceeds.

## NEW LOCK AT WHEELER DAM

In continuing the modernization of the navigation channel, we are presently engaged in building a new lock at Wheeler Dam. This lock, like the new one at Wilson, will measure 110 by 600 feet. The appropriation bill as reported by the House includes \$7 million for reconstruction of the old Wheeler lock, a portion of which failed a short time ago. The rebuilt lock will be in service in June 1962, and the new lock in April of the following year, 1963.

## NAVIGATION LOCK FOR GUNTERSVILLE DAM

During 1962 we plan to start designing a new navigation lock for Guntersville Dam. Like the new locks at Wheeler and Wilson, it will measure 110 by 600 feet, and when completed it will give us large modern locks for over half of the channel distance from Paducah to Knoxville.

Thus far I have talked entirely about construction for navigation, flood control, and power. But in doing this I would not want to minimize the operational aspects of these activities, because this is where the payoff comes. The movement of bulk cargoes to industries on the Tennessee River; the control of floods to the end of effecting a considerable reduction of flood heights on both the Ohio and the Mississippi Rivers; and the supply of electric power for defense, for industrial production, and for homes in the region—these are examples of uses made of the river control facilities we have constructed.

Senator HILL. Maybe you would want to give us this, or maybe Mr. Wessenauer would have these figures on his fingertips. But we had this morning the Atomic Energy Commission. And I called their attention to the fact, which of course they already knew, of the power they are receiving from TVA.

## POWER FURNISHED AEC

What percentage of TVA's powers goes to Atomic Energy?

Mr. VOGEL. Approximately 50 percent.

Senator HILL. Half of TVA's power is going to the Atomic Energy Commission?

## CHEMICAL FACILITIES AT MUSCLE SHOALS

Mr. VOGEL. Yes, Senator.

Last year when we came before you we described our plans to rehabilitate TVA's chemical facilities at Muscle Shoals in Alabama. These facilities are unique. They provide a national center for fertilizer and munitions research, for development and production.

The basic facilities for this chemical center are for the production of nitrogen and phosphorous, both essential ingredients in fertilizers and munitions. Last year we began the rehabilitation of the phosphorous facilities. This year we propose to start a modernization program for the nitrogen facilities.

Senator HILL. You have a pretty good program for modernizing your nitrogen facilities?

## NEW PAN-GRANULATION PROCESS FOR NITROGEN FERTILIZERS

Mr. VOGEL. We are just beginning the program, Senator, and since this budget was submitted, we have found it desirable to make some modifications in our construction schedules for improving these facilities. We have been working for some time on a new pan-granulation process for nitrogen fertilizers and had scheduled the initiation of construction of a demonstration scale plant for fiscal year 1963.

This new facility will enable us to produce better fertilizers for use in our educational program and to demonstrate a new process by which high-grade fertilizers can be produced at lower cost to the ultimate consumer. This process will require less plant investment per unit of capacity than conventional plants, and production costs promise to be lower.

Research and development of this new process has moved forward faster than we expected. And this makes it possible and desirable to begin installation of the pan-granulator during the fiscal year 1962 instead of in fiscal year 1963.

No increase in our appropriations request is involved, simply a readjustment in scheduling the plant additions which I have just described.

As you know the various fertilizer products of TVA's chemical plant are distributed to farmers through private and cooperative fertilizer dealers who participate in educational programs in 40 States. Our test demonstration program extends to 31 States. These programs are aimed at introducing improved fertilizers and fertilizer practices which will improve farm efficiency; at the same time, the efficiency and the effectiveness of the fertilizer industry are improved as its members are enabled to apply our developments, all, of course, in the interests of lowering the cost of fertilizer to the consumer.

To date, 184 fertilizer manufacturers have been licensed to use royalty-free and nonexclusive patents on fertilizer processes developed by the TVA. The end objective of our fertilizer research and distribution program is, of course, to cheapen the cost of fertilizer to the farmer.

Senator HILL. You have made some very fine progress to that end, have you not?

Mr. VOGEL. It has been moving right along, Senator, all the time.

## TRIBUTARY WATERSHED PROTECTION AND IMPROVEMENT

A third major program activity of TVA to which we are giving increased attention is tributary watershed protection and improvement. The aim of this program is twofold, to protect and improve the soil and water resources of the region to a greater degree than heretofore, and to aid in the economic development of specific areas.

Now, in large measure this is a program of research and demonstration, but it has other aspects as well. We seek to determine facts, to give technical assistance to local bodies, and to stimulate development by laying a groundwork for it. The resources of the region are for the most part privately owned. The greatest opportunity, therefore, for their development will be found in the cooperative efforts of private citizens, their organizations, and their State and

local agencies of government. It is our aim to work with them to the end that the contributions we make at the Federal level may be most effectively utilized.

In this connection, it may be stated that we adhere with faith to the traditional TVA philosophy: to treat each area as a whole, and to shun the piecemeal attack of building aimlessly, project upon project, for the sake only of creating monuments.

I have previously introduced Mr. Wagner, the most recent appointee to our Board; this is his first appearance before you in this capacity.

Senator HILL. He used to come to see us when he was General Manager.

And we are happy to welcome you here today, Mr. Wagner, as a member of the Board.

Mr. VOGEL. You have known him for many years as a staff member, and a very competent General Manager.

Senator HILL. I have indeed. He is a very efficient man. The only thing, when he takes you fishing he does not always see to it that you catch a fish.

Mr. VOGEL. Senator, if he has not told you about the big bass he caught—I think perhaps it was a year ago now—I think perhaps you have been missing something.

Senator HILL. I have seen that picture.

Mr. VOGEL. He carries that picture along with that of his twin grandchildren.

Now, in order that you may become better acquainted with him in the position which he presently holds, and because he has had many years' experience in the development of the TVA approach to resource development, I am going to suggest that you call upon him a little later to describe this program in somewhat greater detail.

Senator HILL. All right, we will do that, General.

#### FORESTRY RESEARCH AND DEMONSTRATION

Mr. VOGEL. A major valleywide activity included in water shed protection and improvement is forestry research and demonstration. The Tennessee Valley is a great timber area. It is becoming a better one, under the conditions of sound woodland management on the part of owners, and better utilization of timber by the forest industry.

Senator HILL. Is this not true, General, that prior to the time TVA began, there was very little sound conservation and management of our timberland?

Mr. VOGEL. That is true. And, at that time, very little attention was being given to the development of the valley forests. Now, of course, the situation has changed.

Over the past 10 years sawtimber growing stock has increased by  $1\frac{1}{2}$  billion board-feet. This is the result of the increase in forest areas which the TVA program has promoted through reforestation efforts, and of better woods management, which we have stimulated by the wide use of demonstrations, conferences, and other educational means.

The output of these improved forests has likewise increased. Currently the timber output is valued at \$500 million a year. Properly

developed, managed, and used, the forest resources can contribute a billion dollars a year to the national production.

There are two new multimillion-dollar pulp and paper mills in the valley that employ nearly 6,000 people.

The TVA recently completed a study showing that the region can support additional mills using hardwoods. This would add significantly to the improvement of forest resources and the forest economy.

Now, again let me emphasize that TVA's forestry projects are cooperative. We work with the owners, the users, public agencies, and industrial groups. We cooperate with the U.S. Forest Service, with SCS, and the Agricultural Extension Service.

Our aim is to promote the wise use of natural resources in such a way as to improve the economy and protect the watershed, objectives which are fully compatible under conditions of sound management.

Our 1962 plans are based on a continuation of forestry research and demonstration. This program discovers the facts, presents the facts, and appeals to self-interest and public interest to do what is best in the long term for the individual and for the region.

#### TOTAL APPROPRIATION REQUEST

Our appropriation requests for 1962 total \$38,203,000. This is exclusive of the power program which will be financed with income from power sales and bond proceeds.

Senator HILL. There are not any funds in this bill to finance your power facilities?

Mr. VOGEL. That is right. We are entirely on our own there.

Senator HILL. As far as power is concerned, you are entirely on your own, and that "own" means that you can finance some, of course, from the revenues which you receive from the sale of power, and the other source of funds is, of course, the sale of bonds which we authorized here some 2 years ago?

Mr. VOGEL. That is right.

Our fertilizer operations will be financed principally from non-power proceeds.

That concludes my opening statement, Mr. Chairman, and we are ready to proceed from this point as you may desire.

Senator HILL. General, we may arrive at this later on, but I think I will ask it now anyway.

#### TOTAL INVESTMENT AND ANNUAL RETURN

Senator Hayden, who is the chairman of the full committee, was not able to be here, he had another meeting, and he asked me to be sure to have in the record, he left this memorandum here:

The total gross investment in electric power facilities (total value of capital assets before deduction for depreciation and other reserves—all the money which will be placed into the facilities).

Second, the total reimbursements applicable against the total investment.

Three, the total reserves, if any, remaining after reimbursement.

Four, estimated annual rate of return on the investment.

And I am going to hand this over to you, sir.

Mr. VOGEL. With your permission, we will prepare that material for the record.

Senator HILL. Good. And we will have it appear at this point in the record.

(The information referred to follows:)

	<i>June 30, 1961</i> <i>(in millions)</i>
1. Gross investment in electric power facilities	
Completed plant (before depreciation).....	\$2,042.5
Construction in progress.....	161.7
Total gross investment.....	<u>2,204.2</u>
2. Reimbursements applicable to appropriation financed portion of above investment.....	\$195.1
3. Reserves of funds held for future use.....	\$5.5
4. Estimated annual rate of return on the investment (percent).....	3.71

A complete presentation of the application and derivation of funds used in the power program is as follows:

	<i>June 30, 1961</i> <i>(in millions)</i>
Assets:	
Completed plant in service.....	\$2,042.5
Less accumulated depreciation.....	417.8
Completed plant less depreciation.....	1,624.7
Construction and investigations in progress.....	161.7
Plant completed and underway.....	1,786.4
Inventories.....	32.2
Funds held for future use.....	5.5
Total.....	<u>1,824.1</u>
Derivation:	
Total appropriations for power program.....	1,368.3
Plant received by transfers from other agencies.....	19.8
Subtotal.....	1,388.1
Less appropriations returned to Treasury.....	195.1
Subtotal.....	1,193.0
Accumulated net income from power operations.....	580.5
Contributions in aid of construction.....	6
Borrowings.....	50.0
Total.....	<u>1,824.1</u>

#### TRIBUTARY AREA DEVELOPMENT PROGRAM

Senator HILL. Do you suggest that we go on now with Mr. Wagner at this time, General?

Mr. VOGEL. Yes; I think it would be appropriate at this point to hear from Mr. Wagner.

Senator HILL. Mr. Wagner, suppose you give us a statement of the TVA viewpoint now, the history behind it, and the whole story of your tributary area development program.

Mr. WAGNER. Senator Hill, I will be very glad to do that.

This program has perhaps not been as well understood as we would like to have it, and I am grateful for this opportunity to describe it to you in some detail.

The tributary area development program includes TVA activities in several subareas in the Tennessee Valley where special and detailed attention is being given to economic development. These are defined areas where special problems inhibit economic growth, where specific

opportunities exist for substantial further development of the resource base, and of course where local groups have organized to turn their own energies, and those of their State and local governments, together with ours, to the problems of economic growth and area improvement.

The roots of this program and the basic concepts which it involves go back to the very early days of TVA. It was recognized then—by TVA's first board of directors—that as TVA's various programs were carried forward areawide in a broad sweep of general coverage over the region, there would be smaller and identifiable areas in the valley where special conditions would require more precise and specific analysis and treatment to bring fullest economic development.

#### PARTICIPATION OF STATE AND LOCAL GOVERNMENTS

It was recognized by TVA's first board, too, that as development proceeded in all its phases, State and local governments would also participate. This has been the keystone of TVA's programs from the very beginning.

Senator HILL. They have done that from the very beginning?

Mr. WAGNER. Yes, sir; it has been done.

Senator HILL. You do not distribute the power to the small local home consumer or some small business houses and places in town; that distribution is made by that particular city or that particular town, or that particular area, is it not?

Mr. WAGNER. That is right; power is distributed into the homes and farms by local institutions.

Senator HILL. You therefore have this joint enterprise of TVA with these local agencies or institutions; is that not right?

Mr. WAGNER. That is correct. And it has been so from the very beginning.

#### THE 1936 REPORT OF BOARD

The board's 1936 report to the Congress, for example, on the unified development of the Tennessee River, said—that is this report (referring to volume)—

A program of unified development for the Tennessee River Basin, in order to be most effective and economical, must have in view not only the functions of the Federal Government, but also the proper relating of these functions to the functions of State and local governments, and the activities carried forward under private initiative, to the end that the best total development may be achieved. This report makes no attempt to define specifically the sphere of the National Government or that of State and local governments or of private initiative. The distribution of responsibility must be gradually arrived at through determinations of policy by Congress and by the State legislatures in accordance with constitutional provisions.

Again, in speaking of the place of the smaller rivers of the valley in a unified development, the report stated:

Thus, the control of the smaller rivers should not be dominated by any single end, but by consideration of the greatest total benefit. To secure such results \* \* \* the Tennessee Valley Authority can serve as a coordinating agency, with planning and advice, and in appropriate cases by cooperation where contribution to navigation or flood control is clearly evident.

In a preliminary way, TVA very early earmarked some of the tributary problem areas for attention later, after the big job of providing the massive basic tools for resource development was further along.

## TOTAL TRIBUTARY PROBLEM AREAS

As early as 1938, some 100 such areas were given a preliminary review. By the end of World War II, one small watershed was the subject of intensive study and concentrated activity. Here we undertook to demonstrate what might be accomplished in one small area, a single watershed, by the combined and intensified developmental efforts of Federal, State, and local agencies working with the people. It served as a proving ground for the development of administrative methods suitable for adaptation to meet the differing situations in the various small watersheds which make up the drainage basin of the Tennessee.

You, Senator Hill, summarized some aspects of that program on the Senate floor in the spring of 1953 when the TVA appropriation for fiscal 1954 was under consideration.

You spoke, for example, of the tremendous importance of the unified approach to resource development, viewing the job as a total job, utilizing all resources. And you spoke also of the great importance of local participation if the development efforts were to bear lasting fruit.

Senator HILL. If I may interrupt you there, to go back and look over the record for that time, you will find that many other Senators expressed that same view and recognized that the TVA program involved the Federal Government doing all that it should do and was justified in doing, but that for total development you had to have more. You had to have the help, the cooperation, the contributions from the local people, so to speak—the cities and the municipalities and the State itself—associated together in a great joint enterprise.

Mr. WAGNER. That is correct.

## AREA PROGRAMS UNDERWAY

The program has grown since that modest beginning. Today 10 area programs are underway, and since March of this year the coordinating committee originally in charge of these activities in TVA has been succeeded by a small full-time staff. This is under the direction of Richard Kilbourne, who was formerly TVA's Director of Forestry Relations and at the same time coordinator within TVA of this program.

Now I should like to tell you in somewhat greater detail just what we do in this program, to describe the methods and processes we employ—

Senator HILL. All right, give us that picture.

Mr. WAGNER. Thank you, I will.

And I would like also to give you some examples of the problems and the accomplishments of some of the special projects that we have underway.

The local organizations involved in this program are not alike, the problems of the areas are not the same, nor is progress equal. Only the purpose is identical.

It is an effort undertaken jointly by TVA, State, and local agencies and by private individuals working together, first, to appraise the total resource base of the area and its potential for economic growth, then to undertake activities to reduce the obstacles which can be iden-

tified as limitations on its optimum development for the benefit of the people.

#### INTEGRATED DEVELOPMENT OF ALL RESOURCES

This is not solely a program of extending a system of water control to the small tributary rivers and streams of the valley, although that is part of the whole. It is not a program designed to provide emergency relief for areas of local depression. But if it is successful, it should help to provide jobs and raise incomes and to give protection against recessions of the future. Simply stated, it is an effort to apply to small, individual tributary areas, the total TVA program of integrated development of all resources. Because the areas considered are much smaller than the region, local problems become more apparent, and local opportunities are more clearly defined. The participation of local groups becomes increasingly important, and their share of the total responsibility increases.

The program is open to every area in the river basin. It is initiated in different ways. Most often a group is organized locally to achieve some particular improvement on which public attention has been focused.

#### FLOODING OF BOTTOM-LAND FARMS

In some areas, for example, the occasional and seasonal flooding of bottom-land farms has been considered a major barrier to the economic growth of the area, and a local organization might be formed to seek relief. Such a group might approach TVA with a single purpose, to obtain Federal assistance in the channel clearing or dam construction believed to be required. Other groups organize in the hope of attracting a specific industry to develop a resource believed to be available.

The problems differ. But always there is a common denominator—the desire and need for economic improvement; the feeling that their area is not realizing the full potential of its resources. They come to TVA for varied types of assistance. We explain our program to them and if they are interested, a broad cooperative program is undertaken.

#### RESOURCE BASE INVENTORY

First, TVA urges that the total, not just a fragment, of the resource base be inventoried before a decision as to the priority of activities is undertaken;

Second, we urge that the organization should include representatives of all parts of the area and of all sectors of the economy, farmers, businessmen, bankers, forest and sawmill owners, representatives of towns and villages and rural areas, of labor and employers;

#### PARTICIPATION OF STATE GOVERNMENTS

And, third, we urge the participation of the State government, for we believe that governments of the States should share increasingly in responsibility for developing the resources of the Tennessee Valley, that they should not be bypassed by an agency of the Federal Government.

As the committee knows, TVA from the beginning has sought to conduct all its programs in such a way as to strengthen State and local governments, and in this program we think it essential that State

governments, as well as local agencies, should participate fully. If for no other reason, it is in their own self-interest.

For example, analysis showed that in one area the State was spending twice as much money per capita as for the State as a whole but receiving only about half as much revenue per capita as in the rest of the State. Clearly, a State is strong only as its subareas are strong.

As I said at the beginning, the organization of these area groups differs. Some, but not all, have formal charters recognized by State legislative action.

#### ESTABLISHMENT OF WORK GROUPS

After general understanding of procedures and objectives is achieved, and agreement that appraisal should precede action is reached, work groups are normally established, each one organized to survey a major resource and the current level of its development. They analyze the problems and opportunities it presents. Water, land, forests, and the industries and related services are inventoried.

TVA offers the help of technicians in each field who work with the individual committees, prepare the inventory forms which provide the basic information, assist in the analysis and interpretation of the findings. The technician in turn is able to recommend to TVA whatever intensification of its programs are desirable to make the local activities most effective. A representative of a State agency participates. He, too, shares the responsibility for giving technical advice.

#### COORDINATION OF EXISTING STATE AGENCIES

Coordination of existing State activities in the area is sought. Through these committees and their reports to the parent association there is made available to the people the basic information about their resources from which problems and opportunities can be defined and the potential for growth appraised.

Much of the basic data is available but reported on a statewide basis, or for the great watershed as a whole. Forest inventories have been made, for example. Soils have been studied and agricultural production analyzed.

TVA itself has a vast amount of data about the water resource of the region. Records of precipitation and of stream-flow are voluminous. Rates of siltation and records of water quality are available, used by TVA in its operations, and available to technicians of State and local governments.

TVA power distributors know about the industries they serve with electricity. Transportation studies have been made by TVA. The Bureau of the Census and other agencies have collected information of various kinds.

All this material is assembled and made available to the committees which I have described. It is brought up to date and down to size, supplemented by greater detail. It is analyzed, interpreted, and discussed, related to the specific area under study. Gradually public understanding of all the resources grows, all the problems and all the opportunities. The decisions of private owners and public bodies can be made with awareness of all the alternatives available.

## "TVA ; DEMOCRACY ON THE MARCH"

In 1943 a book called "TVA ; Democracy on the March" was published. The author was Mr. Lilienthal, then Chairman of the Board of TVA. This book has much to say about the importance of local participation in total resource use efforts.

One chapter was entitled "Experts and the People." It described one advantage inherent in the statutory organization provided by Congress for TVA. Not only did specialists in various resource fields work together under a single management, they worked close to the problems, bringing scientific knowledge out of textbooks, research and experimentation, giving it to the people in a form they could understand and use.

The program I have just summarized is an illustration of one further step in this direction. Geologists, hydrologists, economists, and agronomists are called upon by Mr. Kilbourne's staff to meet with various groups. Specialists in recreation, transportation, forestry, and agriculture—in fact from all resource fields represented in TVA—are available for consultation and assistance. TVA programs are intensified to keep pace with local activities.

The resource inventories and their analyses sometimes indicate that the project or activity which the local group was first organized to promote is of less consequence than other development activities insofar as long-time economic growth is concerned. Priorities change, and in the course of study and discussion it may become apparent that the greatest impediment to local economic growth lies in the quality of education, or the lack of facilities for transportation by highway or rail in the area, or in shortages of certain resources, or limitations on credit or suitable sites for industry.

## PROBLEMS OF UNEMPLOYMENT

For example, in one of these areas the inventory showed that there was a major problem of unemployment and underemployment. Now, there were newly established industries nearby and there were jobs in those industries, but the people living in this area were not properly trained for those jobs.

The State leader of this project talked to the local people who were working in the field of vocational education, and together they went to a nearby State college and talked to the people there interested in vocational education. The college agreed to help organize a program for retraining of these unemployed people to give them the kind of background they needed to take jobs in the new industries. They agreed that they would conduct night schools for adults in the local school buildings, using the facilities that were there. And they are now engaged in talking with the managers of nearby industries to determine the specific kinds of training for these unemployed people—at the present time unemployable in the industries accessible to them—the kind of training needed to qualify them for the jobs that are there.

The story of another group—and this one organized also on a small watershed basis—further illustrates how a broadened view may alter the timing and the nature of activities undertaken.

Here, more than 10 years ago, a group of farmers under the leadership of the county judge asked TVA to dredge out the channel of their stream. They hoped to stop the damage caused by summer floods to riverbottom corn crops. The uplands, heavy producers of cotton in years gone by, had eroded away into nonproductiveness; their owners were scratching out a bare existence or had already given up and abandoned the farm.

There was very little off-farm employment in industry or otherwise. Young people were leaving the area as soon as they finished school—to look for jobs. And now the bottom lands, fertile but often overflowed by the floodwaters of a stream choked with silt from the destroyed uplands, were also failing to produce decent income.

TVA agreed to see what we could do to help. We met with local groups and with representatives of the State and undertook the kind of analyses and activities I have just described.

The people first recognized, although this took some time, that what they really wanted was more job and income opportunities; that eliminating bottom land flooding was important only as it contributed to that end; that it was only a part, probably a small one, of their total problem, and that in any case dredging the channel would be useless until something was done to stop the flow of silt which would only fill it again. So they set up work groups to tackle, with TVA and other Government agencies, a whole variety of problems.

A program of tree planting on the worst eroded lands was intensified and a market for pulpwood was found, providing cash income from trees planted in earlier years.

If I may digress for a moment, I'd like to point out how this pulpwood marketing demonstrates the tie between TVA's general valley-wide programs and these tributary area development projects.

#### PAPERMILLS

In the early 1940's TVA's foresters prepared an extensive study to show the feasibility of locating papermills in the Tennessee Valley. This is an area which grows pine trees well and fast.

Based on the findings of this report, about 1950 a paper company built, on the Hiwassee River, what is now the Nation's largest newsprint plant. This plant provided the market for pulpwood from the area I've been describing.

The pulpwood is loaded to barges at a landing on the banks of the Kentucky Reservoir, which TVA had identified and reserved for local use even before that reservoir was filled in 1944. And, of course, the barge channel created by TVA's main stream dams was used to haul the pulpwood nearly 400 miles to the mill.

Another papermill, using mostly pine, has begun operation this year near Pickwick Dam.

And now TVA has completed and released another study on the feasibility of hardwood pulpmills in the valley. This, too, in the years ahead, will help to bring continuing jobs and income to other landowners and factory workers in other tributary areas.

## TEST-DEMONSTRATION FARMS

But now to return to other activities in the tributary area I started to describe. TVA, working through the Agricultural Extension Service, established a greater number of test-demonstration farms in the area and the county agents persuaded and helped farmers to change over to diversified farming, including livestock raising.

As a result there have been several grade A dairies established in this area. Hog raising has been undertaken, and sheep and feeder calves have been introduced into the farm economy. This, with the help of concentrated TVA fertilizers, fitted into a plan for permanent pastures and cover crops to conserve and rebuild the upland soils. Cash crops, such as strawberries, were also introduced.

## ATTRACTING INDUSTRY

Meanwhile, committees were at work determining what industries the area might best support. The whole watershed has a population of only about 20,000 people. I was recently told that 4 principal towns, the largest with 4,000 people, had only 2 industries of consequence in 1953. Since then, working in the area development program they have established 11 new industries and the old ones have expanded, providing nearly 2,000 new jobs.

While many areas attract industries which employ only, or principally, women, this community's industries have a reasonable balance between male and female employment and community leaders are working for an even better balance.

The largest county, reflecting the spirit of progress and growth, has built a new court house, and a new Hill-Burton hospital. The largest city has built new school facilities and several new churches and its outskirts are bustling with new residential subdivision construction.

Ten years ago when we first undertook this program, the concern locally was for the vacant houses and the loss of people. For 10 years work has been going on in this area. There has been progress every year. Now the construction of several relatively small water control projects is a next logical step in the orderly development of this area's resources. Changed land use has reduced erosion and therefore the problem of siltation.

## EROSION CONTROL

About 25,000 acres have been planted in pine trees, and in addition, large areas have been put into permanent pasture, so that a substantial part of the area which contributed so much to the silt and added to the flooding problem has been brought under control.

There is one problem that has not been whipped yet. That is the problem which is common in this area, as it is in many others, the erosion of soil from drainage ditches and cuts and fills along roadsides. We believe we will be able, through coordination of the activities of State and local agencies in this program, to bring about changes in maintenance procedures and perhaps in construction that will help to correct that problem.

Water control projects are now recognized to be needed not just to reduce the local flood damage potential first identified as a prob-

lem, but more importantly, to provide for the further industrial growth the area requires and can reasonably expect.

An adequate year-round supply of water will support increased industrial growth. Improved recreation facilities will attract it. The channel dredging project originally proposed would, alone, clearly be inadequate in the light of present knowledge of the area's potential for economic growth.

TVA engineers have surveyed the small river. Effective design and efficient location of the structure have been determined, their cost can now be estimated, the benefits of their use appraised. They should be built. Based on TVA's research in other smaller, experimental watersheds and on careful analysis of the total cost and income situation in this watershed, it is clear that these projects will be worth more than they cost. Their contribution to long-term economic growth will be substantial.

#### DISTRIBUTION OF COSTS

We are now endeavoring to develop a method for relating the public benefits of the water control projects to the several objectives of Federal, State, and local governments and institutions in a way that will furnish a key to the proper distribution of costs among them. And we are trying further to develop a method for using some of those future dollar benefits to provide the dollars needed now to build the projects. This idea is supported in a recent publication of the National Academy of Sciences—National Research Council. It has this to say:

Cost-sharing between Federal, State, and local governments, and private owners should be in proportion to benefits, with the possibility for specific adjustments in special circumstances. Moreover, the cost-sharing should be reasonably proportionate in each time period; the Federal Government should not bear all present costs with a vague promise for future expenditures at a later date by other groups. If private owners or local government cannot share in costs from the beginning, special loans for this purpose might be granted by the Federal Government, with a definite repayment obligation established. Sound economic and technical planning, and restriction of programs to economically justifiable levels, will prevail only when those who should be beneficiaries of programs acknowledge and plan to repay their indebtedness.

This is one problem facing us, particularly on some of the larger tributary streams in the Tennessee Valley where development is feasible from the engineering point of view, where there are reasonably substantial benefits to navigation, flood control and power production, but where those benefits are not nearly great enough alone to justify the total cost of the projects. Our inability to solve the problem promptly and without consideration and study has given rise to some criticism and considerable misunderstanding in at least one watershed.

A few critics have accused TVA of "dragging its feet" in the development of tributary streams. Misled by these remarks, others have commented that "with completion of development of the main river TVA should now proceed to development of the tributaries." Questions of priority and responsibility do not lie between development of the tributaries and the main river. Tributaries have not been neglected.

## DAMS ON TRIBUTARIES

Of the 20 dams built by TVA, only 7 are on the main river; 13 already built and the single dam now under construction are on tributaries. Of the total of 31 structures which now control the river system, only 9 are on the main river; 22 are on tributaries.

There is not now, nor ever has been, any reluctance on the part of TVA to build projects on tributaries. This is clear from the record. Projects have been built at whatever location is best suited to promote the statutory objectives of the act creating TVA.

## AVAILABILITY OF LOW-COST TVA POWER

In addition, development means more than just building dams, as I have pointed out. And in TVA's many other important development programs, the tributary areas have not been neglected either. Nearly all of the Tennessee Valley has the benefits of low-cost TVA power. Its availability, for example, was a key factor in determining the location of the Arnold Engineering Development Center's wind tunnel project in the Elk River Basin and the AEC's installation at Oak Ridge in the Clinch River Basin and at Paducah.

## NEW POULTRY RAISING INDUSTRY

Midwestern grain, transported on the new barge channel on the Tennessee, has been the key to a vast new poultry-raising industry all through the Tennessee Valley and the Southeast. TVA's agricultural programs, its test-demonstration farms, its program for reforestation and better forest management have not been confined to the banks of the Tennessee River alone. They are valleywide.

New industries at Decatur and Huntsville, Ala., and in the Muscle Shoals area, while located on the banks of that main river, draw workers from many miles away—from the Elk River Basin, from Bear Creek and Yellow Creek, and from other tributary areas.

In its basic statute TVA was directed to control this river system for three major purposes: to create a channel for navigation, to control its floods and the floods below on the Ohio and the Mississippi to which the flow of the Tennessee contributed, and to generate electricity for the people in the region to use. These are the reasons why the projects were built. These are the primary Federal purposes they serve, no matter where they are located.

TVA has, however, an additional responsibility to manage all its programs in ways which realize the greatest return for regional development.

## DEVELOPMENT OF FISH AND WILDLIFE RESOURCES

From the beginning, therefore, benefits beyond the three justifying the Federal expenditures have been recognized. Experts in fish and wildlife have worked to make certain that the value of these resources should have opportunity for full development.

In our program of reservoir land disposal, we have from the beginning endeavored to make certain that space for recreation and for industrial growth is provided. Water supplies for industries and general municipal use have been improved, fishing is better—it is better, Senator Hill, except the day you and I tried our luck together.

Senator HILL. You mean the fish are biting now?

Mr. WAGNER. They are always biting when I am not there.

Wildlife refuges have been increased, and areas for recreation conveyed for development to States, counties, municipalities, and to private persons.

All these, and other benefits, have accrued because of a Federal investment in structures built to create a navigation channel, control floods, and generate electricity. They are byproducts, immensely important to regional growth. Our experience with them in reservoirs already built and operating encourages us to believe it is feasible to extend development to some of the smaller tributaries in cases where the investment would not be justified to achieve the purposes for which Federal construction is undertaken, but would be justified if Federal and local objectives were combined and joint financing arranged.

#### FINANCING MULTIPURPOSE DEVELOPMENT

It is natural that devising a new method of financing the multipurpose development of small rivers primarily for local benefits should present difficulties—legal, economic, and administrative. It is not unnatural that an occasional spokesman for a local group should prefer to strive for the assumption by the Federal Government of total responsibility. He sees that in some localities improved water supplies for municipal industrial growth have become available without investment by those localities. He sees that swimming beaches, picnic grounds, and marinas for watercraft have been added to local assets as a byproduct of a Federal program of construction undertaken primarily to accomplish other purposes. To a few, this circumstance has led to the conclusion stated by one community leader. He was quoted as follows:

Fairness demands that the people and communities in the valleys of the small rivers flowing into the Tennessee River enjoy the same benefits as those areas near the main stem of the river.

That seems to us to reflect considerable misunderstanding, not only of the differing responsibilities of, and the relationship between Federal, State, and local governments, but of the potential of tributary streams for development.

The watercourses vary and the possibility for their development is not the same. The problem and the opportunities of each one differ. We believe every river in the valley should be developed to its full economic potential. We believe it will take the combined resources of all levels of government to do it. It is not a Federal job alone.

#### ECONOMIC RETURNS FROM WATER CONTROL FACILITIES

Economic returns from Federal investment in water control facilities are calculated in a number of ways. One return rarely evaluated, however, lies in the increased capacity of State and local governments to undertake subsequent programs of water control in cooperation with the Federal Government or alone. The heavy private investment in business and industry and the income from resulting jobs, all stimulated by the Federal investment already made in this region, provide new tax resources for State and local governments. The enhancement of land values is another measure.

In the Tennessee Valley, once wornout cropland, contributing little income to the owner or in taxes to the support of public services, has been transformed to waterfront land that is extremely valuable, as industrial sites, for recreation development, and for residential use.

Even enhanced land value is not the only direct result to the Federal program, of course. There are other illustrations.

#### SALE OF FISHING LICENSES

In one State, for example, the sale of fishing licenses brought nearly \$1,700,000 last year, a fifteenfold increase over the income reported in 1935. In the same period, sale of out-of-State fishing licenses increased nearly 200-fold.

The increased opportunity for fishing is the result of the Federal investment in water control.

#### REVENUES FROM VISITORS

States in the Tennessee Valley tax gasoline sales. Last year, TVA projects attracted more than 10 million visitors. We estimate that about one-third of them are from nonvalley States. No estimate can be made of the revenues derived by the States from the expenditures of these visitors, but it must have been considerable.

We believe that this increase in revenues available to local and State governments is one measure of the soundness of the Federal program. It has helped them to accept an increasing share of the total responsibility. We believe it may enable them to participate with TVA in developing those small tributaries where it can be demonstrated that economic growth will result.

We are going to continue to work on the problem.

In one watershed two or three members of the work groups now engaged in analyzing various problems and planning their solutions are members of the State legislature. This participation will, we believe, certainly add to their understanding of the problems.

In another State of the valley, the Governor has already initiated a study of the question of State participation.

Our efforts will continue, and be intensified, in the areas where the people are willing to join in the enterprise, where all that remains is to develop a reasonable framework within which the work can begin.

Senator HILL. Senator Dworshak, you have to leave in a few minutes. Do you have any questions?

Senator DWORSHAK. The Interior Committee is holding an important meeting, and I just stepped out a few minutes. May I just ask a few questions on behalf of one of our colleagues on the Appropriations Committee?

#### REHABILITATION OF LOCK AT WHEELER DAM

General Vogel, in the budget request we have from the White House, there is a request for \$7 million for—

expeditions rehabilitation of the navigation lock at Wheeler Dam on the Tennessee River in Alabama. This lock is now inoperative due to failure on June 2, 1961, of the landward lock wall.

What was responsible for the failure of that lock?

Mr. VOGEL. We have extensive engineering investigations underway in this connection, Senator. We have employed a board of consultants. Extensive tests have been made of the foundations.

It would appear that the principal fault lies with the underlying shale strata. In order to pin this down specifically and be sure of the actual basic facts, we are now conducting some field experiments, and we will have better information in a short time.

Senator DWORSHAK. Who constructed the lock, the TVA or the Army Engineers?

Mr. VOGEL. It was built by the Corps of Engineers, sir.

Senator DWORSHAK. And how many years ago was it built?

Mr. VOGEL. It was completed in 1935.

Senator DWORSHAK. At that time was there not some kind of a lock in use which was eliminated at the time?

Mr. VOGEL. This lock was built for use in conjunction with Wheeler Dam. During its construction—as plans matured—a larger, higher lock was decided upon and some changes were accordingly made as the work proceeded.

Senator DWORSHAK. There was no lock in that vicinity prior to the building of this landward lock?

Mr. VOGEL. The term "landward" Senator, refers specifically to a wall of the lock.

I might add in this connection that investigations have revealed weaknesses in both of the walls and the river wall also will have to be replaced. I am sure it can be safely stated that under these conditions the lock would have had to be completely rebuilt anyway.

Senator DWORSHAK. It was my impression—you say 1935 when this lock was constructed there was a previous structure of some kind?

Mr. VOGEL. No, sir, not at this specific site.

NOTE: There were two small locks at the upper end of the Muscle Shoals Canal at the time Wheeler lock was started. These were built by the Federal Government between 1875 and 1890 as a part of a canal development bypassing Muscle Shoals and Elk River Shoals. Wheeler lock replaced these two structures.

Senator DWORSHAK. And this lock has been in operation for more than 20 years?

Mr. VOGEL. More than 25 years.

Senator DWORSHAK. And it failed on June 2, 1961?

Mr. VOGEL. Yes, sir.

#### REPORT OF INVESTIGATING BOARD

Senator DWORSHAK. And before you expend this \$7 million, will you await the report of the investigating Board so you will—

Mr. VOGEL. We already have some money available, Senator, in connection with a new lock which is being constructed next to the old one in order to help take care of growing traffic needs. That money is available to proceed on either or both of these locks until the money now being requested is available.

Senator DWORSHAK. You do not have to wait this report, then, of the Board?

Mr. VOGEL. No, sir.

We will, of course, need the additional money in this fiscal year, before the year is out.

Senator DWORSHAK. Will not the expenditures of that amount depend to some extent on what kind of a report is made by the Board?

Mr. VOGEL. Not at the present stage of the work. But the lock will have to be rebuilt and we think what we have requested is approximately what will be needed.

Senator DWORSHAK. Then what is the prime purpose of having the Board make an investigation so that you will not make the same mistake twice?

Mr. VOGEL. I think that is a very important reason, sir.

Senator DWORSHAK. You made a mistake; I am assuming that.

Senator KEFAUVER. If the Senator will yield, the TVA did not make the mistake.

Senator DWORSHAK. I did not mean him personally.

Senator KEFAUVER. The organization did not build the first lock.

Mr. VOGEL. In any case, we all want to know what should be done to eliminate mistakes of the past, if any were made.

Senator DWORSHAK. That is logical.

I was not blaming anyone, Senator Kefauver; I was merely questioning the chairman as to whether any specific information had been made available for guidance of the Board in its future planning at that particular point.

Mr. VOGEL. We hope that this experience will be also of assistance in the advancement of scientific knowledge.

Senator KEFAUVER. May I say, I thought your question implied that TVA built the first lock. It was not built by the TVA.

Senator DWORSHAK. I asked him, and he said the Army Engineer Corps built it.

Senator HILL. We have had a rollcall from the Senate. We will stand in recess for a few minutes.

(Whereupon, a recess was taken.)

Senator HILL. The subcommittee will be in order.

General, you gave us a splendid summation of your budget, the items in the budget and the need for those items, and we have had a splendid presentation of a fine program of tributary development by Mr. Wagner.

I wonder if one of you gentlemen or some member of your staff might give us a summarization—a picture of your fertilizer operations?

#### TRIBUTARY DEVELOPMENTS

Senator KEFAUVER. Mr. Chairman, I wanted to ask some questions about the tributary developments, unless you want to come back to it later.

Senator HILL. No; you might as well go ahead right now.

Senator KEFAUVER. I know that the members of the Board are greatly concerned and interested in connection with the development of the tributaries of the Tennessee, and the local people and the States and counties are very interested, as evidenced by the fact that associations have been formed. We have recited some of the steps that have been taken. I know that you have been doing a lot in connection with the tributaries, and that you have plans for the future, but, frankly, I have been fearful that the job is not going to get done as expeditiously as it should under the plan that you are now following.

In the first place, I always felt that the TVA Act gave you the responsibility of at least taking the lead in the development of navigation, flood control, power, and general resource development in the valley, and traditionally these things have been a Federal project of the TVA.

I am sure the local authorities, the State, the counties, and the cities, want to do what they can. But the trouble is that rivers go through some counties, some States, some towns, that to work out a coordinated and effective plan would seem very difficult, and would seem to have the possibility of greatly hindering many things from being done that ought to be done.

Furthermore, you say that some of them may not have sufficient promise of profit at the present time to warrant exclusive development by the TVA. But as time goes on and the section develops, their benefit-cost ratio would increase, I would think.

So I would hope that unless you feel quite sure that your program is going to bring about these developments expeditiously, you might reconsider your responsibility in connection with it.

Mr. VOGEL. Senator, I think Mr. Wagner, who discussed this whole program at some length, covered many of the points which you have raised. Unfortunately, I do not think you were in the room at the time.

Senator KEFAUVER. I did not get to hear all the discussion.

Mr. VOGEL. But it is clear, I am sure, that TVA has taken a very definite lead in connection with the development of the tributaries.

We regard our mission as one which relates to the development of the entire Tennessee River Valley and all its resources. The tributary areas are a part. These areas have profited as a result of what has been done up to this point.

#### DEVELOPMENT OF VALLEY IMPROVEMENT ASSOCIATIONS

It is true, I think, of any large undertaking such as we are discussing that as you accomplish first the things which are most important and most dramatic, it becomes a little more difficult to gain understanding of the necessity to give careful attention to the further development of all the resources. And it is for this reason that we have ourselves encouraged the development of these tributary area associations of which there are now quite a number.

We think this is healthy, because it stimulates the interest of the people themselves; it creates a broader interest in the utilization of all the resources.

I have said before that were we to develop the river in its entirety for navigation, were we to free the adjoining lands from the ravages of floods, were we to provide power in any degree possible, all this would be to no avail if the people themselves did not make use of it, if they did not find ways in which to use these developed resources.

So this is moving in the right direction, I am sure.

## BASIC LEGISLATION

Senator KEFAUVER. Let me say in that connection, General Vogel, if I may interrupt, that all through the TVA Act, wherever the Tennessee River is mentioned, it says "and its tributaries."

Take, for instance, in section 3(j)—

to promote navigation on the Tennessee River and its tributaries, flood control on the Tennessee River and its tributaries, transmission lines—

and so forth—

on the Tennessee River and its tributaries.

If you had this concept in the beginning before you built Chickamauga Dam or Norris Dam or any of the great dams that have been built that have meant so much to the Nation and to the defense of our country, had there not been some joint arrangements worked out between Alabama, Tennessee, and Mississippi, Hamilton County, Meigs County, and Chattanooga and Knoxville, nothing would ever have been done.

Mr. VOGEL. I do not think this is an issue, Senator.

The valley associations of which we have both spoken go completely across political boundaries. They are organized for the welfare of the areas which they represent. This gives us groups with which to talk, with which to work, with which to advise, and whom we can assist in making the best use of the resources available to them.

Surely we are well aware that the tributaries of the Tennessee and the areas drained by them are part of the entire overall Tennessee Basin. This is what we have worked with over the years.

Senator KEFAUVER. And yet you are applying different criteria to the development of the tributaries than you are for the Tennessee River?

Mr. VOGEL. I do not think we are, Senator.

The criteria are exactly the same. But we are trying to find better and newer methods which will enable us to go further than has been possible in the past under existing methods.

Senator KEFAUVER. What I mean by different criteria is that you did not and should not have waited until the State of Tennessee and Anderson County agreed to acquire the land or do certain other things before starting Melton Hill Dam. And yet I understand that on the tributaries you are putting as a condition precedent the doing of certain things by the local authorities themselves.

Mr. WAGNER. Senator, Melton Hill Dam is on one of the tributaries.

Senator KEFAUVER. Well, let's take Norris Dam.

Mr. WAGNER. All right, Norris Dam is on a tributary too, but my point is this: that the act does instruct us to develop the Tennessee River and its tributaries. And of the 20 dams the TVA has built, only 7 are on the main stream, 13 are on the tributaries, and the one under construction now is on a tributary. So the tributaries have not been neglected.

I think the point is that the act also instructed us to build dams for purposes of navigation, flood control, and power production.

Wherever we have been able to find a dam which contributed to those purposes in sufficient amount to justify its construction, we have built it. But we are talking now about dams where the benefits for these Federal purposes specified in the TVA Act fall far short of justifying the kind of expenditures that would be required to build them.

And instead of saying, let's not build those dams at all, let's turn our backs on this particular area, we are saying let's see if there is not a way that we can find to combine the resources and the interests and the objectives of the Federal Government, the local government, the State government, to build these projects.

It is this program in which we are engaged that I described at some length. We believe that this is an opportunity for TVA to again demonstrate something new in the field of water resource development, to demonstrate a way to build a project that will serve the people in the area where it exists which could not have been built through the normal procedures of justifying and building dams. This is the kind of a problem we are talking about.

I think that the TVA Board from the beginning has not neglected the tributaries.

I would point out to you, for example, that Norris Dam, the first dam we finished, is on the Clinch and Powell Rivers, tributaries to the Tennessee.

Senator KEFAUVER. I know that. I am talking about the new projects.

Mr. WAGNER. I believe they are all about the same age. You are talking about additional projects?

#### NEED FOR LEADERSHIP

Senator KEFAUVER. I am talking about additional projects.

Let me make it clear—of course, whichever way it is going to be done, I am all for it. But I think that the act does give you a leading responsibility, as you admit. And the second thing is that I am very fearful that unless you go on and take the lead in doing these things, it is going to be a long time before they are done.

Mr. WAGNER. To take the lead in doing these things is precisely what we are proposing in this program.

Senator KEFAUVER. Well, take the chief responsibility. I know the Corps of Engineers does have a method whereby, if a project does not quite come up to the benefit-cost ratio, they make some provision for local people to assume some part of the expense, usually small, like the acquisition of rights-of-way or something of that kind.

## NEW APPROACH TO APPRAISAL OF PROPOSED PROJECTS

Mr. WAGNER. We would like to approach this a little differently than by the traditional cost-benefit ratio. We would like to satisfy ourselves, when we approach one of these projects—in studies made jointly with other agencies that might be concerned—that all of the good to come from one of these projects over a period of time, to whomsoever this good may redound, is more than enough to justify the cost of the project.

Now, you can call it cost-benefit ratio or economic justification, but we do not think it should be a question of saying, "Can you squeeze another \$10,000 worth of benefits out of this?" We think it is a question of fair appraisal of the benefits of a project; then seeing what it costs and comparing the two; and after that has been done, it is a job of trying to decide where these benefits fall, whether they are in line with Federal responsibility, State responsibility, or local responsibility. If we can get agreement among all the groups that we are talking with as to where they fall, then we would like to tackle the question of how to raise the money that is directly related to these benefits.

This, I say, has been a part of TVA's thinking from the very beginning. It is referred to in general terms, in reports of the first Board of Directors of TVA. It is referred to again in Mr. Lillienthal's book. The principle is reiterated in a publication this year of the National Research Council of the National Academy of Sciences. We believe this is a great new opportunity.

## TOTAL FUNDS FOR TRIBUTARY DEVELOPMENT

Senator KEFAUVER. I asked you informally a little while ago the total that you have for tributary development, and I believe they total \$408,000 in rough terms.

Mr. WAGNER. My figure was incorrect. I was speaking from memory. It is \$628,000.

Senator KEFAUVER. Is that going to be sufficient to start into construction in conjunction with benefits applied locally or not?

Mr. WAGNER. There are no construction funds included in those figures. But I can assure you that when and if we find projects where we believe we can come to you conscientiously asking for Federal funds to make our contribution, we will be in here asking for those funds.

## LOCAL ASSOCIATIONS

Senator KEFAUVER. We do have these associations like the Tennessee Tributary Association, the Elk River Association, and others that are trying mighty hard to work in cooperation with you to get some of these projects underway that you have been working on jointly. Every time I go to Tennessee I meet with these people, and they continue their enthusiasm, but they do not feel that very much progress is being made.

Mr. VOGEL. We think they are doing a splendid job, Senator. I think we should recall, however, that they have been in existence for a very, very short period of time. And obviously Rome was not built in a day.

And as has been pointed out, there must be established a base upon which we can conscientiously proceed. This we are establishing, I think, with considerable rapidity. We are examining the benefits that we can anticipate. And as you realize surely, these benefits can take many different forms. They will not all be in the categories that Mr. Wagner has mentioned as described in the act, the principal ones being navigation, flood control, and power.

And so we are reaching for the others. We believe that there are other things to be found. How we are going to put them together is a question. We have a problem there, but we have solved many problems in the past, and I am sure that this one is not insuperable.

## MULTIPLICITY OF AUTHORITIES

Senator KEFAUVER. I appreciate your giving this assurance about it. I have just been concerned that with the multiplicity of authorities and governments and interests that you have to deal with, it is going to be very difficult to work out.

Mr. VOGEL. Fortunately, we have well established relations in the valley with local governments, with the local bodies and with the State bodies so that we can work together very rapidly. I know that the matter of cooperation with State and local bodies is something in which we have vast experience.

Senator KEFAUVER. In connection with tributaries, is there any present program with reference to the Little Tennessee where it flows into the Big Tennessee at Lenoir City?

## EXTENSION OF DAM AT FORT LOUDOUN

Mr. VOGEL. We have a study underway on that at the present time, in connection with the extension of the dam at Fort Loudoun.

Senator KEFAUVER. How long will that study be continued?

Mr. VOGEL. The General Manager has indicated that it will be completed during this coming year. We will have something to say to you at a subsequent hearing about that.

Senator KEFAUVER. That is near my hometown. I have been very much interested in that small river.

Mr. VOGEL. I realize that.

Senator KEFAUVER. Thank you, Mr. Chairman.

Senator HILL. General, as I say, you and Mr. Wagner both made splendid and most informative presentations here which are very much appreciated. Your summary tables will be placed in the record, for our information.

(The information referred to follows:)



Summary of budget financed from appropriations (for fiscal years ending June 30, 1960, 1961, and 1962)

	1960 actual	1961 estimate	1962 estimate
ACQUISITION OF ASSETS			
Navigation, flood control, and power program:			
Multipurpose dam:			
Melton Hill Dam and Reservoir.....	\$148,900	\$4,024,000	\$7,854,000
Navigation facilities:			
New lock at Wheeler Dam.....	188,709	4,000,000	8,944,000
New lock at Guntersville Dam.....	2,324,351	20,000	200,000
New lock at Wilson Dam.....	46,278	1,427,000	303,000
Other navigation facilities.....	114,572	5,000	3,000
Flood control facilities.....		122,000	
Power supply facilities:			
Kingston Steam Plant units 1-9.....	1,951,646	761,000	1,226,000
Additions and improvements at existing multiple-use facilities.....	544,982	1,220,000	96,000
Investigations for future facilities.....	170,294	85,000	277,000
Distribution of administrative and general expenses.....	202,502	217,000	
Total navigation, flood control, and power program.....	\$5,702,234	\$11,884,000	\$18,909,000
Fertilizer, agricultural, and munitions program:			
Chemical facilities.....	910,327	2,157,000	3,137,000
Distribution of administrative and general expenses.....	25,403	35,000	35,000
Total fertilizer, agricultural, and munitions program.....	944,730	2,192,000	3,172,000
General service activities:			
General facilities.....	1,519,629	168,303	1,534,000
Distribution of administrative and general expenses.....	6,096	15,000	15,000
Total general service activities.....	1,525,725	183,303	1,549,000
Total acquisition of assets.....	\$8,172,689	\$14,259,303	\$23,680,000

EXPENSES

Navigation, flood control, and power program:

Navigation operations.....	292,866	336,000	353,000
Flood control operations.....	328,305	379,000	376,000
Multiple purpose reservoir operations.....	2,509,273	2,819,000	2,812,000
Topographic mapping.....	198,107	177,000	134,000
Distribution of administrative and general expenses.....	228,928	245,000	245,000
<b>Total navigation, flood control, and power program.....</b>	<b>3,557,469</b>	<b>3,956,000</b>	<b>3,920,000</b>

Fertilizer, agricultural, and munitions program:

Fertilizer, agricultural, and munitions program.....	3,143,198	3,459,000	3,596,000
Distribution of administrative and general expenses.....	117,869	130,000	130,000
<b>Total fertilizer, agricultural, and munitions program.....</b>	<b>3,261,067</b>	<b>3,589,000</b>	<b>3,726,000</b>

Watershed protection and improvement program:

Watershed protection and improvement.....	1,049,286	1,211,000	1,336,000
Distribution of administrative and general expenses.....	68,079	75,000	75,000
<b>Total watershed protection and improvement program.....</b>	<b>1,117,365</b>	<b>1,286,000</b>	<b>1,411,000</b>

General service activities:

Maintenance of bridges financed by others on TVA dams.....			10,000
<b>Total expenses.....</b>			<b>9,067,000</b>

INVENTORIES AND PROPERTY TRANSFERS

General service activities:			
General inventories.....	10,319		
Property transfers.....	-2,717		
<b>Total inventories and property transfers.....</b>	<b>7,602</b>		

Total budget financed from appropriations.....

	16,122,506	23,099,303	32,697,000
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FINANCING

Appropriation.....	14,903,850	20,520,000	31,203,000
Balance brought forward.....	5,291,959	4,073,303	1,494,000
Balance carried forward.....	-4,073,303	-1,494,000	
<b>Total financing.....</b>	<b>16,122,506</b>	<b>23,099,303</b>	<b>32,697,000</b>

## SUPPLEMENTAL ESTIMATES

[H. Doc. 129]

## TENNESSEE VALLEY AUTHORITY

Budget page	Heading	Original estimate	Revised estimate	Increase
209	Payment to Tennessee Valley Authority fund.....	\$29,703,000	\$31,203,000	\$1,500,000

This amendment is to provide funds for additional construction in 1962 on the navigation lock at Wheeler Dam, Ala., so as to achieve a more efficient and economical work schedule.

[H. Doc. 210]

## TENNESSEE VALLEY AUTHORITY

## PAYMENT TO TENNESSEE VALLEY AUTHORITY FUND

"For an additional amount for 'Payment to Tennessee Valley Authority fund', \$7,000,000, to remain available until expended."

This proposed supplemental appropriation is to provide for the expeditious rehabilitation of the navigation lock at Wheeler Dam on the Tennessee River in Alabama. This lock is now inoperative due to failure on June 2, 1961, of the landward lock wall. National defense (including the space program) and economic considerations make it imperative that the lock be returned to service on the earliest possible date.

Summary of budget financed from power proceeds (for fiscal years ending June 30, 1960, 1961, and 1962)

	1960 actual	1961 estimate	1962 estimate
ACQUISITION OF ASSETS			
Navigation, flood control, and power program:			
Multipurpose dam: Melton Hill Dam and Reservoir.....		\$3,030,000	\$8,408,000
Power supply facilities:			
Kingston steamplant units 1-9.....	\$9,895	9,000	
Gallatin steamplant units 3-4.....	1,307,260		
Johnsonville steamplant units 7-10.....	2,406,891		
Widows Creek steamplant unit 7.....	38,406,205	6,230,000	
Widows Creek steamplant unit 8.....	337,386	12,500,000	25,553,000
Colbert steamplant unit 5.....	8,204,761	32,146,000	22,937,000
Paradise steamplant units 1-2.....	6,331,116	46,858,000	84,777,000
Eastern area steamplant unit 1.....			12,068,000
Wilson hydro units 19-21.....	8,477,075	9,858,000	2,273,000
Wheeler hydro units 9-11.....	1,397,162	8,794,000	8,446,000
Transmission system facilities.....	26,122,437	26,000,000	30,000,000
Coal land and rights.....	128,163	1,700,000	300,000
Additions and improvements at existing power facilities.....	1,664,684	2,068,000	1,466,000
Investigations for future facilities:			
Current.....	94,361	273,000	229,000
Reclassification of prior years' costs.....	-53,621		
Distribution of administrative and general expenses.....	1,706,301	1,787,000	1,812,000
Total acquisition of assets.....	96,540,076	151,253,000	198,269,000
EXPENSES			
Navigation, flood control, and power program:			
Power operations.....	139,062,487	143,776,000	154,519,000
Allocation of multipurpose reservoir operations.....	1,678,144	1,890,000	1,884,000
Distribution of administrative and general expenses.....	2,355,640	2,530,000	2,530,000
Total expenses.....	143,096,271	148,196,000	158,933,000
INVENTORIES AND DEBT DISCOUNTS			
Navigation, flood control, and power program:			
Power inventories.....	982,850	-2,036,000	-2,245,000
Amortization of discount on borrowings.....		-7,000	-12,000
Total inventories and debt discounts.....	982,850	-2,043,000	-2,257,000
Total budget financed from power proceeds.....	240,619,197	297,406,000	354,945,000
FINANCING			
Balance brought forward.....	48,554,289	51,651,593	7,025,593
Proceeds from borrowings.....		49,708,000	140,000,000
Current proceeds:			
Power operations.....	242,898,482	253,531,000	273,710,000
Sale of retired plant and other miscellaneous receipts.....	818,019	973,000	720,000
Total current proceeds.....	243,716,501	254,504,000	274,430,000
Payments to Treasury:			
Reduction of appropriation investment.....		-10,000,000	-10,000,000
Dividend (return on appropriation investment).....		-41,432,000	-40,000,000
Total payments to Treasury.....		-51,432,000	-50,000,000
Balance carried forward.....	-51,651,593	-7,025,593	-16,510,593
Total financing.....	240,619,197	297,406,000	354,945,000

Summary of budget financed from nonpower proceeds (for fiscal years ending June 30, 1960, 1961, and 1962)

	1960 actual	1961 estimate	1962 estimate
EXPENSES			
Navigation, flood control, and power program: Multipurpose reservoir operations.....	\$293,139	\$279,000	\$296,000
Fertilizer, agricultural, and munitions program:			
Fertilizer, agricultural, and munitions development.....	17,311,058	19,752,000	20,284,000
Distribution of administrative and general expenses.....	407,968	435,000	435,000
Total fertilizer, agricultural, and munitions program.....	17,719,026	20,187,000	20,719,000
General service activities:			
Reimbursable services.....	3,924,137	4,896,000	6,458,000
Distribution of administrative and general expenses.....	66,574	65,000	65,000
Total general service activities.....	3,990,711	4,961,000	6,523,000
Total expenses.....	22,002,876	25,427,000	27,538,000
INVENTORIES			
Fertilizer, agricultural, and munitions program: Chemical inventories.....	251,080	185,000	-----
Total budget financed from nonpower proceeds.....	22,253,956	25,612,000	27,538,000
FINANCING			
Balance brought forward.....	3,238,140	3,383,433	3,685,433
Current proceeds:			
Navigation operations.....	6,073	7,000	7,000
Multipurpose reservoir operations.....	293,139	279,000	296,000
Fertilizer, agricultural, and munitions development.....	17,139,720	20,051,000	20,582,000
Watershed protection and improvement.....	77,566	49,000	45,000
Reimbursable services.....	3,990,711	4,961,000	6,523,000
Sale of retired plant and other miscellaneous receipts.....	892,040	567,000	508,000
Total current proceeds.....	22,399,249	25,914,000	27,961,000
Balance carried forward.....	-3,383,433	-3,685,433	-4,108,433
Total financing.....	22,253,956	25,612,000	27,538,000

FERTILIZER OPERATIONS

Senator HILL. I wonder if now we might have either one of you, or whoever you think best, to give us a summary picture, so to speak, of our fertilizer operations and what has been accomplished and what we are doing today.

Mr. VOGEL. Senator, we have here, as I indicated earlier, Dr. Lewis Nelson, who has been with us a relatively short period of time and who came to us from the Department of Agriculture. He has done a very fine job in coordinating our activities in agriculture and fertilizer development. I believe that it would be worthwhile for you to listen to him.

Senator HILL. All right, Doctor we are glad to have you. You may proceed in your own way.

Mr. NELSON. I would like to tell you about the status of projects that we have on the drawing boards, on new chemical fertilizers we are working on at the present time, and some of our hopes about them.

NEW CHEMICAL COMPOUND—OXAMIDE

We are working on a nitrogen compound that is known as oxamide. Presently about 50 percent of the nitrogen in the soil is lost through volatilization in the atmosphere, or through leaching out of the soil,

or through the plants taking it up too soon. This new compound is almost the perfect nitrogen fertilizer.

Senator KEFAUVER. What is the name of it?

Mr. NELSON. Oxamide.

Senator KEFAUVER. What does that mean?

Mr. NELSON. The chemical compound of it is  $\text{CONH}_2$ , taken twice.

Senator KEFAUVER. I have tried to learn a lot about drugs, but I don't know as much about chemicals generally.

Senator HILL. Aren't some drugs chemicals?

Go ahead, Doctor.

Mr. NELSON. This compound has a unique chemical property, in that when it is finely ground it is just as soluble as ammonium nitrate. As you increase the size of particles it becomes less and less soluble. We think that there is good evidence that this compound in large particles might stay available in the soil and release nitrogen over a period of 2 or 3 years. You can see what a benefit that would be to farming.

Senator HILL. How long have you had this?

Mr. NELSON. We have been working on it intensively during the last year, but we started looking at it a little over 2 years ago.

Senator HILL. How long have you felt that it is a feasible fertilizer to use?

Mr. NELSON. We can't say at the moment that it is feasible because it depends upon the manufacturing process. In the case of fertilizer chemicals we have to have processes so that we can manufacture a fertilizer cheaply and within the range of what the farmer can pay and the range of what his choice between it and other products would be. The manufacturing cost of oxamide would have to be fairly close to that of present nitrogen fertilizers. We are testing to find an economical process. We are devoting a great part of our fundamental research effort to find a new process, a cheap process to produce oxamide. It looks very encouraging.

#### SEARCH FOR NONEXPLOSIVE AMMONIUM NITRATE

Another thing that we are working on is to try to find a nonexplodable ammonium nitrate. You are all acquainted with the hazards of ammonium nitrate. There is some hope that we may find a way to make ammonium nitrate nonexplodable for agricultural use.

Senator KEFAUVER. How are you getting along with that project?

Mr. NELSON. We know that certain compounds and certain chemicals will inhibit the explodability of ammonium nitrate, it is a matter of getting the right combination.

#### RESEARCH EFFORTS TO TAKE OXYGEN FROM FERTILIZER

Now, a most exciting current investigation is our research efforts to take the oxygen out of fertilizer. In the early days, fertilizers with a very low analysis were filled with lime filler, sandstone, and other things. We got rid of those through the introduction and demonstration of high analysis fertilizers.

There was much gypsum in phosphate fertilizers, and that has been pretty well eliminated in our high analysis goods. Now about the only other element in fertilizer that adds to bulk and weight is the

oxygen in the chemical compound. It makes no difference to the plants whether the oxygen is in the fertilizer. We have been able to produce some nitrogen and phosphorous compounds that have 150 percent plant food, based on the ordinary way it is reported today.

If this proves feasible, we have made a tremendous advance, because of the savings in the shipping costs, transportation, handling, and bagging, through the elimination of materials not useful to growing plants.

#### DEMONSTRATION PLANT FOR AMMONIUM PHOSPHATE

We have mentioned that we plan to build a small-scale demonstration plant for ammonium polyphosphate. This will be an unusually high analysis fertilizer material. It will be a 16-61-0 formulation, in other words, 77 percent plant food. It is made possible by our discovery a few years ago of superphosphoric acid, a very high analysis phosphoric acid. This superphosphoric acid has another unusual property beside its high analysis. We call it the "sequestering" effect. It will keep iron, aluminum, and certain minor elements in solution that are very valuable for plant growth. This will undoubtedly have a tremendous role in the liquid fertilizer market, because they want clear material without any precipitants of any kind in them.

(Recess.)

Senator HILL. You may continue, Doctor.

#### PAN GRANULATOR

Mr. NELSON. I was starting to mention the pan granulator which General Vogel talked about briefly. This offers a tremendous potential to the fertilizer industry, we feel. It is not entirely a new idea. Pan granulators are used by the drug industry. These are small rotating pans in which they make pills. As far as we know, this process has never been used in the fertilizer industry. With it we can come up with perfectly sized granules that have uniform chemical composition. The process appears to be much cheaper than other processes now used, besides producing higher quality material. We feel that the operating costs will be lower than those of conventional processes. We feel that we can save up to a quarter of a million dollars a year in our own plant by installing this process. It will have a significant demonstration value to the fertilizer industry. We are particularly anxious to get underway, because there is quite an upward trend in new commercial fertilizer plants planned. The easiest time to incorporate a new process is at the time the plant is being built. That is another reason why we are so interested in the pan granulation process.

Mr. VOGEL. I might add that in industry at the present time fertilizer is pelletized by the use of expensive prilling towers. This has largely limited conventional processes to the big companies. The smaller ones cannot get into it as readily. The TVA pan granulator would provide a method which would be usable by almost anybody.

Senator HILL. Dr. Nelson, Senator Stennis had to go out. Just tell him what you said.

Senator STENNIS. I would be very interested, but I wouldn't want to take up the committee's time.

Mr. NELSON. I was describing an adaptation to fertilizer manufacture of a granulating process that is used by the drug companies in making pills. As far as we know it has not been used anywhere in the fertilizer industry. Our pilot plant studies show that it works well on fertilizers, and produces a product with highly uniform chemical and physical qualities. It appears to be a much cheaper process than those usually employed. We feel that it would save us roughly a quarter of a million dollars a year over the operation of our present facilities.

Senator STENNIS. How would that figure out in pounds of production of the fertilizer itself, or tons?

Mr. NELSON. Our basic plant capacity would not be changed. The cost per ton of product would be lowered some. I don't have those figures immediately available.

Mr. VOGEL. The result should be a lower cost product from industry.

Senator STENNIS. That is what I mean, you feed that into industry, and it is a better method—

Mr. NELSON. It should result without question, it seems to us, in lowering the cost of fertilizer to the farmers.

Senator HILL. Of course, you are not in the commercial fertilizer business, yours is research and demonstration, correct?

Mr. NELSON. Yes.

Senator STENNIS. You said that that is fed to industry.

Mr. NELSON. That is right.

#### USE OF TVA PATENTS BY INDUSTRY

Senator STENNIS. I notice that the chairman said "to date 184 fertilizer manufacturers have been licensed to use royalty free patents on fertilizer process developed by TVA." That is a very remarkable achievement. They do use them extensively, do they?

Mr. VOGEL. They certainly do.

Senator STENNIS. I know sometimes, Mr. Chairman, we have new fertilizers come on the market, and the companies contribute to them. But after all, the main process goes back to the research and experimentation that the Agriculture Department has carried out. And this is another illustration of it, now, and TVA carries on its research and feeds it into the channel, which is remarkably good work, I think.

Senator KEFAUVER. Some of the fine new fertilizers of today were researched and developed and patent-secured by the Tennessee Valley Authority's operations there, isn't that true?

Mr. VOGEL. That is correct. Our objective is continually to develop products of higher quality in order that a better product may be available to the farmer at lower cost.

Senator KEFAUVER. I think you do a tremendously great job.

#### USE OF GRANULATOR BY SMALLER MANUFACTURERS

Do I understand, Dr. Nelson, that you say that this new proposal will enable smaller manufacturers to efficiently get into business?

Mr. NELSON. Yes, that is our expectation.

Senator KEFAUVER. Or General Vogel said so.

How do you explain that?

Mr. NELSON. There will be less cost for equipment.

Senator KEFAUVER. The equipment is not as expensive?

Mr. NELSON. Our ammoniator-granulator, for which 119 licenses have been issued for use in 154 plants, is a good example. This helped fertilizer manufacturers to develop certain types of fertilizers with a lower cost of equipment, and it is very widely used.

Senator HILL. Those 154 plants are all privately owned and operated plants, aren't they?

Mr. NELSON. Yes, of industry, or cooperatives.

Senator KEFAUVER. And they have the right to use your development and your patent—it is in the public domain?

Mr. NELSON. Yes, a license is issued to them royalty-free.

Mr. VOGEL. It is our policy, Senator, as I am sure you know to issue nonexclusive royalty-free licenses on all our patents.

Senator KEFAUVER. Yes.

#### CREATION OF NEW MARKETS FOR INDUSTRY

Senator HILL. Through your demonstration process you are testing the fertilizer, and you also show the farmer what he can do on particular areas with that fertilizer, and therefore you create a market for private industry, don't you?

Mr. NELSON. Yes, I am certain that it creates a demand for new fertilizers. In that respect we have completely revised our test demonstration program in the last year. We had made studies in previous years in cooperation with the Extension Services of the several States to see what we could do to make our demonstrations more effective in the valley States. As a result we have a new program which is now being started. I am sure it will be an increasingly effective program.

#### OPERATION OF DEMONSTRATION PLANTS IN OTHER STATES

Senator HILL. But you also operate in a few of the States outside the valley States.

Mr. NELSON. Yes.

Senator HILL. I believe you said about 40 States.

Mr. VOGEL. Yes; of which 31 are in the test demonstration program.

Senator STENNIS. That is a demonstration?

Mr. NELSON. Demonstrations.

Senator HILL. Do you want to add something, General?

Mr. VOGEL. I think that covers it quite well. We certainly are not limited to the valley in this work, and the Nation as a whole, we feel, profits thereby. We are even extending our knowledge into the new State of Hawaii.

Senator STENNIS. It seems to me like a list of those States for the record would be of interest to the Senators from States in other parts of the country.

Mr. VOGEL. We will supply such a list.

(The list referred to follows:)

STATES PARTICIPATING IN FARM TEST DEMONSTRATIONS OF TVA FERTILIZERS—  
SEPTEMBER 8, 1961

Alabama	Michigan	Pennsylvania
Arizona	Minnesota	South Carolina
Colorado	Mississippi	South Dakota
Georgia	Missouri	Tennessee
Idaho	Nebraska	Texas
Illinois	Nevada	Utah
Indiana	North Carolina	Virginia
Iowa	North Dakota	Washington
Kansas	Ohio	Wisconsin
Kentucky	Oklahoma	
Maine	Oregon	

## FORESTRY PROGRAM

Senator STENNIS. If there is nothing else on that, may I ask a question about the forestry program?

Senator HILL. Go right ahead.

Senator STENNIS. I just wanted to mention the forestry program. I am fairly familiar with some of the things that you have done. You have helped blaze the trail and have done a lot of pioneer work, and the fruits of it are already flowing, as I see, in various ways. What is the main part of the program you are emphasizing now? Are you still emphasizing the seedlings?

Mr. VOGEL. No, we are not emphasizing the seedlings, because we have found that the States now have moved into that field.

Senator STENNIS. What is your main function now in the forestry program?

## FERTILIZATION AS APPLIED TO FORESTS

Mr. VOGEL. We are doing a number of different things. One that ties in directly with what Dr. Nelson is talking about is experimentation in fertilization as applied to forests. We believe that there is a great opportunity here to make the forests of the area more productive.

Senator STENNIS. By commercial fertilizer?

Mr. VOGEL. Yes.

Senator STENNIS. Are you running experiments on that now?

Mr. VOGEL. We are doing work in that field; yes, sir.

Senator STENNIS. Long enough to get any showing of results of any kind or determine anything?

Mr. VOGEL. We have some indications that this is a profitable line of approach. Beyond that I wouldn't be able to say very much at this time.

## PULP AND PAPER MILL

Senator STENNIS. What about the pulp market in the area now? You mentioned a recent new mill. Is that near Corinth, Miss.? I have forgotten the name of it.

Mr. VOGEL. It is in Tennessee, but near Corinth, Miss. That is the Tennessee River Pulp & Paper Co. at Counce, Tenn.

Senator STENNIS. I found that prices were a great deal less than when I was there a few years ago. What about it in your area around Corinth?

Mr. VOGEL. I wonder if we could ask Mr. Kilbourne to discuss this. He was head of our Forestry Relations Division until recently.

Senator STENNIS. I just asked that in passing.

Mr. KILBOURNE. As you know from your acquaintance with forestry in Mississippi, pulp prices have fluctuated. But, generally speaking, they have been holding up quite well in the Tennessee Valley area. There hasn't been any marked dropoff.

Senator KEFAUVER. Are they about the same in Mississippi as they are in Tennessee?

Mr. KILBOURNE. Yes, about the same.

Senator STENNIS. They were up when the market was moving faster, but they have slowed down in areas down in our State now.

#### PRICES FOR PINE PULPWOOD

What is the going price, as we say, for pine pulpwood in some of the areas with which you are familiar, what is the selling point now?

Mr. KILBOURNE. Are you thinking about delivered, or on the stump?

Senator STENNIS. Delivered.

Mr. KILBOURNE. Delivered on the siding?

Senator STENNIS. Yes.

Mr. KILBOURNE. Prices run from \$12 to \$14 a unit delivered to the siding or landing. Of course, that varies with the transportation distances. But the woods price, stumpage price, is about \$3 to \$5, depending on the volume and accessibility.

Senator STENNIS. Well, you certainly have done a great work there.

#### RESEARCH ON IMPROVED TYPES OF PINE SEEDLINGS

Mr. WAGNER. In the forestry field we are also giving increased emphasis now to research on improved types of pine seedlings. In addition to that, we are doing some new work on hardwoods, on the development of hardwoods. We are carrying on further work and putting further emphasis on improved forestry management and on the better utilization of forest products.

We have, for instance, recently issued a report on the feasibility of hardwood pulp mills in the valley. We have great surpluses of hardwoods.

Senator STENNIS. Well, if you could get to that new uses problem and make a contribution there, that would be really ringing the bell because that is in the near future.

#### STEAM GENERATING ELECTRIC PLANTS

We were talking about tributaries. Now, you know that northern Mississippi is one of your good customers in buying electricity. And we don't have any valleys there and streams, unfortunately, for you to make generating plants water driven, but we would be mighty glad to have one of your steam plants down there. And I am not an engineer, I don't know about the feasibility of it, but I have always been told that the closer your product is to where you are delivering the electric current the better, because it is cheaper, and there is less loss.

Mr. VOGEL. Of course, as the demand in that region increases, we will be more impelled in the direction of building plants.

I might point out that we sell power at the same rates throughout the area we supply.

Senator STENNIS. But there is less cost in transportation, isn't that true, the closer your plant is to your end-use point?

Mr. VOGEL. Of course, there are a number of factors that enter into this matter of cost. The transmission cost is only one. There is also the matter of transporting the basic fuel to the site. And this is a bit remote from the coal supply of the region.

Senator STENNIS. What do you burn, coal and oil?

Mr. VOGEL. All of our thermal plants are coal burning.

Senator STENNIS. Do you find that cheaper than gas?

Mr. VOGEL. Yes; we have found it so in our area.

Senator STENNIS. All our military people tell us that they want to go to gas because it is cheaper than coal.

Mr. VOGEL. It depends upon where you are, Senator.

Senator STENNIS. I noticed everyone smiling.

I must have touched off something, but I don't know just what.

#### SALE OF POWER IN MISSISSIPPI

The volume of your sales and uses in Mississippi, leaving out what you sell to the Atomic Energy Commission, out of that 50 percent, why, you sell a considerable portion of that in Mississippi, do you not?

Mr. VOGEL. We sell quite a bit of power in Mississippi. However, the average rate of use is not as heavy there as in some other parts of the TVA service area.

#### YELLOW CREEK WATERSHED IN MISSISSIPPI

You mentioned a moment ago about our small watershed program, and I presume you had in mind, and I am sure you are acquainted with, the fact that you have in Mississippi the Yellow Creek watershed.

Senator STENNIS. I know. That is where I have seen some of your fine work, and the results of it.

Mr. VOGEL. And we have had an excellent response from the people of that area. I think this should be pointed out. They are working very actively with Mr. Kilbourne and his group, and have even viewed one of the other watersheds on which considerable progress has been made in the lower part of the valley.

Senator STENNIS. There has been excellent work done, as I told Senator Hill a little while ago. I have observed something about your forestry projects.

#### TOTAL GENERATING PLANTS

How many generating plants do you have in all?

You gave that number.

Mr. VOGEL. We have eight.

Senator STENNIS. You gave that number.

Mr. VOGEL. We have eight.

Senator STENNIS. You gave it here, and I made a note. I will get it.

#### LOCATION OF PLANTS

But they are all located in the States of Tennessee, Alabama, and Kentucky. Is that right?

Mr. VOGEL. Yes, as far as the steam plants are concerned. We have hydroplants in North Carolina and Georgia also.

Senator STENNIS. I know we used to battle here under Senator Hill's leadership ever since I have been here with reference to appropriations for these plants. And now you have your own financing bill that had these terrible birth pains, and the fine record that TVA has made is what has made it possible to get this new financing plan.

Have you ever made a study as to the feasibility of locating a steam plant down toward the southern end of your territory?

Mr. VOGEL. These are continuing location studies; yes. They are going on constantly. And we are not failing to consider every possible area in this connection. And our final determination is always dependent upon factors which bear directly upon the economics and the engineering feasibility.

Senator STENNIS. Well, does that mean that you have a study going on now with respect to the possibility of locating one in the southern area of the territory you serve?

Mr. VOGEL. We have studies looking considerably into the future, yes, sir—not that any plants are immediately anticipated in that area.

Senator STENNIS. Well, you know we have natural gas down there that never fails, a great abundance of supply.

Mr. VOGEL. This is an economic factor to which we will certainly give full consideration.

Senator STENNIS. I thank you, Mr. Chairman.

Senator HILL. Mr. Jones, you have been very quiet. Is there anything you would like to add?

#### TVA REVENUES

Mr. JONES. Just this, Senator: As you realize from the testimony that has been given here, we are not asking for any money for power facilities. But I would like to point out that of the total request for some \$38 million, about three-fourths is for construction, not operations. And at the same time from the self-supporting, self-financed power program, we have paid into the Federal Treasury over \$50 million in the past fiscal year. Therefore, the appropriation we are asking is less than 80 percent of what we are paying to the Federal Government. Uncle Sam at the moment is receiving more money from TVA than is being asked in appropriations for it.

Senator HILL. Well, you have paid in a good many millions through the years, haven't you?

Mr. JONES. Yes, some \$300 million from power proceeds has been paid in over the years, \$51 million last year. Because of the variation in the cost of money to the Federal Government, it will be a little less this year. In 1962 it will be about \$50 million.

Senator STENNIS. Mr. Chairman, I would like to ask one question along that line.

Senator HILL. Well go ahead.

#### NEW FINANCING PROGRAM

Senator STENNIS. You have been under your new financing program now for 2 or 3 years?

Mr. JONES. Yes.

Senator STENNIS. Is that proving adequate?

Mr. JONES. Very satisfactory, sir. We have sold two bond issues, \$50 million each. The rating given us by Moody's and Standard and Poor was AAA, which is the best there is. We have had, considering the market at the time, very favorable interest rates. In fact, at present our most recent issue of bonds is being offered at a slight premium.

Senator STENNIS. That is wonderful.

#### NEED FOR ADDITIONAL AUTHORIZATIONS

Mr. JONES. I would like to mention this: It has no bearing on the present request. The ceiling established in the bond amendment of 1959 was \$750 million. That will provide for 5 or 6 years. But we must keep in mind that it takes 4 years to build a steamplant. And before we can start a steamplant we have to know where the money is coming from. So it is likely that we will be asking the Congress for additional authorizations in the not too distant a future. We cannot wait until we have used all of the \$750 million.

Senator STENNIS. That is the very thing I was going to say, don't wait until you run out.

Senator HILL. You just want to raise the ceiling?

Mr. JONES. We must, Senator, in order to continue to be sure of making the contribution that power makes as a tool of resource development.

Senator HILL. Any other questions, gentlemen?

If not, General, I want to thank you, and thank you, Mr. Wagner, and Dr. Nelson, and all of you gentlemen, and Mr. Jones, all of you who have contributed so much to this hearing this afternoon and have brought us this most worthwhile and interesting information. It will certainly be helpful to us in securing the appropriations for TVA. We are very grateful to you.

#### RESEARCH ON FERTILIZER PROCESSES

In that connection I noted that you had a splendid statement in your budget program book here on research on fertilizer processes. Unless there are some objections, I think I will put that in the hearing.

Mr. VOGEL. There is certainly no objection.

(The statement referred to follows:)

#### RESEARCH ON FERTILIZER PRODUCTS AND PROCESSES (\$1,969,000)

The 1962 estimate of \$1,969,000 covers fundamental research, applied research, and process engineering for the discovery and development of improved fertilizer products and processes.

Research in the field of fertilizer technology is carried out in this country mainly by TVA, USDA, and private industry firms and groups. In general, industry research on processes and products is for short-term gains. The principal emphasis of TVA fertilizer research is on broad projects of potential value to the Nation that are beyond the immediate interest or capacity of industry. To avoid duplication, the TVA and USDA work cooperatively with each other and with industry to the fullest extent possible.

Information on TVA research is made available to industry through articles in professional and trade journals, published reports, correspondence, demonstrations, and visits by industry representatives to the TVA chemical plant. The fertilizer industry, as it adopts TVA developments and makes commercial application of them, is the medium through which the benefits of technological development are passed to the farmers. TVA holds 120 patents covering its

chemical developments. Private firms may use TVA patented manufacturing processes and equipment under royalty-free, nonexclusive licenses, thus assuring the widest competitive use of the results of TVA research. Through fiscal year 1960, 221 licenses had been granted to 167 firms.

TVA research on fertilizer products and processes is primarily in the fields of nitrogen and phosphorus and their compounds, these two elements being basic plant nutrients and basic materials for the production of munitions. The research staff and facilities are available for a dual purpose of agricultural advancement or national defense as the situation may require.

Through studies of trends and needs and through exploratory laboratory work and basic studies, specific research projects are evolved. If detailed laboratory studies show them to be promising, research projects are carried through the pilot-plant stage. At appropriate times during research and development of new or improved fertilizer products, basic agronomic studies and plot tests are conducted as described below under "Basic Agronomic Research."

The need for better nitrogen fertilizers is great. The nitrogen fertilizers that are commercially available have several drawbacks. Some of them are of low concentration and consequently are quite costly per unit of available nitrogen by the time they reach the farmer. Others of higher concentration have the disadvantages of poor physical properties, explosibility, or high cost. All those generally available are too soluble in water to resist leaching from the soil. Some slowly soluble nitrogen fertilizers are made, but they are too expensive for use in general farming practices.

During 1962 TVA will concentrate on the search for new and improved nitrogen fertilizers. During the past few years, several promising possibilities have been uncovered that may lead to the development of methods for making better nitrogen fertilizers economically. From laboratory and greenhouse tests, the compound oxamide appears to be an almost ideal nitrogen fertilizer. It is slowly soluble, nonexplosible, and has better physical properties than ammonium nitrate or urea. It contains 32 percent nitrogen. Efforts will be directed toward the development of an economical process for the manufacture of oxamide.

Another investigation to receive further attention in 1962 relates to the elimination of the potential explosibility of ammonium nitrate fertilizer, the most widely used solid nitrogen fertilizer in the United States. Ammonium nitrate can be exploded by detonation. If ammonium nitrate can be made nonexplosible, its shipment and handling would be safer and simpler. There are indications that the addition of some substances to ammonium nitrate may make it unexplodable. This possibility will be investigated.

Further studies will be made of the preparation of cyanogen from nitrogen and carbon at very high temperatures. Cyanogen can be used as an intermediate in the production of a variety of compounds that may be suitable for fertilizer. Oxamide is one such material.

By heating urea under the proper conditions a series of compounds of less and less solubility can be obtained. There is a good possibility that research along this line will permit the production of a new, improved nitrogen fertilizer at a low enough cost for use on farms. It is expected that pilot-plant studies of this process will begin in 1962.

Work will continue in 1962 on the use of liquid ammonia, the cheapest form of fertilizer nitrogen, as a reactant in fertilizer production or as a carrier for other fertilizer materials. Another continuing research project is the investigation of ways of increasing the concentration of nitric acid for use in fertilizer manufacturing processes to permit more economical shipping and handling.

While emphasis will be placed on the search for better nitrogen fertilizers in 1962, an important part of chemical research and development will continue to be devoted to phosphorus and polynutrient fertilizer materials. Studies will continue on the production of ammonium polyphosphates from ammonia and superphosphoric acid. These materials are high-analysis nitrogen-phosphorus fertilizers that can be used in the manufacture of liquid fertilizers.

Small-scale research is being done on the development of an economical way to make granular potassium metaphosphate fertilizer in slowly soluble form. Because of low solubility this material is expected to have superior agronomic qualities. It is planned to construct a pilot plant in 1962 to develop the process and to provide material for extensive testing.

Other research planned for 1962 is the continuation of studies on improved ways of making superphosphoric acid and liquid fertilizers. There are indications that the technology of making superphosphate fertilizer can be advanced.

It has been found that a calcium polyphosphate of superior properties can be made from high-analysis superphosphate. The new material will contain 63 percent  $P_2O_5$  as compared with 54 percent in high-analysis superphosphate.

The accumulation of basic data on phosphorus, nitrogen, and potassium compounds is an important continuing part of TVA's research. This information provides the foundation on which much of the subsequent fertilizer research and development is based. An understanding of the behavior of fertilizers in the soil is of basic importance in the search for better fertilizers and more efficient fertilization practices. This is a long-term TVA project. Since only a small part of many fertilizers is recovered in the crops to which the fertilizers are applied, the economic rewards of this research can be great.

#### TWIN LAKES PARK

Senator KEFAUVER. There is one thing I want to ask, Mr. Chairman. How is the Twin Lakes Park coming on?

Mr. VOGEL. We are very pleased with the response that we have had on that, Senator. As you know, this was an idea born in the minds of one of our staff members and subsequently approved by the Board. It has caught fire. We recently had a meeting over in the area of the site itself with the Governors of Tennessee and Kentucky, the Secretary of the Interior, and a representative of the Corps of Engineers, in fact all of the people that would be immediately interested. Considerable enthusiasm was expressed. We have had no serious objections raised by anyone. And it is our fond hope that the plans will move forward expeditiously and provide a fine new recreation area in the valley.

Senator KEFAUVER. I am certainly glad to hear that.

Mr. VOGEL. I should point out that the area will be an important recreation resource for the Nation because it is within a day's drive of about 80 percent of the population of the country.

Senator KEFAUVER. We know the great interest of Mr. Udall, of Mr. Conrad Wirth and the people down there in the Park Service. And they are as enthusiastic as you and I are about it.

It is not our position, but the only misgivings I have heard about it at all—and I am sure that you are working that out—is that little Stewart County has had very severe property losses, first by virtue of the Kentucky Dam, and then the Barkley Dam being built by the Corps of Engineers, and the Fort Campbell Reservation took a lot of their land. And they have been very much concerned about losing their tax base. But I know that some system can be worked out to encourage the growth of private development which would offset what they would lose.

Mr. VOGEL. We are sure that is true. We discussed that with the county judge.

Senator KEFAUVER. Judge Atkins is a very intelligent man.

Mr. VOGEL. We had a very good discussion about the problem. We think, and I believe he is convinced, that taxwise the county will be better off if this program is developed. It should be of economic benefit to the area by virtue of the many people who will be brought into it.

#### CHANNEL BETWEEN KENTUCKY AND TENNESSEE LAKE

Senator KEFAUVER. Are plans now underway—or are studies now underway in connection with the channel between Kentucky and Tennessee Lake—

Mr. VOGEL. That work is actually underway up there.

Senator KEFAUVER. Some of the construction is actually underway?

Mr. VOGEL. Yes.

Senator KEFAUVER. Mr. Chairman, I want to join you in paying very high tribute to the fine report that these directors and other officials of the TVA have brought us, and to congratulate them upon the excellent management and direction of this vitally important project.

Senator STENNIS. Mr. Chairman, may I at this point say this. I wish more of the Senators could really hear this story as it has gone in the record and know the effect of what has really been achieved. But with the rush in the latter part of the session it is very difficult for them to get here, General and members of the committee.

#### VISITORS FROM ABROAD

Senator KEFAUVER. Mr. Chairman, have any of the board members testified as to the number of foreign visitors we have had in the valley this past year?

Mr. VOGEL. I was about to say, in response to Senator Stennis, that we wish more of the Members of Congress would and could visit us and afford themselves an opportunity to observe our programs firsthand. A picture is worth a thousand words, but a visit is worth a thousand pictures. And we think you have to be actually on the spot and meet our people to learn of their personal enthusiasm, their self dedication to this work, and to gain a true perspective of what is going on. Now, we have people from all over the world coming to visit us. And it is often said to us, "Why is it that people in other parts of the world know so much more about TVA and seem to appreciate it so much more than do our own people?"

In fact, I was asked this very embarrassing question about a year ago on the BBC in London. And I must confess, it is a difficult thing to answer. But we have between 2,000 and 3,000 foreign visitors a year. And these embrace all kinds of human enterprise. We have students and minor government officials—

Senator KEFAUVER. You don't mean 2,000?

Senator STENNIS. Visitors from foreign countries.

Senator KEFAUVER. Foreign visitors.

Mr. VOGEL. Foreign visitors—students, members of legislatures, cabinet officers, kings and queens and potentates. We hope that they are gaining something by their visits, and that the United States is gaining too in the understanding and their friendship. They go away with a feeling that here is something that they themselves may do in their own way to stimulate their progress. And I think that it points up again how much value can be gained from our approach to the development of small tributary areas. This is exactly the kind of thing that people can do anywhere in the world to benefit their economic status and improve their well-being.

Senator HILL. I have never known a visitor to go there, General, that didn't come back very much impressed with it.

Senator KEFAUVER. How many visitors, aside from the foreign visitors, that is, U.S. citizens, come to see it?

Mr. VOGEL. That gets up in the millions—Mr. Jones says 10 million—that probably doesn't count them all. If you figure in those who make a casual visit to our locks and dams and who partake of the recreation facilities, it is almost incalculable.

Senator KEFAUVER. General Vogel, I think it would be mighty fine if we could get more Senators and Congressmen as well as other people interested. It is not easy for them to get down. You don't have any, what some people call junkets, arranged, do you?

Mr. VOGEL. No, they have got to get down on their own horsepower. But once they are there we will see that they get a good look at things.

## VISIT OF DIRECTORS OF THE WORLD BANK

And I might add in this connection that we are looking forward to a visit in November by all of the Directors of the World Bank. There will be some 40 of those. And we expect to give them a good view of TVA. I think this is an excellent opportunity for us, and for our country, to show these people from so many nations around the world what can be accomplished if people are willing to work for it.

Senator STENNIS. That will be wonderful. It would be fine if you could get the President of the United States down with his helicopter and bounce him around from mountain to mountain and dam to dam.

Mr. VOGEL. We have been very fortunate in having had the President of the United States down there when he was a Senator. Senator Gore brought him down as his guest, with Mrs. Kennedy. And we are very happy that he had that opportunity to see what we are doing.

## TRANSPORT OF MISSILES BY WATERWAY

Senator STENNIS. Mr. Chairman, I know in armed services they told us about the plan to transport the missiles from Huntsville, Ala., to take them on down the Tennessee, the Ohio, and the Mississippi on down to the gulf. Has that worked out, have you taken one yet?

Mr. VOGEL. Yes, and under rather difficult conditions. The SATURN missile booster was moved after the failure of the lock at Wheeler. It was moved around the lock on a temporary roadway. It made the trip in fine shape using the waterway all the rest of the distance.

Senator HILL. And that SATURN is a good-sized missile.

Mr. VOGEL. That is the booster.

Senator HILL. I know it is.

Senator STENNIS. I didn't know that you had moved one.

Mr. VOGEL. That was done within the last month.

Senator HILL. It got to Canaveral all right?

Mr. VOGEL. Yes, sir, it did.

Senator STENNIS. That is an Alabama product.

Senator HILL. That is right.

If there are no other questions, gentlemen, again we want to thank you and express to you our deep appreciation for your very fine statements.

Mr. VOGEL. Thank you, Mr. Chairman.

Senator STENNIS. We are proud of what you are doing.

Mr. VOGEL. We appreciate what you are letting us do.

Senator HILL. Mr. Richard W. Smith, Mr. Harold H. Hair, and Mr. John J. Meehan of the National Chamber of Commerce of the United States.

We are glad to have you, gentlemen. Sit right down and make yourselves at home.

CHAMBER OF COMMERCE OF THE UNITED STATES

STATEMENT OF RICHARD W. SMITH, MANAGER, NATURAL RESOURCES DEPARTMENT; ACCOMPANIED BY JOHN J. MEEHAN, ASSISTANT MANAGER, NATURAL RESOURCES DEPARTMENT; AND HAROLD H. HAIR, GOVERNMENT OPERATIONS AND EXPENDITURES PROGRAM

GENERAL STATEMENT

Mr. SMITH. I am Richard W. Smith, manager of the natural resources department of the Chamber of Commerce of the United States. I have with me two other members of the national chamber's staff. They are John J. Meehan, assistant manager of the natural resources department, and Harold H. Hair of the Government operations and expenditures program.

I am here to present the views of the Chamber of Commerce of the United States on H.R. 9076, the public works appropriation bill for fiscal year 1962. The chamber is a federation of 3,600 business organizations—local, State, and regional chambers of commerce and trade and professional associations—with a total membership of 2,800,000 businessmen.

From time to time we note that individuals—including Members of Congress—attach significance to the fact that a position taken by the national chamber is at variance with that of a local chamber of commerce. Last year, for example, your chairman alluded to representations made by local chambers of commerce to this committee and suggested that the views of the U.S. Chamber of Commerce might not accurately represent the views of the local chambers of commerce. Approximately 45 written statements were submitted to this subcommittee last year by local chambers of commerce favoring individual projects under consideration. Most—but not all—of the local chambers of commerce were members of the national chamber. But, in a federation such as ours we do not expect unanimous agreement with every facet of our policy. Nor do we consider it a weakness or a contradiction for the national chamber to take a position which may not be agreed to by a small minority of its 3,600 organization members.

Through these procedures we believe we can be of particular service to the Senate, for we are in a position to present a broad national viewpoint of American business and industry.

POLICY DECLARATIONS OF NATIONAL CHAMBER

I believe a few words about the policy declarations of the national chamber may help explain what I say. The views we express today are based on such policy declarations.

Most policy proposals are developed by one of the chamber's committees. These committees, which are appointed annually by the president of the chamber, are made up of men who are experts in a particular field and who serve on a voluntary basis. Policy proposals may also be submitted by any member.

Proposed policy declarations are normally submitted to the chamber's board of directors to determine whether they are eligible for chamber policy. To be eligible, policy proposals must be "national in character, timely in importance, and general in application to business and industry." If the board determines the proposals meet these criteria, they are referred to the policy committee.

A preliminary report containing the text of policy declarations recommended by the policy committee for annual meeting consideration is sent to all organization members prior to the annual meeting. Members are invited to comment on such proposals or confer with the policy committee about them. The organization members who receive these preliminary reports include 2,900 State, local, and regional chambers of commerce.

Policy proposals finally recommended by the policy committee are presented to delegates representing organization members at an annual meeting open business session and voted upon. Approval by two-thirds of the vote cast is required to adopt a policy declaration. Such declarations expire 3 years after adoption, unless reaffirmed. The board of directors frequently interprets a general policy to fit a specific situation.

Thus, the recommendations which follow are the culmination of board action, committee study, and staff work beginning last November—before President Eisenhower's budget was submitted in January—and extending through the review of the record of hearings before the House Appropriations Committee, some of which were released to the public as late as July 13.

#### BUDGET RECOMMENDATIONS

On submission of the 1962 budget to Congress, 16 separate national chamber committees—representing more than 500 businessmen—and their supporting staffs examined the individual items in considerable detail. Their recommendations were transmitted for coordination to our Government operations and expenditures committee—which in the meantime had conducted a separate overall review of the budget. The budget recommendations were approved by the national chamber's board of directors.

The committees originating the recommendations being made to you today are the natural resources committee and the Government operations and expenditures committee.

May I call attention to the fact that Richard Wagner, president of the national chamber, recently wrote to President Kennedy expressing the chamber's complete support of a strengthened defense program. At the same time, Mr. Wagner stressed the importance of keeping the country economically strong and directing Government spending only to indispensable needs. We strongly urge that such criteria be used in considering appropriations for civil public works.

#### THE TENNESSEE VALLEY AUTHORITY

##### TVA FERTILIZER PROGRAM

We recommend a reduction of \$4,767,000 from the \$38,203,000 appropriation requested for the Tennessee Valley Authority fund.

The reduction represents the net cost of the TVA fertilizer program as indicated in the budget document. This includes:

Research on fertilizer products and processes.....	\$2,086,000
Fertilizer production and distribution.....	974,000
Fertilizer tests and demonstrations.....	1,707,000
Total.....	4,767,000

The chamber opposes this program because it is a commercial activity in competition with private enterprise and a subsidy to some farmers. The sheer magnitude of the program—fertilizer sales estimated at \$20 million—removes it from the research and demonstration category claimed by TVA officials.

Operations planned for fiscal 1962 call for the distribution of 289,000 tons of fertilizer costing \$25 million. This scale of operations is far in excess of the amount required for educational purposes. A consultants' report on the distributor demonstration program with TVA fertilizer, released in December 1957, questioned the validity of TVA using "educational objectives" as justification for the size of the program. The consultants indicated that the primary reason for such large scale production was to help finance the balance of the TVA fertilizer program—or to approach a break-even point in operations. The consultants' observation is equally appropriate today.

#### TVA STATEMENT SUBMITTED TO HOUSE COMMITTEE

Although receipts from fertilizer sales in fiscal 1962 are expected to be \$20 million, the sale of TVA fertilizer below cost or below the market price, constitutes a Government subsidy to farmers using the product. The TVA statement submitted to the House Appropriations Committee this year stated (pt. 3, p. 886):

TVA fertilizers are priced to serve the program objectives described earlier rather than to provide maximum revenue to TVA. In order to encourage farmers to try experimental products or to take part in educational programs promoting more efficient fertilization and conservation practices, prices are set slightly below the price of plant nutrients in conventional materials or below the estimated price of new products, were they commercially available.

A recent report on "Subsidy and Subsidylike Programs of the U.S. Government" prepared by the staff of the Joint Economic Committee, stated the TVA fertilizer program is considered by many to constitute a subsidy to the farmers receiving and using its products. The report pointed out that this is a far more extensive program than one just of research and experimentation, and, to the extent that the fertilizer is distributed below cost instead of sold commercially at competitive prices, there is an element of subsidy to the recipients of TVA fertilizer.

We recommend that TVA cease the production of fertilizer on a commercial basis; and that research work on the development of new fertilizer materials and experimental work geared to test-plot demonstrations be transferred to the Agricultural Research Service of the Department of Agriculture.

#### TVA COAL MINING OPERATIONS

We recommend that the 1962 appropriation bill incorporate language to prohibit the use of appropriated funds, funds from revenue

bond sales, or power revenues by TVA to acquire coal lands or coal mining rights. TVA should not further compete with private enterprise by acquiring coal lands and mining or contracting for the mining of its own coal.

General Vogel, Chairman of TVA's Board, in testifying before the House Public Works Appropriations Subcommittee this year, was asked if it was TVA's intention to go into the coal mining business.

Definitely no—

he answered—

the purpose \* \* \* is \* \* \* to assure ourselves of the availability of coal in the future at reasonable costs \* \* \*.

If there is a need for it and it can be mined at a reasonable cost, then I am sure there will be people perfectly willing to undertake the mining and supplying the coal for our use.

Whether TVA mines its own coal or contracts out the mining makes little difference—it is still unfair competition with private enterprise. The cost of the coal will not include such items as taxes, royalties, and full interest on investments that are included in the price of the coal that TVA now buys. We believe that TVA should not be allowed to own and operate, or have operated, its own coal mines.

#### USER CHARGES

The chamber further recommends that TVA be required to adopt an appropriate system of user charges in connection with the use of navigation facilities, such as Wheeler Dam.

We see no reason why those who derive special benefits from TVA's navigation features should not at least pay for the operation and maintenance costs through a user charge.

When General Vogel was asked about this during the House hearings (pt. 3, p. 992) he replied that it would be contrary, he believed, to the national policy, it would be setting a precedent, and he was advised by his General Counsel that TVA does not have authority to impose user charges for the use of the waterways for purposes of navigation.

But the appropriate legislative committees of Congress could, and we think should, give it the authority. A positive statement in support of this principle by this committee would do much in furthering congressional intent along these lines. Such action would help to relieve the increasing drain on the Federal Treasury.

#### ATOMIC ENERGY COMMISSION

##### HANFORD, WASH., GENERATION PROJECT

The national chamber recommends a reduction of \$60 million from the request of \$268,750,000 for AEC plant acquisition and construction. This item was in anticipation of Congress approving the administration's request for authority to spend \$95 million for construction of a 600,000-kilowatt steam-electric generation facility addition to the new plutonium production reactor, under construction at Hanford, Wash.

The construction of electrical generation facilities at Hanford would be a wasteful use of Federal funds. The project is not needed to provide electrical energy for the Pacific Northwest. As of June

30, 1960, Bonneville Power Administration which will market the power from Hanford, had idle plant capacity in its system of approximately 400,000 kilowatts. The prospective treaty with Canada on the development of the Columbia River is expected to increase the electrical energy available to the Bonneville Power Administration and the Pacific Northwest by an additional 2,600,000 kilowatts.

The proposed addition of electrical generation facilities to the Hanford project is another instance of unwarranted Government competition with investor-owned taxpaying electric companies. Deletion of the Hanford power generation facilities from the requested appropriation would be in the public interest and would contribute to the cooperative development effort between industry and Government.

As you know, this proposal has aroused much controversy in the Congress and in the press. Many proponents urged approval on the basis of a \$95 million investment; and apparently overlooked the necessity of an additional investment of \$20,850,000 by Bonneville Power Administration for transmission lines before the energy could actually become available.

On May 10, 1961, the National Chamber submitted a statement on electric power at the Hanford plutonium reactor to the Joint Committee on Atomic Energy. I will not take your time to repeat the statement now, but for your information copies have been attached to my statement.

(The statement referred to follows:)

STATEMENT OF THE CHAMBER OF COMMERCE OF THE UNITED STATES ON ELECTRIC POWER AT THE PLUTONIUM REACTOR

The Chamber of Commerce of the United States urges your committee to delete from S. 1774 and H.R. 6744, the authorization of funds for the Atomic Energy Commission, the amount of \$95 million for construction of a 600,000 kilowatt steam-electric generation facility addition to the new plutonium production reactor, under construction at Hanford, Wash. This appears in project 62-A-6 in section 101A and section 110 (disposition of electrical energy).

This project, expected to cost \$95 million, is not needed to provide electrical energy for the Pacific Northwest. The 1960 annual report of the Bonneville Power Administration, which would market the power from Hanford, states that the system had, as of June 30, 1960, idle plant capacity of about 400,000 kilowatts.

Utilization of the additional electrical energy from Hanford will necessitate the transmission of this energy outside of the present Bonneville service area. This was confirmed by Secretary of the Interior Stewart Udall in a press conference on March 28 in which he said: "The availability of 600,000-kilowatt Hanford power would make some type of intertie almost essential."

The prospective approval by Canada of the United States-Canada Treaty on the development of the Columbia River will increase the electrical energy generation available to the Bonneville Power Administration and the Pacific Northwest by another 2,600,000 kilowatts.

The utilization of funds for the construction of electrical generation facilities at the NPR would be a wasteful use of taxpayer's money.

The addition of electrical generation facilities to the Hanford project is a clear instance of Government competition with the investor-owned, taxpaying electric utilities. Business-type Government enterprises should exist only where and when it has been conclusively demonstrated that private business is unable to provide essential needs.

In 1958, Senator Clinton Anderson stated that when the Senate considers Hanford generating facilities, "I hope to make sure we are not considering current which would ever be generated by the Government to put the Government into the public power business." Yet it would seem that approval of the 600,000-kilowatt electric generating facility in connection with the NPR at

Hanford would: (1) Set a precedent for federally built steamplants outside the Tennessee Valley; (2) suggest that the Federal Government must create the power which makes enlargement of the service area necessary; (3) set up a situation in which nationwide federally constructed transmission interties would become much more plausible.

The record is clear that the investor-owned electric industry is willing and able to provide the electric needs of the Nation. In 1959 according to Edison Electric Institute, the construction expenditures of the electrical industry amounted to \$3.4 billion and in 1960 they are expected to total \$3.5 billion. The amount invested annually in new facilities, which will be 70 percent greater in 1960 than in 1950, is expected to exceed \$4 billion by 1962.

The Edison Institute reports that by 1970 the Nation's electric companies expect to more than double their present power-producing capability, from 127.3 million kilowatts in 1959 to 263.2 million kilowatts a decade from now. By 1980, the companies anticipate reaching a generating capability of 492.6 million kilowatts—nearly four times today's total and almost twice the predicted capability in 1970.

It is these same investor-owned companies that have ventured into new generation methods to meet the energy requirements of the future. The use of atomic energy to generate electricity has been demonstrated. As of October of 1960, The Edison Electric Institute states that 132 electric companies were participating in one or more of 26 projects aimed at making atomic energy a practical, economic source of electric power. Seventeen are construction projects and nine are study, research, and development programs.

Of the 11 atomic power construction projects, which are in operation, under construction, or in the design or contract negotiations stage, the investor-owned utilities have or will, as shown in the attached chart, spend \$331,554,000 to generate 932,000 kilowatt at an estimated cost to the AEC of only \$46,175,000.

The research and development achievements have been noteworthy as a result of the combined efforts of the investor-owned electric utilities and the AEC. On the other hand, the addition of electric generating facilities to the plutonium production reactor will contribute very little if anything, to the research and development program of the nuclear energy effort.

On July 15, 1958, during Senate debate on the AEC authorization bill, Senator Leverett Saltonstall offered an amendment, which was defeated, to delete \$25 million from the \$145 million to be authorized for the plutonium production reactor, pointing out that the amount to be deleted would be equal to the cost of the features of the proposed reactor which would make possible future converting of the reactor for electric generation. Senator Saltonstall expressed the belief that "it is a wise amendment because it brings the public power issue directly into focus with the atomic energy problem."

The proposal before you to authorize this project raises the question of what rates the Atomic Energy Commission will charge Bonneville Power Administration for the power. At the moment, \$25 million is already "sunk" in convertibility features with no provision made for its recovery through power revenues.

Section 110 of S. 1774 and H.R. 6744 states that NPR energy will be marketed under the BPA preference clause. Yet to get the original \$25 million for convertibility in 1958, Senator Clinton Anderson, then chairman of the Joint Committee on Atomic Energy, stated: "I am happy to note for the record that so far as I am concerned, when (the matter of converting the reactor to dual purpose operation for byproduct generation of electricity) comes to Congress, and I am still a Member of it, I hope we will put such restrictions on the power that it will not become public power in the ordinary sense of being subject to a preference clause for the sale of power to cooperatives. It need not be and should not be."

The Atomic Energy Act of 1954, as amended, clearly states that it is not the intent of Congress that the Federal Government shall embark upon a program of competition with private business. Subsection b of section 1 of the act declares: "The development, use, and control of atomic energy shall be so as to promote world peace, improve the general welfare, increase the standard of living and *strengthen free competition in private enterprise.*" [Emphasis supplied].

To be more specific, Mr. Loren K. Olson, U.S. Atomic Energy Commissioner, in a speech on April 7, 1961, stated that the objective of the U.S. nuclear power program is: "\* \* \* basically, to develop the technology which will permit the production of this power at low cost in competition with power from fossil fuels.

"Our immediate goal is to reduce the cost of nuclear power to a point where utility management in high cost fuel areas can make a decision to build large nuclear powerplants on economic grounds alone by 1968."

It would seem that there are wiser uses of AEC funds which would further the objectives of the Atomic Energy Act, such as concentration on activities of a cooperative power program nature, and research which would contribute to that point where it will be economical for utility management to use nuclear power. To do otherwise, would place the AEC in the position of competing with the very organizations with which it is working to develop economical nuclear power. Such a policy can only have limited benefit to all the citizens of the Nation. Deletion of the Hanford power generation facilities from the requested authorization would be in the public interest and would contribute to the cooperative development effort between industry and government.

Therefore, the National Chamber urges that authorization for electrical generation facilities at the Hanford plutonium production reactor be denied.

*Investor-owned atomic power projects since passage of Atomic Energy Act of 1954*

Name of organization	Electrical capacity of plant, kilowatts	Estimated cost to investor-owned utilities	Estimated research and development cost to AEC
Pacific Gas & Electric Co.....	5,000	\$572,000	-----
Commonwealth Edison Co.—nuclear power group.....	180,000	51,000,000	-----
Consolidated Edison Co. of New York, Inc.....	275,000	110,000,000	-----
Northern States Power Co.—Central Utilities Atomic Power Associates	66,000	22,800,000	\$8,500,000
Pacific Gas & Electric Co.....	60,000	20,000,000	0
Detroit Edison Co.—PRDC.....	100,000	78,232,000	4,450,000
Yankee Atomic Electric Co.....	134,000	57,000,000	5,000,000
Carolinas Virginia Nuclear Power Associates.....	17,000	29,000,000	13,725,000
Philadelphia Electric Co.—HTRDA.....	30,000	24,500,000	14,500,000
General Public Utilities Corporation System.....	5,000	8,250,000	0
Consumers Power Co.....	50,000	30,000,000	0
Total.....	932,000	331,554,000	46,175,000

AUTHORIZING LEGISLATION FOR HANFORD PLANT

Senator HILL. Mr. Smith, I am sure you realize that the conference report on the legislation authorizing the construction of this Hanford plant has not been acted on by the House.

Mr. SMITH. Yes.

Senator HILL. And of course until and unless that legislation is favorably acted upon, there wouldn't be authorization for the appropriation.

Mr. SMITH. I realize that.

Senator HILL. But this has been sort of a play tag from day to day, you don't know when they are going to act upon it.

Mr. SMITH. I would also like to state that if the conference report should be adopted, we still think it would be unfair competition with private enterprise, because it would relieve Bonneville of supplying that much power to the Hanford plant, which then would be available for distribution in competition with private enterprise.

Senator HILL. Thank you.

Senator Kefauver, any questions?

USER CHARGES

Senator KEFAUVER. About charging fees to go through the locks that you have suggested for the TVA, isn't it traditional historical public policy that fees are not charged for use?

Mr. SMITH. Yes, sir. That dates back, probably, to the commerce laws in the Constitution. But in these days of declining revenues for the railroads (in competition with waterborne and highway freight), the right-of-way and maintenance costs furnished by the Federal Government, result in competition unfair to the railroads. Users of waterways should pay a proportionate part of the cost, at least of maintenance, if not of construction.

Senator HILL. You would have that apply, then, Mr. Smith, on all waterways?

Mr. SMITH. Yes.

Senator KEFAUVER. The Corps of Engineers?

Mr. SMITH. Yes.

Senator KEFAUVER. Would that take a constitutional amendment?

Mr. SMITH. I am not sure, sir. I doubt if it would. The Constitution just mentions the commerce, but doesn't mention what methods.

Senator KEFAUVER. What is the constitutional provision?

Mr. SMITH. I don't have a copy of the Constitution with me.

Senator HILL. It gives Congress, of course, the power of regulation of commerce. But it doesn't go too far in spelling it out. As I recall the language, it is pretty general.

You know, you have got a lot of waterways here, you have got a lot of waterways over on the Ohio River.

Mr. SMITH. I am sure that there are quite a lot of our members using those waterways who do not agree with this position.

Senator HILL. I am telling you that down in my State of Alabama we have got to find waterways. One is the Coosa River, on which we are proposing to build a 9-foot channel all the way from Rome, Ga., in northeast Georgia, northeast Alabama, through Montgomery, the capital city, and through Mobile to the gulf. I don't know of any project that these people of that valley have been more interested in than the development of this waterway. It will be finished in 1963.

The Chattahoochee-Appalachicola Waterway—the dam there was the Fort Gaines Dam on the Alabama-Georgia line, and that is now the George Dam, named after Walter George after his death—is very important, and the people are certainly enthusiastic about waterways. I doubt if they would look with much favor on a user charge, Mr. Smith. So far as I recall, and I have been around here a long time, you gentlemen were the first ones to suggest this, weren't you?

Mr. SMITH. I am not sure as to that.

Senator HILL. I am not sure.

Senator KEFAUVER. The thing is that, outside of people out for pleasure, the users of the locks are private businesses, aren't they?

Mr. SMITH. Of course, quite a lot of traffic—

Senator KEFAUVER. Wouldn't you be placing just a further tax on the private business?

Mr. SMITH. Quite a lot of traffic on the Tennessee River is coal to the Tennessee steamplants, and sand and gravel dredged from the river and carried to other points.

Senator KEFAUVER. The same is true on the Ohio River.

Mr. SMITH. Yes, except that on the Ohio it doesn't go to Government plants, but to private industry. As you say, though, Senator, there may be quite a lot of objections. This policy, however, was adopted by a majority of our members.

Senator KEFAUVER. The majority of the members of what committee?

Mr. SMITH. The membership of the chamber. The policy originated in our transportation and communications committee.

Senator KEFAUVER. Was there much of a fight about it?

Mr. SMITH. No.

Senator KEFAUVER. Maybe they didn't hear the resolution read.

Mr. SMITH. Well, it was mailed out to them 60 days in advance of the annual meeting.

Senator HILL. If they had that much notice they had notice, didn't they? Good notice?

Mr. SMITH. Yes.

#### PROBLEMS OF SOUTHEAST AREA

May I say, Senator Hill, I am familiar with the problems of the area down there, because I spent 25 years in the Southeast. I was 4 years on the Tennessee Geological Survey, 13 years on the Georgia Geological Survey, and 6 years with the U.S. Bureau of Mines stationed at Tuscaloosa, Ala., working in Alabama and Mississippi.

Senator HILL. You know that area pretty well.

Mr. SMITH. I know it very well. My wife is from Rome, Ga.

Senator HILL. Are you familiar also with the Warrior-Tombigbee Waterway, because that goes by Tuscaloosa, in fact Birmingham is the port, down through Tuscaloosa and on down through Mobile Bay and out into the gulf.

Senator KEFAUVER. Have you visited the fertilizer plant at Sheffield?

Mr. SMITH. Yes, sir; several times, sir.

Senator KEFAUVER. Well, I have had fertilizer manufacturers tell me that the research done there in showing the value of fertilizer and demonstrating its great benefit to the farmers has been a boon to the free enterprise manufacturer of fertilizer.

Mr. SMITH. Also I think you have had considerable opposition from the Fertilizer Manufacturers Association on this, have you not?

Senator KEFAUVER. We don't know. That may have been. But I was of the impression that the use of fertilizer had been greatly enlarged many, many fold over what they had spent for experimentation and used to see whether it is acceptable or not.

Mr. SMITH. You must remember, Senator, that we are objecting principally to the commercial manufacture and distribution in large quantities of the fertilizer at prices lower than the market price.

Senator KEFAUVER. Their program is, I believe, that—you recommend striking out the whole thing, do you not?

Mr. SMITH. Yes, sir. We believe in research, but we believe that it can better be done by the Department of Agriculture which does research for the whole country.

#### HISTORY OF TVA

Senator HILL. Mr. Smith, I will tell you an interesting piece of history. The Tennessee Valley Authority had its genesis really in the National Defense Act of 1916 in section 124. The Congress at that time—I wasn't here then—saw the clouds of war becoming more and more ominous all the time and getting closer and closer. So they

passed the National Defense Act of 1916, which was largely an act providing for manpower and the purchase of material. But they did put in this section 124 authorizing the President of the United States to build nitrate plants at such locations as he might select. And they dedicated it to munitions in time of war and fertilizer for the farmer in time of peace. And they went further and said that, provided further that the property should never go into private hands, the Government was going to keep them. That is just a little interesting piece of history when you go back to 1916.

Mr. SMITH. I visited Muscle Shoals.

Senator HILL. Were you there before the TVA came in?

Mr. SMITH. Yes, I visited it right after the close of the war.

Senator HILL. You were there when Wilson Dam—

Mr. SMITH. Was just a foundation, and nobody wanted it until Henry Ford decided he wanted it.

Senator HILL. That is right. Henry was a man who really stimulated tremendous interest. I don't mind telling you, when I was in Congress I was a strong advocate of Ford.

Mr. SMITH. If he had been content with a 50-year license under the Federal Power Act, I think he would have gotten it, but instead he wanted a hundred-year license.

Senator HILL. Ford is down there now, they have got a big plant. They buy a lot of material from Reynolds Metal Co.

Are you a native of Virginia, Mr. Smith?

Mr. SMITH. No, I am a native of Massachusetts, but when I graduated from college I came south.

Senator HILL. You know a fellow named Eli Whitney from Connecticut came south and revolutionized textiles and cotton and the textile business.

Mr. SMITH. That is right.

Senator HILL. Mr. Hair, do you and Mr. Meehan have anything to say?

Mr. HAIR. Not unless you have any particular questions.

Senator HILL. Do you have anything, Mr. Meehan?

Mr. MEEHAN. Not at the moment, unless you have some specific questions.

Senator HILL. I think your statement is very clear. You gentlemen are very frank and very clear as to what you believe. And we respect you for it.

Mr. SMITH. Thank you.

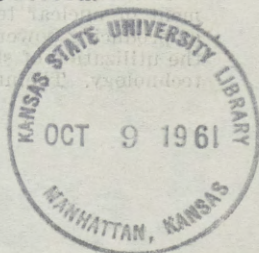
Senator HILL. Anything else?

Mr. SMITH. We appreciate very much the opportunity of appearing.

Senator HILL. Thank you very much.

#### COMMUNICATION

I have here a letter from Edwin Vennard, managing director of Edison Electric Institute to Senator Hayden on the matter of the Hanford plant. And we will file that at this point in the record.



(The letter referred to follows:)

EDISON ELECTRIC INSTITUTE,  
New York, September 7, 1961.

HON. CARL HAYDEN,  
Chairman, Senate Appropriations Committee,  
Washington, D.C.

DEAR SENATOR HAYDEN: We should like to file for the record the attached statements concerning the addition of generating facilities to the new production reactor at Hanford, Wash. These are the same statements that we presented to the Joint Committee on Atomic Energy and the House Appropriations Subcommittee on Public Works.

Very truly yours,

EDWIN VENNARD, *Managing Director.*

TESTIMONY OF SHERMAN R. KNAPP BEFORE HOUSE APPROPRIATIONS  
SUBCOMMITTEE

My name is Sherman R. Knapp. I am president of Connecticut Light & Power Co. In my recent capacity as president of the Edison Electric Institute I submitted two letters to the Joint Congressional Committee on Atomic Energy stating the institute's position on the Hanford steam plant. I should like to submit these letters to this committee and to introduce Mr. Edwin Vennard, vice president and managing director of the institute, who will amplify a few of the institute's objections to the Hanford steam plant.

MAY 16, 1961.

HON. CHET HOLIFIELD,  
Chairman, Joint Committee on Atomic Energy,  
Washington, D.C.

DEAR CONGRESSMAN HOLIFIELD: In my capacity as president of the Edison Electric Institute, I should like to state the position of the institute with regard to the addition of generating facilities to the new production reactor (NPR) as is presently contemplated in the Atomic Energy Commission authorization bill for fiscal 1962.

As you may know, the institute includes 192 operating companies serving over 97 percent of all customers of the investor-owned segment of the electric utility industry in the United States. These customers comprise over 77 percent of our Nation's electric users.

Our comments are directed to the consequences and economics of adding generating facilities to the NPR. We, of course, are not qualified to discuss either the production of or need for weapons-grade plutonium, but we do have experience in the production of electric power and the potentialities of using nuclear energy in this regard.

In previous testimony before the Joint Committee on Atomic Energy we have expressed our belief that the Nation's nuclear power program can best be advanced with a program which stresses research and development. Construction of power-producing reactors should be consistent with the research achievements of developmental programs. Improvement in technology, not the addition of kilowatts, should be the immediate objective of our Nation's nuclear power program. Power requirements should be met with the most economical means available in the various regions of our country. We believe that experience to date confirms the wisdom of this approach.

The expenditures of money for generating facilities to utilize the low-temperature, low-pressure steam available from NPR will not advance our Nation's nuclear power development program. So far as power production is concerned, the Hanford reactor represents retrogression rather than progress. Any experience in fuel design and operation that might be learned from the reactor can be obtained without the addition of facilities to utilize low-temperature, low-pressure steam. The Hanford steam plant cannot possibly be justified on the basis of making a contribution to nuclear power technology.

The reactor obviously produces heat that can be utilized. But the advancement of nuclear technology and the utilization of the most economical means of producing power in the Northwest should be uppermost in our minds and not the utilization of steam which can be considered primitive in our modern utility technology. The uneconomical use of the low-temperature, low-pressure steam of

the NPR will not add to our prestige in the international scientific community, nor will it advance nuclear technology.

Rather than spend taxpayers' money for facilities that will not make a contribution to nuclear power technology, it would be more profitable from the standpoint of the Nation's progress in nuclear power development if money were spent on more basic projects such as nuclear fuel research.

Furthermore, we believe that the building and operating of any thermal plant for the production of power for sale to the public by the Federal Government is contrary to the public interest and American principles. It is not a proper function of the Federal Government and is not necessary. During these times when there is a great need for large and necessary governmental expenditures for national defense and international requirements, it is important that the Federal budget not be burdened with expenditures for electric power development which can be financed in the free market. The Hanford steam plant would establish a dangerous and unnecessary precedent in this regard and in addition is not economically sound and will not make any contribution to civilian nuclear power technology.

Very truly yours,

SHERMAN R. KNAPP,  
*President, Edison Electric Institute.*

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EDISON ELECTRIC INSTITUTE,  
*New York, N.Y., May 25, 1961.*

Hon. CHET HOLIFIELD,  
*Chairman, Joint Committee on Atomic Energy,*  
*Washington, D.C.*

DEAR CONGRESSMAN HOLIFIELD: Thank you for the opportunity to submit a supplementary statement concerning the institute's position on the contemplated addition of generating facilities to the new production reactor (NPR) at Hanford, Wash. Because you questioned the accuracy of our May 16 letter in light of the testimony offered at the May 17 hearing on the NPR, we have read carefully the transcript of this hearing. We still believe that our statements are factual.

In our letter of May 16 we made the following points:

1. Addition of generating facilities to NPR at a cost of \$95 million will not make a contribution to nuclear power technology. Nuclear power technology could be advanced better by sponsoring more basic research and development programs.

2. It is not a proper function of the Federal Government to build and operate thermal plants for the production of power for sale to the public.

3. As electric power capacity can be financed in the free market, there is no need for Government spending for this purpose.

In reading the transcript of the May 17 hearing, we could not find any reference as to the role of the Federal Government in building and operating thermal plants nor any reference to the investor-owned utility industry's ability to supply future power requirements with generating capacity financed in the free market. Therefore, we assume that you refer to our statement about the Hanford steam plant's contribution to nuclear power technology.

Information on nuclear power technology advancement was not the dominant part of the testimony given at the May 17 hearing, but it was stated that the Hanford steam plant could provide experience in the manufacture and operation of very large turbines employing low pressure, saturated steam, and could provide experience in operating a large nuclear power plant in conjunction with a large power system.

We see no reason why the utility industry should seek experience in the manufacture and operation of any size turbine that will utilize low-pressure steam. While it is true that the commercial nuclear powerplants in operation or scheduled for operation in the near future have turbine steam conditions that are lower than modern fossil fuel-fired plants, this is an indication of the status of nuclear technology rather than a desired effect. The major portion of our nuclear research and development program is oriented toward the development of materials and systems for high-temperature nuclear powerplants. Economically competitive nuclear power certainly will not be achieved if we must rely on the steam conditions of the NPR.

Operating experience with a commercial-size nuclear powerplant on a power system unquestionably is a necessary part of our nuclear power program. But we are gaining such experience with plants in operation and will gain additional operating experience in the years to come as more plants are placed in commercial operation. All of these plants will be for the production of power only and will not have dual-purpose functions. The expenditure of \$95 million to gain the incremental operating experience that the dual-purpose Hanford steamplant would contribute would not be a prudent investment.

The testimony of May 17 makes no strong claims that the Hanford steamplant will advance the art of nuclear power.

Although the testimony did not refer to the other statements in our letter, we reiterate that it is not the proper function of the Federal Government to build and operate thermal powerplants to serve utility customers. Furthermore, the record shows that the investor-owned power systems have adequately met the power requirements of their customers. We have plans for the future to continue this record. All of the capacity to serve America's power needs could be financed in the free market. There is no need for the Federal Government to spend money to build powerplants. This is especially true of thermal plants.

We wish to stand on our letter of May 16 and this statement. If you have any specific comment pertaining to our statements, we should be pleased to hear from you. We should appreciate it if this letter is included in the record of the authorization hearings.

Very truly yours,

SHERMAN R. KNAPP, *President.*

TESTIMONY OF EDWIN VENNARD, VICE PRESIDENT AND MANAGING DIRECTOR OF EDISON ELECTRIC INSTITUTE BEFORE HOUSE APPROPRIATIONS SUBCOMMITTEE

My name is Edwin Vennard. I am vice president and managing director of the Edison Electric Institute, a trade association of the investor-owned electric light and power companies. The 192 member companies serve 97 percent of all customers of the investor-owned segment of the industry. The investor-owned companies serve about 80 percent of the Nation's electricity users.

My purpose in being here is to suggest that it is not wise for the Government to spend \$95 million to install electric generating facilities for the new production reactor at Hanford, Wash. There are three reasons:

1. Addition of these facilities will not make a contribution to the advancement of nuclear power technology.
2. The appropriation is not necessary to meet power needs.
3. Spending Government funds on such an addition is wrong in principle.

The expenditure is not necessary, because the power capacity to serve America's power needs including those of the Northwest can be financed in the free market.

There is now in existence in America the largest and most extensive system of transmission lines and powerplants in the world. The present power supply, with about 25 percent reserve capacity, is ample for the existing needs of homes, farms, business, and industry. About 80 percent of the Nation's power supply system has been financed in the free market and there is nothing to indicate that all of America's power needs cannot be so financed.

With the building of this system over the years have come many engineering and economic advances. These have included the building of larger and larger generating units with higher and higher temperatures and pressures; more and more interconnections and pooling with higher and higher transmission voltages. The result has been a constant improvement in efficiency. The average price of a kilowatt-hour of electricity today is less than it was 13 years ago, despite the fact that the costs of material and labor have about doubled.

About 4 million Americans are direct owners of these companies and about 120 million Americans have an indirect financial interest in them through insurance companies, pension funds and the like. The \$46 billion now invested in the investor-owned electric utility industry is the largest investment of any industry in America. This constitutes about 12 percent of all investment in plant and equipment of all industry in America. The \$3.5 billion of new investment per year going into this industry for plant and equipment is larger than for any industry in America.

The new money flowing into the investor-owned electric industry constitutes about 10 percent of all personal savings.

To the extent that new investment for plant construction contributes to the advancement of the American economy, this industry is making a great contribution.

Furthermore, the investor-owned electric light and power industry, of all industry, is the largest single taxpayer to Federal, State and local governments. That is to say, these companies collect from their customers the largest block of taxes for the support of government.

With one-sixteenth of the world's population, America now has more than one-third of all the world's power capacity. This is more than the next five countries combined and three times the capacity of Russia.

The investor-owned companies have plans for practically doubling their capacity during the next 10 years, with continued expansion of the transmission and pooling of facilities. This calls for an expenditure of \$52 billion for new plants between 1960 and 1970. The plans for about doubling again between 1970 and 1980 call for the investment of \$91 billion more during that decade.

This great expansion will be financed in the free market.

In view of these facts, and because the evidence indicates that all such power capacity can be so financed (not just the 80 percent served by investor-owned companies), there is no need for the Federal Government to appropriate money to build powerplants.

This is especially important during these times when we are told that the Federal Government must accelerate our space program, increase our expenditures for national defense and contribute more to the defense and well-being of other nations of the free world.

Finally, I believe it is not a proper function of our Government to engage in operation of business. The American concept is one of free enterprise under Government regulation.

#### HEARING RECESS

Senator HILL. The hearing will stand in recess at this time.

(Whereupon, at 4:50 p.m., Friday, September 8, 1961, the subcommittee recessed, subject to the call of the Chair.)

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes the need for transparency and accountability in all financial dealings.

2. The second part of the document outlines the various methods and techniques used to collect and analyze data. It includes a detailed description of the sampling process and the statistical methods employed to interpret the results.

3. The third part of the document presents the findings of the study. It provides a comprehensive overview of the data collected and discusses the implications of the results for the field of research.

4. The fourth part of the document discusses the limitations of the study and suggests areas for future research. It highlights the need for further investigation into the issues identified during the study.

5. The fifth part of the document provides a conclusion and summarizes the key findings of the study. It reiterates the importance of accurate record-keeping and the value of the research conducted.

## PUBLIC WORKS APPROPRIATIONS FOR 1962

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WEDNESDAY, SEPTEMBER 13, 1961

U.S. SENATE,  
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,  
*Washington, D.C.*

The subcommittee met, pursuant to notice, at 2 p.m., in room F-39, U.S. Capitol, Hon. Lister Hill (chairman of the subcommittee) presiding.

Present: Senators Hill, Magnuson, Stennis, Pastore, Bible, Dworshak, and Hickenlooper.

### ATOMIC ENERGY COMMISSION

#### STATEMENT OF HON. HENRY M. JACKSON, A U.S. SENATOR FROM THE STATE OF WASHINGTON

ACCELERATOR FOR UNIVERSITY OF WASHINGTON

Senator HILL. The committee will kindly come to order.

We are very happy to have our good friend and colleague, Senator Jackson, of Washington, with us.

Senator, we would be delighted now to have you proceed in your own way and make any statement you see fit.

Senator JACKSON. Mr. Chairman, there are two items I would like to comment on very briefly. The first relates to a tandem Van de Graaf accelerator for the University of Washington.

Senator HILL. Do you know where that name Van de Graaf comes from?

Senator JACKSON. I assume some noted scientist from the State of Alabama.

Senator HILL. That is right.

Senator STENNIS. Tuscaloosa.

Senator HILL. He and all his brothers, incidentally, were all great football players.

Senator STENNIS. Incidentally.

Senator JACKSON. Well, that is a good combination.

Mr. Chairman, in the interests of brevity, I would like to place in the record a statement that I have prepared in connection with this research tool. It is a device to aid our physicists in the field of low-energy physics. I might state that it is my understanding from the information that I have received from you and referred to the committee that the funds for this item are in the program for the next fiscal year, in the atomic energy budget—not the current one, but the program for fiscal 1963—but are now included in the lump sum ap-

propriations requested by the National Science Foundation for an amount in the sum of approximately \$1,220,000 for fiscal year 1962.

Senator HILL. The present fiscal year, 1962.

Senator JACKSON. Right.

CONSTRUCTION OF BUILDING BY THE UNIVERSITY

While the total cost of the facility—the equipment, rather—will run approximately \$2,600,000, with the University of Washington putting up \$1,300,000 for a building—in other words, the University of Washington, Mr. Chairman, puts up a building and the National Science Foundation and/or the Atomic Energy Commission would provide the funds for the equipment that goes into the building. Due to this arrangement, it was not necessary for the Joint Committee on Atomic Energy to authorize the facility, because the Atomic Energy Committee only authorizes those structures that relate to physical property, realty, and so on. So it was not authorized by the committee.

What I would like to suggest is that in view of the understanding that the committee now has with the National Science Foundation, namely, that out of their lump sum appropriations for the current fiscal year, they will make available \$1,220,000, assuming you appropriate the money, approve it this year, that there will be a statement in the report pointing up the importance of this project.

Senator HILL. I may say that the appropriation for the National Science Foundation was carried in the independent offices appropriation bill. That bill has passed both Houses of the Congress and has been signed by the President, so it is the law.

Senator MAGNUSON. It is in there. The lump sum is in there now.

Senator JACKSON. That is right, but what I would like to suggest is that in your report, if you do not mind, if it could be arranged, you make reference to the fact that this was considered by your subcommittee and that you are advised that the item is in the independent offices appropriation bill already enacted into law.

Senator MAGNUSON. And that we do not need direct authorization.

Senator JACKSON. No, and that there is no need for appropriations out of the atomic energy budget item, due to the fact that money is already being programed out of the funds in the independent offices appropriation bill.

Senator HILL. Or the funds for the National Science Foundation.

Senator JACKSON. For the National Science Foundation, and the committee has been assured by Dr. Waterman that there will be an appropriation of \$1,220,000 for the current fiscal year, and that the balance of the funds, which goes to complete the equipment costs, which total \$2,600,000, will be requested for or made available in the following year.

Senator HILL. I might say for the National Science Foundation, these funds come out of the university nuclear research facilities program.

Senator JACKSON. In the National Science Foundation.

Senator HILL. That is right.

Senator JACKSON. If that is already enacted into law, I assume—  
 Senator MAGNUSON. That was in my independent offices appropriation bill. But they did not spell out what they are going to do.

## PROPOSED LANGUAGE IN REPORT

Senator JACKSON. Now they have earmarked it, in effect, by this action, and I would appreciate it, Mr. Chairman, if some reference could be made in your report in connection with the submission of your appropriation, if there is no objection, inasmuch as it was considered and discussed in the Joint Committee on Atomic Energy, as an item within the budget of the Atomic Energy Commission.

Now, the other item—

Senator HILL. Before you turn to the other item, is there any question any member of the committee would like to ask about this item of the University of Washington accelerator?

(No response.)

Senator HILL. If not, proceed. Your written statement will be made a part of the record.

(The statement referred to follows:)

## STATEMENT OF SENATOR JACKSON

## TANDEM VAN DE GRAAFF ACCELERATOR, UNIVERSITY OF WASHINGTON

For some time now there has been a growing concern that the United States is falling behind in certain areas of basic research. One such area of concern is in the low-energy nuclear physics field.

Dr. Glenn T. Seaborg, Chairman of the Atomic Energy Commission, in a statement to the American Physical Society, on April 26, 1961, called attention to this possible danger and the need for adequate support for low-energy nuclear physics.

Two well-known physicists—Dr. Herman Feshbach and Dr. Victor F. Weisskopf—who are associated with the Massachusetts Institute of Technology, in a letter of February 7, 1961, to the Chairman of the AEC, called attention to the need for more modern apparatus, such as new tandem and linear accelerators to improve our knowledge of low-energy physics. They pointed out that foreign centers are being equipped with these apparatus and that U.S. centers "are hard put to compete." With your permission, I would request that the letter from Drs. Feshbach and Weisskopf be placed in the record of the hearings.

As a partial effort to maintain U.S. leadership in the scientific field and to meet the needs of our nuclear weapons laboratory, this year's AEC authorization bill includes \$3,500,000 for a 15 million electron volt tandem Van de Graaff facility at the Los Alamos Weapons Laboratory. This project, however helpful it will be, will not meet all our needs in this area of research. Additional tandem Van de Graaffs are needed at other scientific centers.

The University of Washington, which is well known for its research work in the field of physics, is prepared to help meet this need with the construction of a 20-24 million electron volt tandem Van de Graaff facility at its center and has offered to make available \$1,300,000 for construction of the building to house the facility. The university has requested \$2,600,000 from the AEC for the machine.

In the case of the Los Alamos Laboratory, the Government is paying the full amount, including the building. The University of Washington would assume approximately one-third the cost of its project.

Dr. Seaborg, in testifying before the Joint Committee, stated that he was acquainted with the physicists and chemists at the University of Washington and that they were doing "first-class work in the field of low-energy nuclear physics." He advised that they were well qualified to handle the program. He

stated that he was very favorably disposed toward this project but that he was not with the Commission at the time the budget was prepared for fiscal year 1962.

The University of Washington is prepared to proceed now. One of our main problems in our competition with the U.S.S.R. for scientific advancement has been our failure to go from the design and planning stage to the completion of a project as quickly as it takes the Russians. Here is an example whereby we can proceed this year rather than wait and lose another full year.

I would certainly hope that this committee will see the wisdom of not permitting this project to be delayed but including it in this year's appropriation bill.

#### FUNDS IN INDEPENDENT OFFICES APPROPRIATION ACT

Senator HILL. I would like to state for the record that this proposal from the University of Washington for the accelerator was mentioned in the hearings on the independent offices appropriation bill in June. A letter from Dr. Waterman dated May 19 stated that \$6 million had been requested for university nuclear research facilities, and that the University of Washington proposal would be a worthy competitor with 12 other universities for such funds, but the decision would be made after the funds were made available.

As the independent offices appropriation bill finally passed, the lump sum for National Science Foundation was reduced by about 5 percent, so that the allocation to this program may be slightly less than the \$6 million.

When the Atomic Energy Commission was before us last Friday, they stated there are no 1962 funds available for such a project, that there would be no conflict at all with the AEC programs if National Science Foundation would go forward with it, and Dr. Seaborg stated: "And I would be pleased to see that project undertaken under whatever auspices. I think it is a very worthwhile project."

#### APPROVAL BY NATIONAL SCIENCE FOUNDATION

On August 29, Dr. Waterman of the National Science Foundation stated in a letter to Mr. Cooper, our clerk, that the proposal has been favorably reviewed and approval recommended to the National Science Board, and they plan to grant \$1,220,000 in fiscal year 1962, to purchase a model EN 4 15 million electron volt tandem Van de Graaff accelerator, and that additional grants would be made in subsequent fiscal years.

I am now advised that the National Science Board approved the project on September 1, and that notifications of the approval and the grant are scheduled for release sometime next week.

Senator Jackson, you may proceed.

#### COMMUNICATION

Senator JACKSON. I would also like to include for the record a copy of a letter that Dr. Herman Feshbach and Dr. Victor Weisskopf of the Massachusetts Institute of Technology wrote to the Atomic Energy Commission and also an extract of a statement made in connection with a speech by Dr. Glenn T. Seaborg, Chairman of the Atomic Energy Commission on April 26, 1961, in connection with the need for funds in the field of low-energy physics.

Senator HILL. Without objection, then, these documents will go in the record at this point.

(The letter and statement referred to follow:)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,  
DEPARTMENT OF PHYSICS,  
Cambridge, Mass., February 7, 1961.

DR. GLENN T. SEABORG,  
Chairman, Atomic Energy Commission,  
Washington, D.C.

DEAR DR. SEABORG: We have been concerned with the secondary role low-energy nuclear physics in the United States seems to play in Government and university thinking and planning and are therefore taking the liberty of presenting our views on this subject to you.

We include in low-energy nuclear physics all investigations which have to do with the problem of the structure of nuclei but we exclude the problems connected with the properties and structure of the elementary particles involved. The latter problems are dealt with in what is called high-energy physics.

There is no denying that the field of nuclear structure has suffered some loss of glamour in the last years. In a relative sense, Federal support is diminishing, fewer graduate students seek it out. It is harder to find good candidates for jobs in this field. The effects of this phenomenon can be felt already. The centers of activity for both experiment and theory are slowly moving abroad. In nuclear theory one thinks immediately of Copenhagen and Rehovoth, Israel. In experimental physics one finds that the foreign centers are being equipped with the most modern apparatus such as the new tandem and linear accelerators at Copenhagen, the new linacs at Harwell and Saclay, and the remarkable Phillips' cyclotron at Orsay. Our own centers of low-energy physics are hard put to compete.

There is no need to stress the importance the study of the nucleus has for many applications varying from astrophysics to reactor technology. However, it is important to recognize that it is a field in its own right with many unsolved problems which present special challenges to both the theorist and experimentalist.

Many fundamental questions have yet to be answered. What is the nature of the nuclear surface? Are there nuclear forces between three or more particles or can we describe nuclear dynamics by two-body forces only? Are there any typical mesonic effects traceable in nuclear phenomena which are not expressible as nuclear forces? Is our present interpretation of collective states correct and of sufficient generality? Is there a satisfactory theoretical basis for the statistical theory of nuclear reactions? These questions are only a few examples of still unsolved problems which serve to show that the field of nuclear structure is a vital one with much work to be done.

The methods and ideas used in low-energy nuclear physics research are more varied than in other nuclear fields. The theorists employ concepts from field and elementary-particle physics as well as from solid-state physics. The experimenter uses a wide variety of methods varying from scattering experiments to crystal studies as exemplified by the recent Mossbauer effect experiments. It is clearly a field ideally suited for training of young scientists at universities.

Something like a breakthrough in instrumentation has occurred recently. We refer to the development of tandem accelerators for energies between 10 and 20 million electron volts and to the development of high-intensity linear electron accelerators up to 100 million electron volts. These machines permit the investigation of nuclear spectra and nuclear reactions in new and largely unknown energy regions with much better resolution than before. An enormous amount of significant experimental work becomes possible and many of the outstanding problems of nuclear structure will be clarified.

In view of all this we feel that there are compelling reasons for the AEC to activate and support a wide and vigorous program of research in nuclear structure whenever and wherever there are groups capable of carrying it out. This could be done by supporting financially and intellectually the existing centers. Obsolete equipment should be replaced and the formation of new centers encouraged. We must do whatever possible to attract the best men by reestablishing the spirit of adventure and achievement in low-energy nuclear research.

Very truly yours,

HERMAN FESHBACH.  
VICTOR F. WEISSKOPF.

REMARKS BY DR. GLENN T. SEABORG, CHAIRMAN, U.S. ATOMIC ENERGY COMMISSION, AT ANNUAL BANQUET OF AMERICAN PHYSICAL SOCIETY, WASHINGTON, D.C., APRIL 26, 1961

SOME THOUGHTS ON ATOMIC ENERGY RESEARCH

I want to begin with an explanation of the title of my talk this evening: "Some Thoughts on Atomic Energy Research." It is purposely vague and for this our eminent secretary, Karl Darrow, must share the blame—or more accurately, the requirements for a publication deadline of the Bulletin must be blamed.

On that date, many weeks ago, I did not have a very definite plan for the talk. I only knew that this occasion would provide me an excellent and welcome opportunity to talk to an intelligent and interested—or perhaps I should say "vested interest"—group.

Therefore, I have taken the liberty of making the contents of this talk somewhat less broad and all inclusive than the term "atomic energy research" might imply. I do not intend to speak about the program of applied research of the Atomic Energy Commission. This is an important part of the AEC program but it is not, I suspect, of primary interest to the group present in this room tonight.

I intend, rather, to talk about basic research in physical science including something about philosophy and Commission programs in this area. As you know, I have been in my present position as Chairman of the Commission for less than 2 months. Therefore, in describing the AEC activities, I will tend to be descriptive rather than to try, at this time, to give a full evaluation of the specific programs.

Also, I represent only a small part of a large organization which itself is entwined with many other agencies of our Government. What I say, then, in large part, will represent my own personal views. Perhaps I might add that I shall be describing, in a fragmentary way, a philosophy and program toward which I shall be striving.

Let me start with some statements in regard to broad philosophy as to basic research. As most of you know, I had the honor to serve as chairman of a panel of the President's Science Advisory Committee which late last year issued a report entitled "Scientific Progress, the Universities, and the Federal Government." Although this report was the product of a 14-member panel and the PSAC, I am so thoroughly in agreement with its basic concepts that I can say that it represents a good description of my fundamental philosophy on basic science.

I shall not try to summarize the report here. I would like to impart to you, however, some of its flavor. Let me repeat a number of conclusions that seem to express my own views quite accurately. They are:

First: "In view of the growing importance of scientific research to national security and welfare, all parts of the national community should assume a greater responsibility for supporting, strengthening and expanding basic research and graduate education";

Second: "Federal support for basic research and graduate education in the sciences should be continued and flexibly increased so as to support excellence where it already exists and to encourage new centers of outstanding work";

Third: "The Federal Government should continue and enlarge the practice now followed with great success in a few agencies of providing research support over long terms and for broad objectives";

Fourth: "It should be a general basis of policy and action that basic research and the education of scientists go best together; that they are inseparable functions of the universities \* \* \*";

Fifth: "Universities should accept primary responsibility for insuring that their growing partnership with the Government reinforces their freedom and excellence"; and

Sixth: "The Government should strengthen its ability to establish general policies governing its support of basic research and graduate education at the universities. \* \* \*"

The report also emphasized the importance of research performed outside of the universities and suggested that scientists working in such installations also can be connected fruitfully with graduate education.

There are many other important statements in the report but those I have cited seem to me to distill in well-chosen words my own philosophy about basic research. My views have not changed since becoming Chairman of the AEC.

I am happy to say that President Kennedy has proposed substantial additions to the budget of the National Science Foundation to carry out a number of the recommendations of this PSAC report. On March 27, he recommended increases in the NSF budget totaling \$65 million. Two-thirds of this sum would be used for grants to support basic research in the sciences and to improve research facilities, including graduate laboratories.

Having stated what I consider personally to be some of the most important findings of the PSAC Panel, I would like to discuss how the policies and programs of the Atomic Energy Commission stand up under these criteria. This is important because the AEC is one of the five agencies that disburse about 90 percent of all Federal funds obligated for basic research.

I want to add that there is close cooperation and exchange of information between these agencies. The Commission and the National Aeronautics and Space Administration have set up a joint office to develop nuclear space propulsion systems and in the weapons field, obviously, there has to be a very close coordination of effort with the Department of Defense. The AEC works closely with the National Science Foundation in many areas of research support and education programs; for example, we have an agreement with NSF under which the latter takes care of projects involving support of university research and training reactors.

As you know, our universities have been, and will continue to be, part of the foundation upon which our Nation's atomic energy program is built. The Atomic Energy Commission's dependence on the universities is by choice—perhaps I should say, by necessity. Participation by the universities in our programs has made it possible for the Commission, and hence our country, to get urgently required expansion of new knowledge and, simultaneously, to cultivate the production of additional scientific and technically trained manpower.

I would like to say a few words about the methods used by the Commission to support basic research at educational institutions. The lines of demarcation between various forms of arrangements made with universities are broad. They range from a small contract to support the research effort of a single individual to contracts for the operation of a large industrial type of complex. Many of you are familiar with one or more of these arrangements.

The Brookhaven National Laboratory, for example, is managed for the Commission by the nine institutions that formed a nonprofit corporation, Associated Universities, Inc., but its facilities are used by many additional colleges and universities in the northeast area of the United States.

Brookhaven has three arrangements for graduate and postdoctoral research with about 170 scientists participating. One group is doing graduate thesis work; a second group of graduate students participates in the Laboratory's summer program and a third group pursues postdoctoral investigations. Those in this last group are given the status of research associates. Also, each year about 300 people from university faculties spend considerable time at the Laboratory on research projects.

The Argonne National Laboratory is operated under a contract with the University of Chicago but the 31 schools that make up the Associated Midwest Universities have a vital role in the Laboratory program. Under a seminar speakers program of the Midwest university group, about 150 speakers from the university community visit Argonne each year and an even larger number of ANL staff members give seminar talks on the campuses. Also, there are more than 100 men and women currently doing postgraduate research at the Laboratory.

In addition, Argonne operates for the Commission the International Institute for Nuclear Science and Engineering which offers graduate and postdoctoral study for recommended and qualified scientists from friendly countries.

Argonne's Director and my good friend, Dr. Norman Hilberry, speaking for the Laboratory, expressed what I think is the philosophy of the Commission when he wrote that: "To the extent that we are well and favorably known to the university community, we shall prosper. \* \* \* If we fail to meet our obligations to the university community, we shall perish."

In the performance of its primary mission—research and development of weapons—the Los Alamos Laboratory, operated by the University of California, makes continuing contributions to the store of new nuclear knowledge and its program now includes important inquiries in the fields of thermonuclear reactions and advanced fission reactors.

Of course, I am most familiar with the work of the Lawrence Radiation Laboratory at Berkeley. This Laboratory was established by the university before it was known that it would be supported by the Atomic Energy Commission. I assume you are familiar with the fundamental character of much of the work there. The basic research is undertaken by faculty members on a part-time basis and by full-time nonacademic personnel. In addition, as at most of the other Commission-supported installations, graduate students do their thesis research there. As of last September, there were about 250 graduate students at the Laboratory at Berkeley.

The work of the Lawrence Laboratory at the Livermore site is quite different. The emphasis there is on fundamental research and development on nuclear weapons and systems for nuclear propulsion. Livermore also has an important controlled thermonuclear research project.

Other forms of Commission assistance are represented by the research in biological aspects of radiation effects and high-energy physics at the University of Rochester, the programs in the rare earths and in metallurgy at Iowa State University and the financing of particle accelerators, subcritical assemblies and research and teaching reactors at a number of educational institutions.

At the one major research installation operated by an industrial contractor—the Oak Ridge National Laboratory—the Union Carbide Nuclear Co. cooperates in making the excellent facilities there available to universities. This is done in large part through the Oak Ridge Institute of Nuclear Studies (ORINS), a nonprofit educational corporation composed of 39 universities in the South. In addition there is a cooperative graduate program with the University of Tennessee.

ORINS operates some facilities of its own, such as the research hospital, and conducts courses in radioisotope training. Its objective is to pursue a research and training program which will advance our national effort as well as strengthen science teaching in its member universities. Each summer, ORINS and the Union Carbide Co. make it possible for close to 100 university-faculty scientists to work in the laboratory in areas of their own choosing. When these scientists return to their home institutions, many of them initiate basic research programs of their own. The institute also makes arrangements for graduate students to do their thesis research at the laboratory.

In the category of individual contracts with colleges and universities, the Commission, as of the end of the last fiscal year, had upward of 900 annual contracts in force totaling more than \$36 million for unclassified basic work in the physical and life sciences. These contracts were distributed among 162 educational institutions.

Following the revision of the Atomic Energy Act in 1954, the Commission stepped up its program of helping institutions start or expand curricula in nuclear science and engineering. This assistance is in the form of grants for laboratory equipment, loan of nuclear materials, faculty training and graduate fellowships. Since the program began, 330 schools have been assisted with grants totaling \$18.5 million and loan of nuclear materials valued at \$11 million. Approximately a thousand fellowships have been awarded. These figures do not include the substantial aid to friendly countries in grants, equipment, and training under the atoms-for-peace program.

Basic research supported by the Commission in the physical disciplines concentrates on four major areas: physics and mathematics; metallurgy and the materials related sciences; chemistry; and controlled thermonuclear research. I thought that I might best illustrate the Commission's philosophy by making some specific comments about the work in each of these areas.

In the first category are to be found programs in high-energy and low-energy nuclear physics, computer research, and mathematics. Work in high-energy physics is aimed chiefly at an understanding of the so-called fundamental particles of which about 30 have been observed or firmly predicted. We seek to learn their role in nuclear forces and structure.

The properties of these new particles have been studied extensively as a result of their production through the use of accelerators. Multi-Bev accelerators are needed in the case of the K-mesons, antinucleons, and hyperons.

A number of such machines are in operation or under construction in the United States.

The six-Bev accelerator at Berkeley is being remodeled to provide a more intense beam and increase its versatility. The 12-Bev machine nearing completion at Argonne National Laboratory is expected to produce large beams of particles, including high-energy neutrinos. President Kennedy has reaffirmed the request to Congress for authorization to proceed with a 15- to 20-Bev linear electron accelerator at Stanford and, in addition, has asked for funds to launch its construction.

The new proton accelerator at Brookhaven has attained energies as high as 32 Bev, the highest energy produced so far in the world by a particle accelerator. Work is proceeding on high-energy machines at Cambridge (the CEA) and Princeton (the PPA). Some of you here may have participated in the informal discussion last September at Brookhaven, following the high-energy conference at Rochester, in which the feasibility of accelerators ranging above 300 Bev was discussed with Soviet scientists who had attended the Rochester meeting.

I hope you are familiar with the 10-year preview of high-energy physics in the United States recently prepared for the Joint Congressional Committee on Atomic Energy by the Government agencies interested in this field. It represents the collective judgment of the scientific staffs of these agencies as to the level of support the Federal Government should give to the high-energy physics effort.

The United States has been a leader in high-energy physics research since World War II. The 10-year preview outlines a program which, it is believed, would maintain our leadership in this field. Its prestige value is high. In today's world, the scientific strength of a nation is a direct measure of its place in the world community. Costly as this area of research may be, I see no alternative but for the Commission to move continuously forward with full and effective support for those facilities which have been authorized, continuing support for the study of new design concepts and for the construction of additional high-energy accelerators as such undertakings become necessary and are justified scientifically.

In addition to the search for new particles and new phenomena through research at higher and higher interaction energies, much needs to be learned about the properties of presently known particles, because a great deal of detailed information is lacking about their mass, structure, lifetimes, spin, magnetic moment, and mode of decay. High-energy scattering experiments are shedding more and more light on the nature of nuclear forces and the shapes of these force fields.

Recent results obtained at CERN, in measuring the magnetic moment of the muon (the Mu meson) represent another important step in our understanding of elementary particle physics. As you know, this experiment showed that the experimental value of the magnetic moment of the muon is in agreement with the theoretically predicted value to within one part in one hundred thousand.

This allows us to deduce that: (1) the laws of quantum electrodynamics are valid at distances down to 0.7 fermi (i.e., 7 times  $10^{-13}$  cm.); (2) the only observable difference between the muon and electron is its mass (i.e., the muon is 207 times heavier than the electron) and it can therefore truly be called a "heavy electron"; (3) the muon can be visualized as a tiny sphere no bigger than 0.3 fermi in radius; and (4) any fundamental lengths which one may think of introducing as a limit to the relativistic invariance of physics are less than 0.2 fermi.

Our leadership in the high energy field is just cause for serious thought concerning the relationship of that area to low energy nuclear physics. The need for extended effort and additional support in low energy investigations is real and clearly recognizable. One research area must not be pushed forward at the expense of another nor must it be held back so that the other can become more fully developed. In other words, we must be certain that there is adequate support for low energy nuclear physics.

Some of you, no doubt, are using the new machines such as tandem accelerators of from 10 to 20 Mev energy and high intensity linear accelerators capable of giving energies in the region of 30 to 50 Mev. These developments make possible a wide range of studies of nuclear spectra and nuclear reactions in these energy regions. This is heartening because we will recognize that many basic questions remain to be answered.

Techniques of modern nuclear science, such as reaction of nuclides with charged particles, neutron reactions, fission studies, and alpha-, beta-, and gamma-ray spectroscopy, lead to information which is applied to assist in the understanding of the nuclear forces, and for the development of nuclear theory. Also included here are Coulomb excitation by highly charged energetic heavy ions, and the nuclear anisotropy and angular correlations which are observed as the result of low temperature nuclear alignment. An example with which you are familiar is beta ray spectrometry. I am sure you have followed the demonstration of nonconservation of parity from the analysis of the beta particles emitted by radioactive nuclei.

Centers of activity, both experimental and theoretical, in the low energy physics field are slowly, but steadily, moving away from the United States. The modern new facilities such as the new tandem and linear accelerators in Copenhagen, the Phillips cyclotron at Orsay, and the new linacs at Harwell and Saclay, equip such foreign centers very well to conduct experimental studies in low energy physics.

Funds and facilities must be made available for vigorous work in low energy nuclear physics whenever and wherever there are capable groups interested in carrying out such programs. No field of basic research is more ideally suited for the development of young scientists at our universities.

The need for additional low energy accelerators remains great, both to replace older existing equipment and to strengthen the nuclear research capabilities of our colleges and universities. I intend to give some attention as to how best we might meet this problem in the coming months.

The Commission effort in basic metallurgy and materials research encompasses basic solid state physics, metallurgy, ceramics, corrosion, and the interaction of radiation with solids. Thus it crosses many boundaries. I shall not try to describe the programs in detail here. I do wish to emphasize, however, that I believe materials research, in addition to its basic interest, has very important practical applications to the welfare of our country. Support for this work in the United States has been lagging.

Included here is the Commission's basic research in solid state nuclear physics which is long range in character and is concerned more with phenomena than with specific material. The investigator selects the materials best suited to the subject matter under investigation rather than fitting the experiment to designated materials.

Examples of individual researches are numerous. A partial list includes alloy theory, electronic structure of solids, mechanisms of atom movements in solids and liquids, origin and influence of lattice imperfections in solids, the nature of strain hardened states, the mechanisms of recovery, recrystallization and grain growth in materials, and the physics of surface reactions.

I am told that the Commission programs account for one-fourth of the total operating university contract research (excluding facilities) sponsored by all governmental agencies in the field of solid state physics.

The entire materials field has direct application to our defense and space programs. Our programs for technological advancement in these areas face not only limited funds but extremely limited numbers of adequately trained scientific personnel.

These activities are so vital to our national well-being that the Federal Council for Science and Technology asked its coordinating committee on materials to try to find a solution to the problem. This group came up with the proposal of establishing interdisciplinary laboratories for materials research on university campuses.

The Federal Council adopted the idea in principle and has recommended, as a major part of the overall national materials research program, the establishment of this kind of laboratory at universities to foster training of students in this field.

The Interdisciplinary Laboratory program is being carried out by the Atomic Energy Commission, the Department of Defense through its Advance Research Project Agency, and by NASA. Good support is being given to a limited number of schools but this effort by no means satisfies the national need.

The great bulk of our universities, including some of the large ones and many of the smaller institutions, will not receive any benefits from this program as presently constituted. It is in the national interest to give meaningful support not only to the present few larger schools, but also to additional larger schools and to the smaller colleges. The Commission effort is directed toward

strengthening research in the materials related sciences throughout the country.

Now I come to nuclear chemistry, but let me hasten to explain what I mean here. There is a problem of semantics.

You know for example that much research in low energy physics is carried on by chemists—or perhaps I should say by people who have obtained their degrees in chemistry. It is difficult to know whether we should call these investigators nuclear chemists or nuclear physicists.

Personally, I tend to define nuclear chemistry broadly as that area of nuclear science in which chemically trained scientists work and make contributions. The nuclear chemist uses all the techniques of modern nuclear science to obtain information which assists in the understanding of the nucleus and nuclear forces and in developing nuclear theory. Much of what I have mentioned in my discussion of low-energy nuclear physics could just as well be described as nuclear chemistry.

The study of the nuclides of the heavy elements is a part of nuclear chemistry with which I have been concerned personally. Both the naturally occurring nuclides in this part of the periodic system (all radioactive) and those produced by nuclear reactors and accelerators are studied.

Research in heavy element nuclear chemistry also includes such subjects as the investigation of the fission process under various conditions, decay schemes and energy levels of excited nuclei. Other areas of interest embrace the nuclides resulting from fission and reactions produced by high-energy particles (spallation).

Closely related to the heavy element nuclear chemistry program is our national transplutonium production project. This is a long-range program for the reactor production of relatively large amounts of transplutonium isotopes. These materials are needed to conduct research on their chemical and nuclear properties. Also, they are used as target materials for the manufacture of new elements and isotopes. Such materials will be extremely useful in obtaining information on isotopes produced in the operation of power reactors.

Substantial quantities of americium, curium, berkelium, californium and einsteinium will be produced. Californium 252 is the most unusual and important of these isotopes because of its high rate of decay by spontaneous fission. Its spontaneous fission neutron spectrum is very similar to the thermal fission spectrum of uranium 235. Samples provided under this program will become valuable tools for reactor studies and fast fission spectrum work.

In this connection, I am sure that you will join me in congratulating the team at the Lawrence Laboratory that recently discovered the isotope of element 103. Incidentally, this new element isotope is the first to be discovered solely by nuclear methods.

The Berkeley scientists—Albert Ghiorso, Torbjorn Sikkeland, Almon E. Larsh, and Robert M. Latimer—performed their experiments with a heavy ion accelerator. You may have read also that the Berkeley researchers have suggested the name Lawrencium for the new elements. I endorse that suggestion fully.

The Commission's basic effort in chemistry also covers such areas as chemical properties and reactions, chemical methods of isotope separation, and process chemistry.

Now I would like to say a few words about our controlled thermonuclear research effort—the diversified program to determine the feasibility of producing power through the use of the energy of nuclear fusion.

For those who may not have followed this field closely, the investigators' first problem is to heat a mixture of ions such as deuterium and tritium to a temperature sufficient to initiate nuclear reactions between the colliding ions. In a 50-50 mixture of deuterium and tritium, this is about 5 kilovolts, or, in popular terms, about 50 million degrees centigrade. At this temperature, deuterium and tritium nuclei will collide frequently and many of them will react with the resultant liberation of substantial amounts of nuclear energy.

The second problem is to confine the hot ionic gas—the plasma—long enough to release sufficient energy to be useful in the generation of electricity. Ingeniously devised magnetic fields forming a kind of magnetic bottle are used to confine the plasma.

Methods for igniting and confining the thermonuclear plasma are under study at four Commission laboratories—Los Alamos, Livermore, Oak Ridge and Princeton—and also at the Naval Research Laboratory.

The Soviets have about an equal effort underway. The rest of the world, taken together, accounts for a program about the same size as our own. All

are making progress but many years probably lie ahead before fusion power reactors can be built.

At both Los Alamos and the NRL installations, powerful new condenser banks are being used for rapid compression of plasma in devices of the type called Seylla. Average ion energies of above 2 kilovolts, or temperatures of about 20 million degrees centigrade, have been obtained.

Recently, the Lawrence Radiation Laboratory at Livermore announced an important advance. The hot plasma was squeezed twice to heat it to approximately 35 million degrees. We hope that modifications in the apparatus will provide temperatures in excess of 50 million degrees very soon.

At ORNL, a modification of a magnetic mirror machine, called DCX-1, is operating at pressures much lower than those previously obtained with this technique. I know you will be interested in hearing tomorrow of the results of some recent experiments with the DCX-1. The Laboratory is building a more versatile successor, the DCX-2, which is expected to make possible further advances in the study of controlled thermonuclear reactions.

Princeton's model C stellarator is in early stages of operation. Scientists there hope to obtain more information on the capabilities of the ohmic method for heating the trapped ions. Thereafter, equipment for carrying the plasma to higher energies will be installed.

If and when any of these experiments result in confining the plasma satisfactorily, it will be an event of great scientific importance. The production of a well-confined thermonuclear plasma would open the way to conduct other experiments designed to test the feasibility of a thermonuclear reactor.

This has been a brief review of my concept of the Atomic Energy Commission's philosophy for supporting basic research which I have tried to illustrate with numerous examples. Most members of this well-informed group probably have intimate knowledge of some parts of the Commission program but I hope it has been useful to try to put the entire effort into a unified perspective.

In conclusion, I would like to make a few remarks in another area which has more to do with the practical applications of science than with basic science about which I have been speaking primarily this evening.

President Kennedy's call for selflessness in service to our country brings to mind the many needs and opportunities for applications of science to nonmilitary or civilian purposes in such a way as to contribute to our economic strength. This may be as important in the future as the contribution of science to our military strength.

There are a number of such areas where imaginative contributions of the highest creative type are required by our very best scientists to advance the welfare of our country. These areas involve applied physics and engineering as well as fundamental inquiry.

Some of them relate directly to our national nuclear energy program such as the need to develop the technology of using plutonium as a reactor fuel and to solve the serious problem of disposal of radioactive wastes. But many relate more broadly to national needs.

One might mention, for example, the development of much more economical means of long-range transmission of electric power; better control over or reversal of the chemical contamination of our environment; long-range predictions of weather, including—possibly—eventual partial control of weather; the desalting of sea water to meet a critical situation in the supply of fresh water; the exploitation of the resources of the ocean, the application of biophysics and biochemistry to the whole problem of living matter; and means for replacing our dwindling national resources of which the application of nuclear power is one part. I am sure you can add many more examples.

I feel so strongly about the need for tackling such national problems that I am willing to suggest that even our own Atomic Energy Commission national laboratories, busy as they are, might assist in the solution of some of them, even though this goes beyond their present atomic energy missions.

We will need to call on every available resource to speed up our technological and economic progress. To do less would impair the ability of the United States to meet the new kind of technical competition which is part of the worldwide ideological struggle.

## HANFORD POWERPLANT

Senator JACKSON. Thank you, Mr. Chairman. The other item is a contingent one, and that is the funds for the power facilities for the Hanford atomic energy reactors. This, of course, Mr. Chairman requires authorization. The matter is going to be brought up, I believe, on the floor of the House today in the conference report. As you know, the amount requested by the Bureau of the Budget by the President, for the Hanford plant was \$95 million. This is what was passed by the Senate in the authorization bill. The House struck it out. We have had a conference and we have reduced the amount to \$58 million to provide for one generator with 400,000 kilowatts in lieu of the 860,000-kilowatt powerplant with two generators.

I have a statement on that, and without taking the time of the committee, I would just like to include it in the record at this point, if there is no objection.

Senator DWORSHAK. The House is voting on it this minute.

Senator JACKSON. They are voting on the conference report. It was passed by the Senate and it is now pending.

Senator HILL. Without objection, the statement of the Senator from Washington will go in at this point.

(The statement referred to follows:)

## STATEMENT OF SENATOR JACKSON

I am before you today to urge your approval of funds for the addition of electric generating facilities to the Hanford new production reactor.

The Hanford electric plant was proposed by the present administration in this year's AEC authorization bill. Dr. Glenn Seaborg, the present Chairman of the AEC, strongly supported this project and so testified during the course of extensive hearings held before the Joint Committee on Atomic Energy. I might also add that Mr. John A. McCone, Chairman of the AEC under the administration of President Eisenhower, has also enthusiastically endorsed the project.

The proposal to add electric generating facilities to the NPR was the result of comprehensive technical and economic studies of the plant's feasibility. These included a 2-year study by the Federal Power Commission in cooperation with the AEC, General Electric Co., and the Bonneville Power Administration, as well as the Corps of Engineers. A report in February 1961 by the Federal Power Commission on all of these studies reached the conclusion that the project was both technically and economically feasible and that very significant benefits could be realized by the Federal Government in carrying out the project.

As originally proposed, the project was to consist principally of two-turbine generator units with a rated capacity of 800,000 kilowatts. The energy for the operation of the plant would have come from the waste heat generated by the NPR in the form of 11 million pounds of steam per hour. The estimated cost of this plant as originally proposed by the AEC was \$95 million.

The other body, in considering the AEC authorization bill, deleted the Hanford project on a teller vote of 176 to 140, or approximately 56 percent of those present and voting, voting against the Hanford project.

The following week on July 18, the Senate considered the AEC authorization bill and by a vote of 54 to 36, or 62 percent of those present and voting, approved the inclusion of the Hanford project in the AEC authorization bill.

The Senate, having acted on the House bill, sent the bill back to the House for further action. The House, on August 8, requested a conference which was agreed to by the Senate. The conferees met and on August 31, the conference report was filed in the other body. On September 5, the conference report was considered by the Senate and approved by voice vote.

Mr. President, I would like to briefly describe the contents of that conference report. The conferees after much hard bargaining, approved a \$58 million electric generating plant at the NPR. This facility will consist of only one turbine generator unit with a rated capacity of 400,000 kilowatts or one-half of that

originally proposed in the AEC authorization bill. There are two points that I wish to emphasize with regard to the compromise reached in conference.

First, all of the electrical power produced at the facility will be used for national defense purposes in connection with the operation of the AEC Hanford installation. Not a single kilowatt of power will be sold commercially.

Second, from the point of view of economic feasibility, this plant can be paid off by savings on the cost of electrical power at Hanford over a period of about 9 years of operation, including a 4-percent annual interest charge on the plant investment. Without question, therefore, the plant is a sound economic investment for the Government.

The \$58 million plant, agreed to by the conferees, is a sensible compromise in the best interests of the Government and I urge your approval of funds for the project.

AUTHORIZATION BILL

Senator MAGNUSON. Let the record show that I join with my colleague.

Senator JACKSON. Both these statements will include you, if the record will show that.

Senator HILL. Senator Jackson, on behalf of himself and Senator Magnuson.

Senator JACKSON. Thank you.

Senator HILL. Are there any questions, gentlemen?

Senator DWORSHAK. Off the record.

(Off record discussion.)

Senator MAGNUSON. I want to ask this question. We have the bill in here, the civil functions bill, the House bill which you say they are voting on. In what section would Hanford be included?

Senator JACKSON. Well, it is in the—

Senator MAGNUSON. Is it in the total amount?

Senator HICKENLOOPER. No, it is a line item.

Senator JACKSON. You see, the whole authorization bill for the current fiscal year is tied up in the conference report, so that it is all up in the air.

Senator MAGNUSON. Now they are voting on that?

They are voting on the authorization?

Senator JACKSON. The House is voting on the authorization conference report of the Atomic Energy Commission.

Senator MAGNUSON. So it is not in this bill?

Senator JACKSON. No, the House could not pass it because it had not been authorized, subject to a point of order in the House.

Senator HILL. Are there any other questions, gentlemen? Senator Hickenlooper, do you have any questions?

Senator HICKENLOOPER. No, I have not, thank you.

Senator BIBLE. I have none, thank you.

Senator HICKENLOOPER. I might say I have several questions, but I have already raised them on the floor. I am not going to continue the argument here. I am against the Hanford proposal. I think I shall say that so there will be no misunderstanding about my position.

Senator JACKSON. Well, I explained before you came in, that my statement here was contingent upon authorization of the project, and this is still in the state of something or another.

Senator HILL. Senator Pastore, do you have any questions?

Senator PASTORE. None.

Senator DWORSHAK. I have none.

Senator HICKENLOOPER. Is this a subcommittee of the Public Works Subcommittee?

Senator HILL. This is a subcommittee of the Public Works Subcommittee.

Senator HICKENLOOPER. All right.

Senator JACKSON. I want to express my special appreciation to the chairman for arranging this special meeting of the subcommittee.

(See p. 59)

U.S. ATOMIC ENERGY COMMISSION,  
Washington, D.C., September 18, 1961.

HON. LISTER HILL,  
Chairman, Subcommittee on Atomic Energy Commission, Tennessee Valley Authority, of the Committee on Appropriations, U.S. Senate.

DEAR SENATOR HILL: In accordance with the request made during the hearings on Friday, September 8, before your Subcommittee on Appropriations for the Atomic Energy Commission, there is attached a proposed amendment to the public works appropriation bill, 1962, as reported by the House, which would provide construction funds in the amount of \$205,960,000 to the Commission for the fiscal year 1962. With the exception of funds for the electric energy generating facilities for the new production reactor, Hanford, Wash., which were excluded from the authorization bill, as passed by the Congress, the amount requested is consistent with the President's budget submission for construction funds for the Commission for fiscal year 1962 as set forth in House document 125.

There is also attached an analysis showing the basis of the funds requested in this amendment.

Sincerely yours,

(Signed) GLENN T. SEABORG,  
Chairman.

U.S. ATOMIC ENERGY COMMISSION

PROPOSED AMENDMENT TO THE PUBLIC WORKS APPROPRIATION ACT, 1962 (H.R. 9076)  
(AS REPORTED BY THE HOUSE)

On page 21, after line 15, insert the following:

"PLANT ACQUISITION AND CONSTRUCTION

"For expenses of the Commission, as authorized by law, in connection with the purchase and construction of plant and other expenses incidental thereto necessary in carrying out the purposes of the Atomic Energy Act of 1954, as amended, including the acquisition or condemnation of any real property or any facility or for plant or facility acquisition, construction, or expansion; and hire of passenger motor vehicles; \$205,960,000, to remain available until expended."

## Authorizing legislation

Project No. and title	As submitted to the Congress	Now included in H.R. 7576 as passed by the Congress	Appropriations	
			As included in President's budget	As requested in proposed amendment
NEW PROJECTS AUTHORIZED FOR FISCAL YEAR 1962				
62-a-1 Modifications to production and supporting installations.....	\$7,500,000	\$7,500,000	\$7,500,000	\$7,500,000
62-a-2 Fission product recovery, phase II, Hanford, Wash.....	1,500,000	1,500,000	1,500,000	1,500,000
62-a-3 Modifications for improved natural fuel elements, Savannah River, SC.....	3,950,000	3,950,000	3,950,000	3,950,000
62-a-4 Solvent purification installation, Savannah River, S.C.....	500,000	500,000	500,000	500,000
62-a-5 Additional reactor confinement, Savannah River, S.C.....	3,000,000	3,000,000	3,000,000	3,000,000
62-a-6 Electric energy generating facility for the new production reactor, Hanford, Wash.....	95,000,000	0	60,000,000	0
62-b-1 Relocation of Clinch River pumping station, Oak Ridge, Tenn.....	1,425,000	1,425,000	1,425,000	1,425,900
62-b-2 Feed vaporization building, Paducah, Ky.....	585,000	585,000	585,000	585,000
62-b-3 Permanent Gallaher Bridge, Oak Ridge, Tenn.....	1,265,000	1,265,000	1,265,000	1,265,000
62-c-1 Weapons production, development, and test installations.....	7,500,000	7,500,000	75,00,000	7,500,000
62-c-2 Specialized plant addition and modification, Oak Ridge, Tenn.....	3,500,000	3,500,000	3,500,000	3,500,000
62-c-3 Tandem Van de Graaff facility, Los Alamos, N. Mex.....	3,500,000	3,500,000	3,500,000	3,500,000
62-d-1 Test plant for Project SNAP, Santa Susana, Calif.....	3,375,000	3,375,000	3,375,000	3,375,000
62-d-2 Experimental beryllium oxide reactor, National Reactor Testing Station, Idaho.....	8,000,000	8,000,000	8,000,000	8,000,000
62-d-3 Fuels recycle pilot plant, Hanford, Wash.....	5,000,000	5,000,000	5,000,000	5,000,000
62-d-4 High radiation level analytical laboratory, Oak Ridge National Laboratory, Tennessee.....	2,000,000	2,000,000	2,000,000	2,000,000
62-d-5 Improvement to radioactive liquid waste system, Oak Ridge National Laboratory, Tennessee.....	1,700,000	1,700,000	1,700,000	1,700,000
62-d-6 Experimental organic cooled reactor loops, National Reactor Testing Station, Idaho.....	6,000,000	6,000,000	3,300,000	3,300,000
62-d-7 Ultrahigh temperature reactor experiment building, Los Alamos Scientific Laboratory, New Mexico.....	3,500,000	3,500,000	3,500,000	3,500,000
62-e-1 Additional transient housing, Argonne National Laboratory, Illinois.....	300,000	300,000	300,000	300,000
62-e-2 Technical services building, National Reactor Testing Station, Idaho.....	1,500,000	1,500,000	1,500,000	1,500,000
62-e-3 Instrumentation and health physics building, Brookhaven National Laboratory, New York.....	2,000,000	2,000,000	2,000,000	2,000,000
62-f-1 Modifications to CP-5 reactor and low-energy accelerator installations, Argonne National Laboratory, Illinois.....	1,650,000	1,650,000	1,650,000	1,650,000
62-f-2 Accelerator and reactor additions and modifications, Brookhaven National Laboratory, New York.....	1,875,000	1,875,000	1,875,000	1,875,000
62-f-3 Accelerator improvements, Cambridge and Princeton accelerators.....	500,000	500,000	500,000	500,000
62-f-4 Accelerator improvements, Lawrence Radiation Laboratory, California.....	550,000	550,000	550,000	550,000
62-g-1 High energy physics laboratory, Argonne National Laboratory, Illinois.....	6,900,000	6,900,000	6,900,000	6,900,000
62-g-1 Chemistry laboratory, Brookhaven National Laboratory, New York.....	6,000,000	6,000,000	6,000,000	6,000,000
62-g-3 Cosmotron laboratory addition, Brookhaven National Laboratory, New York.....	525,000	525,000	525,000	525,000
62-g-4 Mechanical shops building, Lawrence Radiation Laboratory, California.....	2,640,000	2,640,000	2,640,000	2,640,000
62-g-5 Physics building, University of Chicago, Chicago, Ill.....	0	800,000	0	0
62-h-1 Laboratory for mixed fission product inhalation studies, Lovelace Foundation, Albuquerque, N. Mex.....	2,000,000	2,000,000	1,500,000	1,500,000

## Authorizing legislation—Continued

Project No. and title	As submitted to the Congress	Now included in H. R. 7576 as passed by the Congress	Appropriations	
			As included in President's budget	As requested in proposed amendment
<b>NEW PROJECTS AUTHORIZED FOR FISCAL YEAR 1962—continued</b>				
----- Clinical laboratory, Atomic Bomb Casualty Commission, Nagasaki, Japan	\$550,000	0	0	0
62-i-1 Cell physiology laboratories, Oak Ridge National Laboratory, Tennessee	500,000	\$500,000	\$500,000	\$500,000
62-i-2 Mammalian genetics laboratories, Oak Ridge National Laboratory, Tennessee	760,000	760,000	760,000	760,000
62-i-3 Controlled environment laboratory, Brookhaven National Laboratory, New York	0	1,000,000	0	0
62-i-4 Animal bioradiological laboratory, Lawrence Radiation Laboratory, California	0	700,000	0	0
62-j-1 Additional junior high school construction, Los Alamos, N. Mex.	1,750,000	1,750,000	1,750,000	1,750,000
62-j-2 Additional elementary school construction, Los Alamos, N. Mex.	700,000	700,000	700,000	700,000
62-j-3 Mesa public library addition, Los Alamos, N. Mex.	70,000	70,000	70,000	70,000
62-j-4 Real estate development, Los Alamos County, N. Mex.	410,000	410,000	410,000	410,000
----- Housing program at Los Alamos	2,790,000	0	2,790,000	0
----- Community support facility, Los Alamos, N. Mex.	300,000	0	300,000	0
62-k General plant projects	34,510,000	34,510,000	34,510,000	34,510,000
Subtotal	227,580,000	131,440,000	188,830,000	125,740,000
<b>NEW FUNDS FOR PREVIOUSLY AUTHORIZED PROJECTS</b>				
59-a-5 Production reactor facility for special nuclear materials, convertible type, Hanford, Wash.			7,200,000	7,200,000
60-e-11 Natural circulation test plant, National Reactor Testing Station, Idaho			4,000,000	4,000,000
61-d-7 Test installation for Project Rover			7,000,000	7,000,000
61-d-8 Test installation for Project Pluto			6,000,000	6,000,000
61-d-9 Advanced test reactor (amended authorization)			3,550,000	3,550,000
61-d-10 Power reactor plants for the Antarctic			7,000,000	7,000,000
61-f-2 Princeton-Pennsylvania accelerator addition, Princeton, N. J.			5,470,000	5,470,000
61-f-6 Major bevatron improvements, Lawrence Radiation Laboratory, California			5,350,000	5,350,000
61-f-7 Linear electron accelerator (amended authorization)			26,000,000	26,000,000
61-f-8 Materials research laboratory, University of Illinois			5,600,000	5,600,000
61-f-9 Radiation laboratory, University of Notre Dame			1,450,000	1,450,000
57-d-1 Zero gradient synchrotron, Argonne National Laboratory, Illinois			13,000,000	13,000,000
Subtotal			91,620,000	91,620,000
Grand total			280,450,000	217,360,000
Net free unobligated balance brought forward			-11,700,000	-11,400,000
New appropriation requested			268,750,000	205,960,000

## CONCLUSION OF HEARINGS

Senator HILL. We are very happy to have had you here, sir.

Gentlemen, we have no further witnesses, so that will conclude the hearing.

(Whereupon, at 2:15 p.m., Wednesday, September 13, 1961, the hearing was concluded.)



## LIST OF WITNESSES

---

	<b>Page</b>
Betts, Brig. Gen. A. W.....	1
Burrows, Don S.....	1
Corso, V.....	1
Dunham, Dr. Charles L.....	1
Ellis, L. E.....	59
Faulkner, R. L.....	1
Fowler, E. Eugene.....	1
Graham, John S.....	1
Hair, Harold H.....	102
Haworth, Dr. Leland J.....	1
Jackson, Hon. Henry M.....	117, 130
Jones, A. R.....	59
Kilbourne, Richard.....	59
Luedecker, A. R.....	1
Marquis, Robert H.....	59
McCarthy, F. J., Jr.....	1
McDaniel, Dr. Paul W.....	1
Meehan, John J.....	102
Naiden, Neil D.....	1
Nelson, Lewis B.....	59
Owen, Marguerite.....	59
Palo, George P.....	59
Pittman, Dr. Frank K.....	1
Quinn, George F.....	1
Seaborg, Dr. Glenn T.....	1
Smith, Richard W.....	102
Van Mol, Louis J.....	59
Vogel, Herbert D.....	59
Wagner, Aubrey J.....	59
Wells, A. A.....	1
Wessenauer, G. O.....	59
Wilson, Dr. Robert E.....	1



# INDEX

	Page
Atomic Energy Commission.....	1
Fallout situation.....	38, 39
Megaton bomb.....	38
Supplemental estimate.....	2
Appropriation request.....	19
Operating expenses.....	6
Administrative costs.....	46
Biology and medicine.....	9, 36
Agencies, coordination with various.....	37, 40
Amount requested.....	36
Brookhaven Laboratory.....	40
Cancer research.....	36
State agricultural stations and radiobotany facilities.....	41
Total funds for program.....	36
Civilian use of isotopes and explosives.....	9, 45
Amount requested.....	45
Plowshare programs.....	45
Community services.....	10, 46
Los Alamos.....	47
Other communities.....	47
Funds available for transfer.....	23
House report.....	16
Jackson, Hon. Henry M., statements.....	119, 130
Accelerator, University of Wisconsin.....	118
Communications.....	120
Hanford Power Plant.....	129, 130
Language changes, justification.....	11
Physical research program ( <i>see also</i> Plant acquisition and construction).....	9, 32
Amount requested.....	32
Linear electron accelerator, Stanford.....	33, 35
Nuclear accelerator, University of Wisconsin.....	34
Program direction and administration.....	10
Raw materials program.....	8, 19
Amount requested.....	19
Foreign purchases, decline in.....	19
Uranium supply.....	20, 21
Reactor development program ( <i>see also</i> Plant acquisition and construction).....	8, 24
Amount requested.....	24
Cost per kilowatt, power.....	25
Hanford Power Plant.....	14, 48, 129
Idaho, experimental project.....	32
Missile propulsion.....	27
Mobile powerplants.....	27
Nuclear-powered vessels.....	27
Privately owned power reactors.....	25
Propulsion power, merchant ships.....	26
Satellite instruments, operation.....	27
Southern California Edison Co., arrangement with.....	26
Security investigations.....	10
Special nuclear materials program ( <i>see also</i> Plant acquisition and construction).....	8, 21
Amount requested.....	21
Training, education, and information.....	9, 42
Amount requested.....	42
Foreign students, total.....	43
Puerto Rico and South America, programs in.....	44
Research information, publication of.....	41
Students abroad, training abroad.....	42
Tuition fee.....	43
Weapons program ( <i>see also</i> Plant acquisition and construction).....	8, 22
Project Vela.....	24
Underground testing, resumption of.....	22

Atomic Energy Commission—Continued	
Supplemental estimate—Continued	Page
Plant acquisition and construction .....	12, 131
Amount requested .....	47
Construction programs, highlights .....	13
Language changes .....	15
Linear electron accelerator ( <i>see</i> Operating expenses, physical research program)	
Nuclear materials, amount for .....	47
Amount requested .....	22
Existing law, provisions .....	49
Hanford plant .....	48
TVA power .....	48
Reductions by House committee .....	51
Civilian use of isotope and nuclear explosives .....	56
Research on food .....	57, 58
Construction problems .....	59
Physical research .....	54
Law-energy physics machines .....	54
Space program, effect on .....	55
Physical research, amount for .....	51
Reactor development program, effect .....	51, 52
Continuation of projects .....	53
Euratom program .....	53
Space and military programs .....	52
Unobligated balance .....	47
Weapons, amount for .....	50
Seaborg, Dr. Glenn T., statement of .....	18
Tennessee Valley Authority .....	59
Appropriation request, total .....	64
Chamber of Commerce, U.S. .....	102
Smith, Richard W., statement of .....	102
Atomic energy, recommendations for .....	105
Hanford plant, statement on .....	106
Policy declarations .....	102
TVA:	
History .....	110
Recommendations for various programs .....	103
User charges .....	105, 108
Communication .....	111
Vennard, Edward, letter and enclosure .....	112
Testimony before House committee .....	114
Foreign visitors .....	100
Investment and annual return .....	64
Program, 1962 .....	60
Clinch River, Tenn., project .....	60
Forestry research and demonstration .....	63
Guntersville Dam, navigation lock .....	61
Hydrogenerator units, six new .....	60
Knoxville steamplant .....	60
Muscle Shoals, chemical facilities .....	61, 62
Steam generating units .....	60
Tributary watershed protection and improvement .....	62, 65, 78
Appraisal, new approach to .....	82
Basic legislation .....	80
Cost, distribution of .....	73
Economic returns .....	75, 76
Erosion control .....	72
Fish and wildlife resources development .....	74
Fort Loudoun, extension of dam .....	83
Multipurpose development .....	75
Paper mills .....	71
Poultry-raising industry .....	74
Programs underway .....	67
Report of Board, 1936 .....	66
Resources, integrated development of .....	68

Tennessee Valley Authority—Continued	
Program, 1962—Continued	
Tributary watershed protection and improvement—Continued	Page
State and local participation	66, 68, 69
“TVA: Democracy on the March”, publication	70
Test-demonstration farms	72
Total areas	67
Total funds	82
Valley improvement associations	79, 82
Wheeler Dam	61, 76
Investigating board, report of	77
Summary tables	84
Supplemental estimates (H. Doc. 129)	86
Authorization, need for additional	97
Farm test demonstration plants, list of State	93
Fertilizer operations	88
Ammonium nitrate, nonexplosive	89
Ammonium phosphate	90
Forestry program	93
Corinth, Miss., pulp and paper mill	93
Pine seedlings, improved types	94
Kentucky and Tennessee Lake, channel	99
Missiles, transport by water	101
New compound, oxamide	88
Oxygen from fertilizer, extraction	89
Pan granulator	90, 91
Research on processes, statement	97
Mississippi, power sale to	95
New financing program	96
Patents, use by industry of TVA	91
Payment to TVA fund	86
Steam generating plants	94
Total generating plants	95
TVA revenues	96
Twin Lakes Park	99
Yellow Creek watershed, Mississippi	95
Vogel, Herbert D., statement	59





