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94TH CONGRESS } HOUSE OF REPRESENTATIVES { REPORT
1st Session } No. 94-294

AUTHORIZING APPROPRIATIONS FOR THE ENERGY RESEARCH AND
DEVELOPMENT ADMINISTRATION FOR FISCAL YEAR 1976 AND FOR
THE TRANSITION PERIOD ENDING SEPTEMBER 30, 1976

JUNE 13, 1975.—Committed to the Committee of the Whole House on the State
of the Union and ordered to be printed

Mr. PRICE, from the Joint Committee on Atomic Energy and
Mr. TEAGUE, from the Committee on Science and Technology,
submitted the following

JOINT REPORT

together with

ADDITIONAL VIEWS

[To accompany H.R. 3474]

The Committee on Science and Technology and the Joint Committee
on Atomic Energy, having considered H.R. 3474, a bill to authorize
appropriations for the Energy Research and Development Administra-
tion for fiscal year 1976 and for the transition period ending Septem-
ber 30, 1976, hereby report favorably thereon, with an amendment, and
recommend that the bill, as amended, do pass.

(1)

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AUTHORIZING APPROPRIATIONS FOR THE ENERGY
RESEARCH AND DEVELOPMENT ADMINISTRATION
FOR FISCAL YEAR 1976 AND FOR THE TRANSITION
QUARTER ENDING SEPTEMBER 30, 1976

JULY 24 (legislative day, JULY 21), 1975.—Ordered to be printed

Mr. CHURCH, from the Committee on Interior and Insular Affairs,
submitted the following

REPORT

[To accompany S. 598]

The Committee on Interior and Insular Affairs, to which was referred the bill (S. 598) to authorize appropriations to the Energy Research and Development Administration in accordance with section 261 of the Atomic Energy Act of 1954, as amended, section 305 of the Energy Reorganization Act of 1974, and section 16 of the Federal Nonnuclear Energy Research and Development Act of 1974, and for other purposes, having considered the same, reports favorably thereon with amendments and recommends that the bill, as amended, do pass.

The Joint Committee on Atomic Energy in Report No. 94-104, dated February 7, 1975, recommended amending S. 598 by striking all after the enacting clause and inserting a new text. The Senate Committee on Interior and Insular Affairs recommends the following additional amendments to the text of Report No. 94-104.

1. On page 18, delete line 15 and insert the following language:

“(a) For ‘Operating Expenses’, for the following programs, a sum of dollars equal to the total of the following amounts:

“(1) FOSSIL ENERGY DEVELOPMENT.—

“(A) Coal, \$274,973,000.

“(B) Petroleum and Natural Gas, \$48,647,000.

“(C) Oil Shale, \$25,113,000.

“(2) SOLAR ENERGY DEVELOPMENT.—\$96,200,000.

“(3) GEOTHERMAL ENERGY DEVELOPMENT.—\$33,870,000.

- "(4) ADVANCED ENERGY SYSTEMS RESEARCH.—\$68,900,000.
- "(5) CONSERVATION RESEARCH AND DEVELOPMENT.—
- "(A) Electric Power Transmission, \$11,830,000.
 - "(B) Advanced Automotive Power Systems, \$18,000,000.
 - "(C) Energy Storage Systems, \$23,100,000.
 - "(D) End-use Conservation, \$31,000,000.
 - "(E) Improved Conversion Efficiency, \$5,000,000.
 - "(F) Urban Waste Conversion, \$30,000,000.
- "(6) OTHER PROGRAMS.—\$3,107,107,000 of which—
- "(A) \$31,500,000 shall be available for general new programs in Environmental and Safety Research and Scientific and Technical Education in support of Nonnuclear Energy Technologies;
 - "(B) \$18,000,000 shall be available for new programs of Physical Research in Molecular and Materials Sciences in support of Nonnuclear Energy Technologies;
 - "(C) \$3,200,000 shall be available pursuant to section 14 and section 16 of Public Law 93-577 as follows:
 - "(i) \$1,700,000 for the National Bureau of Standards;
 - "(ii) \$500,000 for the Council on Environmental Quality; and
 - "(iii) \$1,000,000 for the Water Resources Council."
2. On page 18, delete lines 21 through 24 and on page 19 delete lines 1 and 2 and insert instead the following language:

"NONNUCLEAR ENERGY DEVELOPMENT

- "(1) NONNUCLEAR ENERGY DEVELOPMENT.—
- "Project 76-1-a, Clean boiler fuel demonstration plant (A-E and long-lead procurement), \$20,000,000.
 - "Project 76-1-b, High Btu synthetic pipeline gas demonstration plant, \$20,000,000.
 - "Project 76-1-c, Low Btu fuel gas demonstration plant, \$15,000,000.
 - "Project 76-1-d, Low Btu combined cycle demonstration plant, \$5,000,000.
 - "Project 76-1-e, Fluidized bed direct combustion demonstration plant, \$13,000,000.
 - "Project 76-1-f, Five megawatt solar thermal test facility, \$5,000,000.
 - "Project 76-1-g, Ten megawatt central receiver solar thermal powerplant, \$5,000,000.
 - "Project 76-1-h, Geothermal powerplant (steam), Raft River, Idaho (A-E and long-lead procurement), \$5,000,000.
 - "Project 76-1-i, Geothermal powerplant, Buffalo Valley, Nevada, \$5,000,000."

3. On page 21, lines 15 and 16 strike "\$240,347,000." and insert instead "\$245,347,000."

4. On page 21, after line 16, insert new sections 102 and 103 to read as set forth below and renumber succeeding sections accordingly.

"SEC. 102. IN SITU OIL SHALE DEVELOPMENT.—(a) The Administrator is authorized and directed in consultation with the Secretary of the Interior to select an appropriate tract of public land for the demonstration of production of oil from shale by in situ methods.

"(b) Upon selection of the tract, the Secretary shall issue a lease to the Administrator and the Administrator pursuant to the authority of the Federal Nonnuclear Energy Research and Development Act of 1974 (88 Stat. 1878; 42 U.S.C. 5901 et seq.) shall invite proposals from potential non-Federal participants to enter into a cooperative arrangement for the demonstration of in situ production of oil from shale wherein the Federal share of costs associated with the undertaking shall include the right to utilize the land included in the lease without royalties or other consideration: Provided, That the lease shall contain such terms and conditions for environmental protection and timely and orderly development as the Secretary shall determine to be in the public interest.

"(c) The Administrator is hereby authorized to select and enter into a cooperative arrangement with an appropriate non-Federal entity for the purpose of performing necessary tests and pilot operations and ultimately for the demonstration of in situ production of oil from shale upon the tract selected pursuant to subsection (a) of this section with the objective of achieving a demonstration of a commercial-size facility capable of producing 30,000 barrels per day or more and operating as a demonstration facility for at least one year. The Administrator is authorized to transfer the lease to the non-Federal participant for continued commercial production at the conclusion of the demonstration phase: Provided, That such transfer shall be on such terms and conditions as the Administrator may have negotiated with the non-Federal participants.

"(d) Upon selection of a cooperative arrangement pursuant to this section, the Administrator shall transmit a detailed report to the Congress describing the agreement and setting forth the schedule for the demonstration.

"(e) Nothing in this section shall be construed as preventing the Secretary or the Administrator from pursuing alternative means for encouraging demonstrations of in situ production of oil from shale.

"SEC. 103. LOAN GUARANTEE PROGRAM FOR SYNTHETIC FUEL.—(a) It is the purpose of this section to—

"(1) assure adequate Federal support to foster a joint government and industry demonstration program capable by 1985 of producing synthetic fuels from coal and oil shale equivalent to at least one million barrels of oil per day, and to assure adequate financial support to those enterprises seeking to employ renewable energy sources to generate power or heat on a commercial scale;

"(2) authorize loan guarantees for the construction and operation of commercial facilities for the conversion of domestic coal and oil shale into synthetic fuels and for the construction and operation of facilities deriving energy from renewable sources; and

"(3) further the national energy policies enunciated in the Federal Non Nuclear Energy Research and Development Act of 1974 (88 Stat. 1878; 42 U.S.C. 5901 et seq.).

"(b) (1) The Administrator is authorized, in accordance with the provisions of this section, section 7 of the Federal Non-Nuclear Energy Research and Development Act of 1974 (88 Stat. 1878; 42 U.S.C. 5901 et seq.), and such rules and regulations as he shall prescribe, and after consultation with the Secretary of the Treasury, to guar-

antee and to make commitments to guarantee the payment of interest on, and the principal balance of, bonds, debentures, notes, and other obligations issued by or on behalf of any person for the purpose of financing the construction and operation of (A) commercial facilities for the conversion of domestic coal and oil shale into synthetic fuels, including but not limited to, such synthetic fuels from coal as high-Btu gaseous fuels compatible for mixture and transportation with natural gas by pipeline, low-Btu gaseous fuels suitable for boiler use in compliance with applicable environmental requirements, liquid fuels for transportation uses, and petrochemicals; and (B) facilities to generate power or heat in commercial quantities utilizing as their energy source direct solar, wind, ocean thermal gradient, bioconversion, or geothermal resources: *Provided*, That the outstanding indebtedness guaranteed under this section at no time shall exceed \$6,000,000,000: *Provided, further*, That up to \$2,500,000,000 of guarantees shall be available for projects to produce high-Btu gaseous fuel compatible for mixture and transportation with natural gas by pipeline.

"(2) An applicant for a loan guarantee under this section shall provide evidence in writing to the Administrator in such form and with such content and other submissions as the Administrator deems necessary to reasonably protect the interests of the United States. Each guarantee and commitment of guarantee shall be extended in such form, under such terms and conditions, and pursuant to such regulations as the Administrator deems appropriate.

"(3) The Administrator is authorized to approve any modification of any provision of a guarantee or a commitment to guarantee such an obligation, including the rate of interest, time of payment of interest or principal, security, or any other terms or conditions, upon a finding by the Administrator that such modification is equitable, not prejudicial to the interests of the United States, and has been consented to by the holder of such obligation.

"(c) The Administrator shall guarantee or make a commitment to guarantee under subsection (b) only if—

"(1) the Administrator is satisfied that competition among private entities for the construction or operation of the system or component to be assisted under this section will be in no way limited or precluded;

"(2) the Secretary of the Treasury and the Administrator are satisfied that the financial assistance applied for is necessary to encourage financial participation by private lenders or investors;

"(3) the amount guaranteed does not exceed 75 per centum of the total project cost of the facility assisted provided that during the period of construction the guaranteed amount may exceed 75 per centum of such project costs until the construction of the facility is completed as determined by the Administrator; and

"(4) the Administrator has determined that there will be a continued reasonable assurance of full repayment.

"(d) No guarantee or commitment to guarantee an obligation entered into by the Administrator pursuant to this section shall be

terminated, canceled, or otherwise revoked, except in accordance with reasonable terms and conditions prescribed by the Administrator. Such a guarantee or commitment to guarantee shall be conclusive evidence that the underlying obligation is in compliance with the provisions of this section and that such obligation has been approved and is legal as to principal, interest, and other terms. Such a guarantee or commitment shall be valid and incontestable in the hands of a holder as of the date when the Administrator entered into the contract of guarantee or commitment to guarantee, except as to fraud, duress, mutual mistake of fact, or material misrepresentation by or involving such holder.

"(e) (1) If there is a default by the obligor in any payment of interest or principal due under an obligation guaranteed by the Administrator under this section and such default has continued for sixty days, the holder of such obligation or his agents have the right to demand payment of such unpaid amount from the Administrator. Within such period as may be specified in the guarantee or related agreements, but not later than forty-five days from the date of such demand, the Administrator shall promptly pay to the obligee or his agent the unpaid interest on and unpaid principal of the obligation guaranteed by the Administrator as to which the obligor has defaulted, unless the Administrator finds that there was no default by the obligor in the payment of interest or principal or that such default has been remedied.

"(2) If the Administrator makes a payment under paragraph (1) of this subsection, he shall have all rights specified in the guarantee or related agreements with respect to any security which he held with respect to the guarantee of such obligation, including, but not limited to, the authority to complete, maintain, operate, lease, sell, or otherwise dispose of any property acquired pursuant to such guarantee or related agreements.

"(3) If there is a default under any guarantee or commitment to guarantee an obligation, the Administrator shall notify the Attorney General. Upon such notification, the Attorney General shall take such action against the obligor or any other parties liable thereunder as is, in his discretion, necessary to protect the interests of the United States. The holder of such obligation shall make available to the United States all records and evidence necessary to prosecute any such suit.

"(f) (1) The Administrator is directed to submit a report to the Congress within ninety days of the enactment of this section setting forth his recommendations on the best opportunities to implement a program of Federal financial assistance with the objective of demonstrating production of the equivalent of one million barrels of oil per day by synthetic fuels processes by 1985 utilizing the authority set forth in this section and other forms of Federal assistance provided for in the Federal Non-Nuclear Energy Research and Development Act of 1974 (88 Stat. 1878; 42 U.S.C. 5901 et seq.).

"(2) The Administrator is directed to submit a full and complete report on each proposed guarantee or commitment to guarantee pursuant to this section to the appropriate committees of the Congress and such guarantee or commitment to guarantee shall not be finalized

under the authority granted by this section prior to the expiration of ninety calendar days (not including any day on which either House of the Congress is not in session because of an adjournment of more than three calendar days to a day certain) from the date on which the Administrator's report on the proposed guarantee or commitment to guarantee is received by the Congress.

"(g) There is hereby authorized such funds as necessary to carry out the purposes of this section."

5. On page 21, line 19 strike "(1),"

6. On page 28, delete line 11 and insert instead the following:

"(a) For 'Operating Expenses', for the following programs, a sum of dollars equal to the total of the following amounts:

"(1) FOSSIL ENERGY DEVELOPMENT.—

"(A) Coal, \$45,175,000.

"(B) Petroleum and natural gas, \$13,480,000.

"(C) Oil shale, \$6,540,000.

"(2) SOLAR ENERGY DEVELOPMENT.—\$24,300,000.

"(3) GEOTHERMAL ENERGY DEVELOPMENT.—\$4,425,000.

"(4) ADVANCED ENERGY SYSTEMS.—\$15,460,000.

"(5) CONSERVATION RESEARCH AND DEVELOPMENT.—

"(A) Electric Power Transmission, \$2,673,000.

"(B) Advanced Automotive Power Systems, \$4,500,000.

"(C) Energy Storage Systems, \$5,500,000.

"(D) End-use Conservation, \$8,000,000.

"(E) Improved Conversion Efficiency, \$1,250,000.

"(F) Urban Waste Conversion, \$7,500,000.

(6) OTHER PROGRAMS.—\$951,308,000 of which—

"(A) \$7,875,000 shall be available for general new programs in Environmental and Safety Research and Scientific and Technical Education in support of Nonnuclear Energy Technologies;

"(B) \$4,500,000 shall be available for new programs of physical research in molecular and materials sciences in support of nonnuclear energy technologies;

"(C) \$800,000 shall be available pursuant to section 14 and section 16 of Public Law 93-577 as follows:

"(i) \$425,000 for the National Bureau of Standards;

"(ii) \$125,000 for the Council on Environmental Quality; and

"(iii) \$250,000 for the Water Resources Council."

7. On page 28, delete lines 17 through 22 and insert the following:

"NONNUCLEAR ENERGY DEVELOPMENT

"(1) NONNUCLEAR ENERGY DEVELOPMENT.—

"Project 76-1-a, Clean Boiler Fuel Demonstration Plant (A-E and Long-Lead procurement), \$8,000,000.

"Project 76-1-b, High Btu synthetic pipeline gas demonstration plant, \$5,000,000.

"Project 76-1-c, Low Btu fuel gas demonstration plant, \$3,750,000.

"Project 76-1-d, Low Btu combined cycle demonstration plant, \$1,250,000.

"Project 76-1-e, Fluidized bed direct combustion demonstration plant, \$3,250,000.

"Project 76-1-f, Five megawatt solar thermal test facility, \$1,250,000.

"Project 76-1-g, Ten megawatt central receiver solar thermal powerplant, \$1,250,000.

"Project 76-1-h, Geothermal powerplant (steam), Raft River, Idaho (A-E and long-lead procurement), \$1,250,000.

"Project 76-1-i, Geothermal powerplant, Buffalo Valley, Nevada, \$1,250,000."

8. On page 29, line 9, strike "\$58,926,000," and insert instead "\$60,176,000."

9. On page 29, line 12, strike "(1),"

10. On page 30, after line 23, insert a new section 301 to read as shown below and renumber succeeding sections accordingly:

"Sec. 301. The Administrator, through reprogramming, may increase any program prescribed in paragraphs (1) (A) through (5) (E) and 6 (A), (B), (C), inclusive, of subsection 101(a) and paragraphs (1) (A) through (5) (E) and 6 (A), (B), (C), inclusive, of subsection 201(a) and the capital equipment for the above programs as provided in section 101(b) (12) and section 201(b) (6): *Provided*, That no program may, as a result of reprogramming, be decreased by more than 10 per centum: *And, provided further*, That no proposed reprogramming action shall be effective unless (A) a period of fifteen legislative days has passed after the Administrator has transmitted to the President of the Senate, the Speaker of the House of Representatives, the Committee on Interior and Insular Affairs of the Senate, the Committee on Science and Technology of the House of Representatives and the Appropriations Committees of the Senate and the House of Representatives a written notice of the proposed reprogramming actions, and (B) no such committee before the expiration of such period has transmitted to the Administrator written notice to the effect that such committee has objection to the proposed action."

11. On page 32, after line 2 insert a new section 306 to read as follows:

"Sec. 306. The Administrator shall, by December 31, 1975, and by the end of each fiscal year thereafter, submit a report to the Congress detailing the extent to which small businesses and nonprofit organizations are being funded by the research, development, and demonstration programs of ERDA, and the extent to which small business involvement pursuant to section 2(d) of Public Law 93-438, the Energy Reorganization Act of 1974, is being encouraged by ERDA."

I. PURPOSE OF THE MEASURE

The purpose of S. 598 is to authorize appropriations for the Energy Research and Development Administration for fiscal year 1976 and for the transition quarter which begins July 1, 1976 and ends September 30, 1976. The amount of authorizations, as amended, is as follows:

[In thousands of dollars]		
	Fiscal year 1976	Transition quarter
Operating expenses.....	\$3,789.3	\$1,093.9
Plant and capital equipment.....	946.9	148.4
Total authorization.....	4,736.2	1,242.3

II. AUTHORIZATION REQUEST

On February 4, 1975, the Energy Research and Development Administration submitted its budget requests for fiscal year 1976 and the transition quarter to Congress. Subsequently, on April 9, 1975, an amended authorization request was submitted calling for authorizations of (1) \$3,418,587,000 for "Operating expenses" and \$868,867,000 for "Plant and capital equipment" (including increases in prior-year authorizations) making a total requested authorization for fiscal year 1976 of \$4,287,454,000; and (2) \$1,001,301,000 for "Operating expenses" and \$128,876,000 for "Plant and capital equipment" making a total requested authorization of \$1,130,177,000 for the transition quarter.

In reviewing the ERDA's budget request, the Senate Interior and Insular Affairs Committee has recommended several changes in the amount of funding for various non-nuclear programs. The Committee's recommended authorization for fiscal year 1976 is \$4,736,107,000 which is \$448,653,000 more than the amount requested. The Committee's recommended authorization for the transition quarter is \$1,242,312,000 which is \$112,135,000 more than the amount requested.

SUMMATION OF INTERIOR COMMITTEE'S ACTION

The following table presents a short summary of the authorization requested by the Administration for fiscal year 1976 and the transition quarter and the effect of the Interior Committee's actions thereon:

	Fiscal year 1976		Transition quarter	
	ERDA authorization request	Interior Committee change	ERDA authorization request	Interior Committee change
Operating expenses:				
Programs.....	2,953.6	267.3	819.8	66.8
Selected resources.....	265.0	93.1	129.0	23.2
Program support.....	200.0	10.3	52.5	2.6
Plant and capital equipment.....	868.9	78.0	128.9	19.5
Total.....	4,287.5	448.7	1,130.2	112.1

OPERATING EXPENSES

The following table summarizes the ERDA's request for operating funds authorization under its major nonnuclear programs and the action of the Senate Interior and Insular Affairs Committee thereon:

FISCAL YEAR 1976 BUDGET ESTIMATES, SENATE INTERIOR AND INSULAR AFFAIRS COMMITTEE, AUTHORIZATION ACTION—SUMMARY TABLE

	Fiscal year 1976			Transition period		
	Report to Congress	Senate Interior change	Total Senate Interior recommen- dation	Report to Congress	Senate Interior change	Total Senate Interior recommen- dation
Operating expenses—costs: ¹						
Fossil energy development.....	311,267	37,466	348,733	55,830	9,340	65,170
Solar energy development.....	57,100	39,100	96,200	14,500	9,800	24,300
Geothermal energy development.....	28,370	5,500	33,870	3,050	1,375	4,425
Advanced energy systems.....	23,173	45,727	68,900	4,030	11,430	15,460
Conservation research and develop- ment.....	32,170	86,760	118,930	7,733	21,960	29,423
Physical research ²	312,500	18,000	330,500	80,300	4,500	84,800
Biomedical and environmental ²	156,515	31,500	188,015	40,500	7,875	48,375
CEQ, WEC, NBS.....	0	3,200	3,200	0	800	800
Program support.....	200,018	10,300	210,318	52,488	2,600	55,088
Change in selected resources.....	78,920	93,100	172,020	52,450	23,225	75,675
Total.....	1,200,033	370,653	1,570,686	310,881	92,635	403,516

¹ The Interior Committee has not considered the nuclear programs of ERDA and this table does not include either ERDA's request for the nuclear programs nor the actions taken by the Joint Committee on Atomic Energy with respect to those programs.

² Total program under cognizance of the Joint Committee and the Interior Committee.

PLANT AND CAPITAL EQUIPMENT

The following table summarizes the ERDA's request for plant and capital equipment funds authorization under its major non-nuclear programs and the action of the Senate Interior and Insular Affairs Committee thereon:

FISCAL YEAR 1976 BUDGET ESTIMATES, SENATE INTERIOR AND INSULAR AFFAIRS COMMITTEE AUTHORIZATION ACTION, PLANT AND CAPITAL EQUIPMENT—COSTS

	Fiscal year 1976			Transition period		
	Budget to Congress	Senate Interior change	Total Senate Interior recommen- dation	Budget to Congress	Senate Interior change	Total Senate Interior recommen- dation
Fossil energy development:						
Coal—Plant:						
Project 76-1-a, clean fuel demonstration plant (A-E and long lead procurement).	\$9,000	0	\$9,000	\$3,500	0	\$3,500
Project 76-1-b, high Btu pipeline gas demonstration plant.....	0	\$20,000	20,000	0	\$5,000	5,000
Project 76-1-c, low Btu fuel gas demonstration plant.....	0	15,000	15,000	0	3,750	3,750
Project 76-1-d, low Btu com- bined cycle demonstration plant.....	0	5,000	5,000	0	1,250	1,250
Project 76-1-e, fluidized bed demonstration plant.....	0	13,000	13,000	0	3,250	3,250
Total, coal.....	9,000	53,000	62,000	3,500	13,250	16,750
Petroleum and natural gas: Cap- ital equipment.....	75	0	75	75	0	75
Oil shale: Capital equipment.....	264	0	264	75	0	75
Total, fossil energy develop- ment.....	9,339	53,000	62,339	3,650	13,250	16,900

See footnote at end of table.

FISCAL YEAR 1976 BUDGET ESTIMATES, SENATE INTERIOR AND INSULAR AFFAIRS COMMITTEE AUTHORIZATION ACTION, PLANT AND CAPITAL EQUIPMENT—COSTS—Continued

	Fiscal year 1976			Transition period		
	Budget to Congress	Senate Interior change	Total Senate Interior recommendation	Budget to Congress	Senate Interior change	Total Senate Interior recommendation
Solar energy development:						
Capital equipment.....	0	0	0		0	0
Plant:						
Project 76-1-f, 5 MW solar thermal test facility.....	0	\$5,000	\$5,000	0	\$1,250	\$1,250
Project 76-1-g, 10 MW central receiver solar thermal powerplant.....	0	5,000	5,000	0	1,250	1,250
Total, solar energy development.....	0	10,000	10,000	0	2,500	2,500
Geothermal energy development:						
Capital equipment.....	\$485	0	485	\$150	0	150
Plant:						
Project 76-1-h, geothermal powerplant, Raft River, Idaho.....	0	5,000	5,000	0	1,250	1,250
Project 76-1-i, geothermal powerplant, Buffalo Valley, Nev.....	0	5,000	5,000	0	1,250	1,250
Total, geothermal energy development.....	485	10,000	10,485	150	2,500	2,650
Advance energy systems.....	0	0	0	0	0	0
Conservation research and development:						
Electric power transmission: Capital equipment.....	1,295	0	1,295	150	0	150
Advanced automotive power systems: Capital equipment.....	0	0	0	0	0	0
Energy storage systems: Capital equipment.....	591	0	591	250	0	250
End use energy conservation: Capital equipment.....	0	0	0	0	0	0
Improved conversion efficiency: Capital equipment.....	0	0	0	0	0	0
Total, conservation research and development.....	1,886	0	1,886	400	0	400
Physical research: ¹						
Capital equipment:						
High energy physics.....	20,320	0	20,320	4,850	0	4,850
Nuclear science.....	5,768	0	5,768	1,200	0	1,200
Materials sciences.....	2,365	2,500	4,865	750	625	1,375
Molecular sciences.....	1,915	2,500	4,415	750	625	1,375
Other capital equipment.....	1,810	0	1,810	950	0	950
Total, capital equipment.....	32,178	5,000	37,178	8,500	1,250	9,750
Plant.....	16,564	0	16,564	4,590	0	4,590
Total, physical research.....	48,742	5,000	53,742	13,090	1,250	14,340
Biomedical and environmental research: ¹						
Capital equipment.....	9,850	0	9,850	2,500	0	2,500
Plant.....	10,471	0	10,471	2,787	0	2,787
Total, biomedical and environmental research.....	20,321	0	20,321	5,287	0	5,287
Total capital equipment.....	44,738	5,000	49,738	11,700	1,250	12,950
Total plant.....	36,035	73,000	109,035	10,877	18,250	29,127
Total, plant and capital equipment.....	80,773	78,000	158,773	22,577	19,500	42,077

¹ Total program under cognizance of more than 1 committee.

III. BACKGROUND TO S. 598

INTRODUCTION AND REFERRAL OF ERDA AUTHORIZATION REQUEST

On February 4, 1975, the bill, S. 598, was introduced by Senator Pastore (for himself and Senator Jackson, by request) and jointly referred to the Senate Committee on Interior and Insular Affairs and the Joint Committee on Atomic Energy. By consent agreement, this bill was referred to the Joint Committee on Atomic Energy for action on the nuclear energy program requests, and was then referred to the Senate Interior and Insular Affairs Committee for action on the nonnuclear program requests. On May 6 (Legislative day, April 21), 1975, the Chairman of the Joint Committee, Senator Pastore, reported S. 598 to the Senate where it was then referred to the Committee on Interior and Insular Affairs.

The two Committees limited their consideration of the bill to those aspects which are within their respective legislative jurisdiction. Those areas of overlap, physical research and environment and safety, were considered by both Committees. Those changes made by the Senate Interior Committee in programs where jurisdictions overlap are designed to affect only the nonnuclear portions of such programs.

In the House of Representatives, on February 20, 1975, the ERDA authorization request was introduced as H.R. 3474 by Congressman Price (for himself and Congressman Teague, by request). The bill was jointly referred to the Joint Committee on Atomic Energy and the House Science and Technology Committee. The House bill was reported jointly out of both Committees on June 13, 1975. On June 20, 1975, the House of Representatives passed H.R. 3474, as amended.

HEARINGS CONDUCTED BY THE SENATE INTERIOR COMMITTEE

The Subcommittee on Energy Research and Water Resources of the Senate Interior and Insular Affairs Committee held four days of hearings on S. 598. Witnesses included representatives from both government and the private sector. In addition, the Subcommittee conducted three additional hearings related to various nonnuclear programs under the jurisdiction of the Energy Research and Development Administration. Witnesses appearing before the Subcommittee included the following:

S. 598 March 3, 1975

Richard E. Balzhiser, Director, Fossil Fuel & Advanced Systems Division, Electric Power Research Institute
 Russell J. Cameron, Cameron Engineers, Inc.
 Richard Demmy, Vice President, United Gas, Inc.
 Henry R. Linden, President, Institute of Gas Technology
 James Nicol, Arthur D. Little, Inc.
 J. B. O'Hara, Manager, Energy Department, Ralph M. Parsons Co.
 Malcolm E. Pruitt, Vice President, Research and Development, Dow Chemical Co.

S. 598 March 4, 1975

- Dr. E. B. Giller, Acting Deputy Assistant Administrator, Energy Research and Development Administration
 Dr. William S. Gouse, Jr., Deputy Assistant Administrator for Fossil Energy, Energy Research and Development Administration
 Dr. James S. Kane, Acting Deputy Assistant Administrator for Conservation Research and Development, Energy Research and Development Administration
 Dr. James L. Liverman, Acting Deputy Assistant Administrator for Environment and Safety, Energy Research and Development Administration
 Dr. Robert C. Seamans, Administrator, Energy Research and Development Administration
 Dr. John M. Teem, Acting Deputy Assistant Administrator for Solar, Geothermal, and Advanced Energy Systems, Energy Research and Development Administration
 Robert D. Thorne, Acting Deputy Assistant Administrator for Nuclear Energy, Energy Research and Development Administration

S. 598 March 5, 1975

- Dr. Charles E. Backus, Associate Professor of Engineering, Arizona State University
 Jack Barnett, Raft River Geothermal Corp.
 Lowell Endahl, Coordinator of Research and Development, National Rural Electric Cooperative Association
 Alan McGowan, President, Science Institute for Public Information
 Dr. John S. Sumner, Professor and Chief Scientist, Department of Geosciences, University of Arizona

S. 598 March 6, 1975

- Robert V. Bursik, Chairman, Citizens for Solar Energy
 Donald M. Carlton, First Vice President, National Council of Professional Services Firms
 Dr. William B. Harrison, Vice President, Southern Services, Inc.
 Douglas T. King, Vice President, Research and Engineering, American Gas Association
 William H. Podolny, General Manager, Fuel Cell Operations, Power Utility Division, United Aircraft Corp.
 Dr. Richard W. Roberts, Director, National Bureau of Standards
 Dr. Chauncey Starr, President, Electric Power Research Institute

Secondary and Tertiary Recovery of Oil and Natural Gas—April 25

- Dr. H. Neal Dunning, Director, Division of Petroleum, Natural Gas, and In-situ Technology, Energy Research and Development Administration
 Mr. J. Wade Watkins, Energy Research Center Liaison, Energy Research and Development Administration
 Dr. Al Narath, Vice President, Sandia Laboratories
 Lloyd Elkins, Vice President, Production Research Director, Amoco Production Company.

Dr. Todd M. Dcscher, Executive Consultant to Vice President, Production Research, Shell Oil Company

Automotive Research and Development—May 5, 1975

- Dr. James Kane, Acting Assistant Administrator for Conservation Research and Development, Energy Research and Development Administration
 Professor Philip E. Meyers, Department of Mechanical Engineering, University of Wisconsin
 Professor Lewis D. Conta, Professor of Mechanical Engineering, University of Rhode Island
 William Sherman, Director, Engineering Division, Motor Vehicle Manufacturing Association
 Robert Beaumont, Sebring International
 James Norberg, ESB, Inc.

Synthetic Fuels Program—June 16, 1975

- Dr. Robert C. Seamans, Administrator, Energy Research and Development Administration
 Bruce Pasternack, Deputy Administrator, Policy and Analysis, Federal Energy Administration
 Dr. Philip White, Assistant Administrator, Fossil Fuels, Energy Research and Development Administration
 Dr. William Gouse, Deputy Assistant Administrator, Fossil Fuels, Energy Research and Development Administration

IV. LEGISLATIVE ACTION IN THE SENATE RELATED TO ENERGY RESEARCH AND DEVELOPMENT

Senate concern for energy research and development dates to 1943 with the introduction by Senator O'Mahoney, Chairman of the Senate Interior Committee, of the Synthetic Liquid Fuels Act. A similar measure was introduced by then Representative Jennings Randolph of West Virginia in the House of Representatives. Subsequent enactment of this measure in 1944 initiated an eight-year program for the construction and operation of demonstration plants to produce synthetic liquid fuels from coal, oil shale, agricultural and forestry products, and other substances in order to conserve and increase the oil resources of the United States.

More recently, on March 2, 1961, Senator Randolph introduced Senate Resolution 105, providing for the creation of a Senate Special Committee on a National Fuels Study. The measure was passed September 11, 1961, and in 1962 the study group was established in the Committee on Interior and Insular Affairs, with ex officio members, including Senator Randolph, from other committees.

The study group completed reports on various energy issues, including development of a domestic shale oil industry, the role of Government-sponsored energy research, and energy self-sufficiency.

Since then, a number of Senate resolutions and bills have been passed relating to specific and particular energy research needs. But no comprehensive energy R. & D. program resulted.

Subsequently in 1971, the Senate initiated the National Fuels and Energy Policy Study. The events leading up to the initiation of this

study and described in the "Legislative History of Senate Resolution 45," prepared by the Senate Committee on Interior and Insular Affairs:

By the summer of 1970 it was becoming increasingly apparent that the abundant supply of low-cost energy that had characterized the American economy would no longer be available. During the previous year, hearings on the declining reserves of natural gas had been held by the Senate Interior Committee and there was general agreement among the witnesses that the gas reserve to production ratio would continue to decline. During the summer and fall of 1970 brownouts occurred in some parts of the country due to a lack of electric generating capacity.

On July 16, 1970, Senator Randolph introduced S. 4092 to establish a Commission on Fuels and Energy. The bill was cosponsored by more than 50 other Senators. On introducing the bill Senator Randolph said:

This Commission would make a detailed investigation and study of the energy requirements and fuel resources and policies of the United States with respect to the different type of fuels and energy, and would report to the President of the United States and to the Congress . . .

Hearings on S. 4092 were held by the Subcommittee on Minerals, Materials, and Fuels of the Committee on Interior and Insular Affairs on September 10 and 11, 1970. Statements were received from forty-four witnesses. . . .

By the time of the hearings the bill had 61 cosponsors and several more were subsequently added.

Both management and labor organizations of the coal industry strongly endorsed the bill.

In general the coal industry witnesses were concerned over the imbalance in Federal research and development funds among the fuel sources. This concern was expressed by the National Coal Policy Conference witness as follows:

Will the Government correct its present imbalance in Federal funds for energy and fuels research and development? Important as nuclear power is, there are processes for making gas from coal, extracting oil from shale, and other synthetic fuel and energy generation developments which warrant substantial Federal attention in terms of money and men. Most of these processes would create little, if any, pollution and several of them, if successful, may well achieve significant cost reductions in the generation of electricity. Magneto-hydrodynamics and fluidized-bed combustion are examples.

The major theme of all the witnesses was the need for a long-range, coordinated natural energy policy which would prevent the various agencies with energy responsibilities from following conflicting courses of action.

Despite the unanimity of opinion among all the witnesses concerning the need for a national energy policy to prevent future shortages and to assure adequate supplies of secure

energy at low costs, no further action on S. 4092 took place in the 91st Congress. This inaction was the result of both the position taken by the administration with respect to the need for a commission and the termination of the 91st Congress. On December 11, in a letter to the Chairman of the Committee on Interior and Insular Affairs from G. A. Lincoln, Director of the Office of Emergency Preparedness, the administration repeated the position it had taken earlier in a letter to Senator Jackson dated November 5, 1970, from the Office of Management and Budget, Executive Office of the President:

It would appear that the study proposed by S. 4092 would closely parallel and duplicate the study requested by the President which is now well underway. By contrast, enactment of S. 4092 and appropriation of funds to support the proposed Commission, appointment of Commission members, selection of Commission staff, and other necessary organizational steps would necessarily delay the commencement of the Commission's study.

Consequently, to avoid duplicative studies and to avoid the delays that would result if the Commission study were substituted for the Council study, I recommend against the enactment of S. 4092.

On December 22, 1970, Senator Randolph summarized the actions that the Senate had taken with respect to S. 4092 and reported on the adverse view expressed by the Office of Management and Budget. He then suggested that:

In view of the administration's reluctance to participate in a joint executive-congressional study along the lines proposed in S. 4092, Senator Jackson and I have reviewed alternatives. We are in agreement that the most feasible vehicle for an urgently needed congressional effort would be a resolution empowering the Senate Committee on Interior and Insular Affairs to make a detailed fuels and energy study and to report its recommendations during the 2-year life of the next Congress beginning in January 1971 and extending to January 1973. No other means is known that can activate this vital effort without further lengthy delay.

On introducing Senate Resolution 45 on February 4, 1971, which would authorize the Senate to make a study of national fuels and energy policy, Senator Randolph disagreed with the administration position concerning the need for a commission.

[However,] since the Commission was not acceptable to the administration, he suggested an alternative:

The administration, nevertheless, has made its decision not to be a partner in a Fuels and Energy Commission with congressional and nongovernmental members. That is its prerogative. The exercise of that prerogative kills the commission concept. But killing the commission concept and placing reliance entirely on the proliferated activities in the executive branch does not necessarily

solve the fuels and energy problems which many knowledgeable persons consider to be of crisis proportions over the long range, even though some shortrange solutions may have emanated from the several instrumentalities created by the President.

Realism forces us to write off the Fuels and Energy Commission approach. Nevertheless, there is too much need for prompt and careful attention to the fuels and energy crisis within the legislative branch for that attention to be excessively delayed. Hence, with the cosponsorship of the junior Senator from Washington (Mr. Jackson), Chairman of the Committee on Interior and Insular Affairs, and other Senators, I am introducing today a Senate resolution to authorize a study of national fuels and energy policy by the Interior Committee, with the cooperation and assistance of the bipartisan leadership of the Committees on Commerce, Public Works, and Atomic Energy.

The objectives of Senate Resolution 45 and S. 4092 were nearly identical except for the vehicle to carry out the study. Under Senate Resolution 45, the Senate would proceed with its own study, using staff employed for this purpose, and would report recommendations to the Senate for a national energy policy.

As there had been for S. 4092, there was unanimous agreement about the need for the development of a national fuels and energy policy as contemplated by Senate Resolution 45. The reasons were stated by Senator Randolph when he said:

My objective in introducing Senate Resolution 45 was to insure that crisis not repeat itself. The immediate goal of the President's Domestic Council is to formulate our energy goal for the 1970's. The charter of the study under Senate Resolution 45 is to define and provide a definitive national fuels and energy policy for the next 20 or 30 years, where none now exist.

On April 5, 1971, the Senate Interior Committee issued Report No. 92-53 to accompany Senate Resolution 45 favorably reporting on the resolution. The committee amended the original resolution to reflect its complementary nature with the Mining and Minerals Policy Act of 1970 and also adopted a technical amendment regarding funding. The report was sent to the Committee on Rules where after several clarifying and technical amendments the resolution was reported (No. 92-87) favorably on April 26, 1971. The resolution was agreed to by the Senate on May 3, 1971.

Pursuant to Senate Resolution 45, the Senate Committee on Interior and Insular Affairs has conducted numerous hearings relating directly to energy research development needs:

President's Energy Message, June 15, 1971.

Energy Policy and National Goals, October 20, 1971. (Part I)

Energy Policy and National Goals, October 20, 1971. (Part II)

Department of the Interior Oil Shale Leasing Program, November 15, 1971.

Development in Coal Gasification, November 18, 1971.

Problems of Electrical Power Production in the Southwest. Albuquerque, N. Mex., May 24, 1971, Las Vegas, Nev., May 25, 1971. Salt Lake City, Utah, May 26, 1971. Durango, Colo., May 27, 1971. Page, Ariz., May 28, 1971. Washington, D.C., November 10, 1971.

Problems of Electrical Power Production in the Southwest. Proposed Energy and Mineral Resources Administration, S. 2410 to Establish a Department of Natural Resources, January 28, 1972.

Advanced Power Cycles, February 8, 1972.

Federal Energy Research Programs and Priorities, June 7, 1972.

Geothermal Energy Resources and Research, June 15 and 22, 1972.

Conservation of Energy, March 22 and 23, 1973.

Conservation of Energy and S. 2176, the National Fuels and Energy Conservation Act of 1973, August 1, 1973.

The President's Energy Message of 1973 and S. 1570, the Emergency Fuels and Energy Allocation Act of 1973, May 1, 1973.

Coal Policy Issues, June 6, 7, and 8, 1973. (Part I)

Coal Policy Issues, June 6, 7, and 8, 1973. (Part II)

Coal Policy Issues, June 6, 7, and 8, 1973. (Part III)

S. 1283, the National Research and Development Policy Act of 1973, June 21, 22 and July 11, 12, 1973.

A number of committee prints were also prepared relating to energy R. & D. issues:

Considerations in the Formulation of National Energy Policy. Studies and Reports Relevant to National Energy Policy.

Goals and Objectives of Federal Agencies in Fuels and Energy. Conservation of Energy.

Summary Report of the Cornell Workshop on Energy and the Environment, February 22-24, 1972.

Federal Resources (Funding and Personnel) in Energy Related Activities, fiscal years 1972 and 1973.

Federal Energy Organization.

Factors Affecting the Use of Coal in Present and Future Energy Markets.

Summary of the Energy Conservation and Development Recommendations Contained in the Final Report of the National Commission on Materials Policy, June 1973.

History of Federal Energy Organization.

In one of these prints, "History of Federal Energy Organization," the following assessment was made of Federal energy research and development efforts through 1973:

Research and development in energy areas have evolved in much the same way as general national scientific policy. When public issues or projects have arisen that have necessitated scientific investigation the Federal agencies involved have carried out their own research with very little concern for cooperative effort among agencies. There have been minimal attempts to centralize research efforts in broad policy areas except to consider short-term problems.

There are actually two threads to be traced concerning research and development history in the Federal Government in order to understand where the Government stands today with regard to energy research policy. First, there are certain agencies with energy-related activities which have undertaken research when it was required for the administration of their responsibilities. Second, intermittent efforts have been made since the Nation's inception to establish a scientific organization and coordinate all important research and development necessary for the formation and implementation of public policy.

The difficulties inherent in such an ad hoc approach are illustrated by the following excerpts taken from Selected Readings on the Fuels and Energy Crisis (92-4) :

There's a vast difference between fuel resources on one hand and energy actually on tap for the consumer on the other, producers emphasize. The leadtime for bringing any one of these resources to market is estimated at 3 to 7 years.

Reasons are legion why energy supplies are now running short :

(1) Government energy policy has been nonexistent. Regulation of various fuels policies has been determined by 48 governmental agencies and 14 congressional committees. The decisions of these disparate groups are often at cross purposes with one another—playing havoc with any overall fuels approach.

"We have the resources," stated Gen. George A. Lincoln, director of the President's Office of Emergency Preparedness (OEP), in an interview. "But we need to get moving with technology, exploration, and development in order to have them available."

In an effort to encourage the development of new energy resources, Senator Henry M. Jackson, on May 12, 1971, introduced S. 1846, a bill to establish a Coal Gasification Development Corporation. Although the bill had 15 cosponsors, it was strongly opposed by the administration. Hearings were held on July 27 and 28, 1971, but no further action was taken by the Senate. In his opening statement at those hearings, Senator Jackson reiterated the need for a massive R. & D. effort in the energy field :

All we need now is to marshal our scientific and technological resources to do what we hope can be done. I am confident that if we give it the kind of priority that is needed here, we can in fact come up with some real answers as we face the energy crisis, not just in this decade but for the balance of this century.

Over the years, I have watched a lot of R. & D. efforts get underway only to find that we have not been hard nosed enough about some of these problems. The result has been that we had delays, and delays can result in a lack of confidence and faith in the effort.

In the next Congress, Senator Jackson introduced S. 1283, a bill to establish a massive federally-sponsored national program for research development and demonstration in fuels and energy. This bill was the first legislation to describe a comprehensive energy R. & D. program for a number of different technologies and fuels. Specifically addressed were coal liquefaction, coal gasification, oil shale development, geothermal steam, and solar power, directed from a centralized agency.

Hearings on the bill were held before the full committee on June 21 and 22, and on July 11 and 12, 1973.

Witnesses included :

June 21, 1973

O'Leary, John F., Director of Licensing, Atomic Energy Commission.

Starr, Dr. Chauncey, president, Electric Power Research Institute.

Swidler, Hon. Joseph C., chairman, New York State Public Service Commission.

Wiesner, Dr. Jerome B., president, Massachusetts Institute of Technology.

June 22, 1973

DiBona, Charles, Special Consultant to the President.

Nassikas, Hon. John N., Chairman, Federal Power Commission.

Ray, Dr. Dixy Lee, Chairman, Atomic Energy Commission.

July 11, 1973

Harris, Shearon, chairman and president, Carolina Power & Light; chairman, Edison Electric Institute Research Division, executive committee, accompanied by John Conway, Consolidated Edison Co., New York, and John J. Kearney, vice president, Edison Electric Institute.

Houthakker, Prof. Hendrik S., department of economics, Harvard University.

Mitchell, Prof. Edward J., Graduate School of Business, Cornell University.

Radin, Alex, general manager, American Public Power Association, Washington, D.C.

Udall, Hon. Morris K., U.S. Representative from the State of Arizona.

July 12, 1973

Bagge, Carl E., president, National Coal Association.

Clam, Herbert D., president, National Fuel Gas Co.

MacKenzie, Dr. James, joint scientific staff, Massachusetts and National Audubon Societies.

Moss, Laurence I., president, Sierra Club, Washington, D.C.

Partridge, John, chairman of the board and chief executive officer of Columbia Gas System, Inc., of Wilmington, Del.

Rodgers, William H., Jr., professor of law, Georgetown University, Washington, D.C.

Symington, Hon. Stuart, U.S. Senator from the State of Missouri.

Walske, Carl, president, Atomic Industrial Forum, Inc.

White, Dr. Philip C., on behalf of the American Petroleum Institute.

Full committee markup sessions were held on September 18, October 23, November 2, 13, 26, and 27.

The following Senators were co-sponsors of S. 1283 as of the date of this report: Mr. Jackson, Mr. Randolph, Mr. Magnuson, Mr. Mansfield, Mr. Pastore, Mr. Bible, Mr. Church, Mr. Eastland, Mr. McClellan, Mr. Robert C. Byrd, Mr. Humphrey, Mr. Cannon, Mr. Moss, Mr. Hatfield, Mr. McGee, Mr. Symington, Mr. Inouye, Mr. Stevens, Mr. Bayh, Mr. Williams, Mr. Haskell, Mr. Eagleton, Mr. Tunney, Mr. Johnston, Mr. Huddleston, Mr. Cook, Mr. McGovern, Mr. Bentsen, Mr. Abourezk, Mr. Bartlett, Mr. Beall, Mr. Brooke, Mr. Burdick, Mr. Case, Mr. Domenici, Mr. Fannin, Mr. Gravel, Mr. Gurney, Mr. Hansen, Mr. Javits, Mr. Mathias, Mr. McClure, Mr. Metcalf, Mr. Mondale, Mr. Nelson, Mr. Pell, Mr. Ribicoff, Mr. Schweiker, and Mr. Taft.

LEGISLATIVE HISTORY OF TITLE II "THE GEOTHERMAL ENERGY ACT OF 1973"

The Senate Committee on Interior and Insular Affairs has been concerned with geothermal resources for many years. Under the leadership of Senator Bible, the committee developed legislation which culminated in the Geothermal Steam Act of 1970 (30 U.S.C. 1001-1025).

In June of 1972, as a part of the committee's study of National Fuels and Energy Policy being conducted pursuant to Senate Resolution 45, 92d Congress, hearings were held on geothermal energy resources and research which provided an overview of the state of technology and the potential of the resource as a new energy source.

On June 13, 1973, the Subcommittee on Water and Power Resources began a detailed investigation of the potential for the production of power from geothermal resources with a hearing in Washington, D.C. At that hearing the following Federal agencies, which have programs related to geothermal energy, were requested to present testimony in response to specific questions posed by the subcommittee:

- (1) The Department of the Interior.
- (2) The Atomic Energy Commission.
- (3) The National Science Foundation.
- (4) The National Aeronautics and Space Administration (NASA).
- (5) The Department of State.

Subsequent to that hearing, the subcommittee conducted field hearings and inspections of existing and potential geothermal developments. On August 8, an inspection was made of the Geysers Geothermal Power Development of the Pacific Gas & Electric Co. in California, which is the only operating geothermal electric facility in the United States.

On August 10, an inspection was made by helicopter of geothermal areas in southern Idaho, which are being considered for early development for power production. On that date, also, the subcommittee held a public hearing in Idaho Falls, Idaho, to take testimony from witnesses including public officials, authorities in geothermal energy,

representatives of industrial concerns involved in energy and various citizens groups and individuals.

On August 11, a similar subcommittee hearing was held in Klamath Falls, Oreg. The hearing at Klamath Falls was conducted at the Oregon Technical Institute, in a modern academic building complex which is entirely heated from geothermal wells.

The results of the subcommittee's investigations have been compiled in a report to the Senate which will be available shortly.

S. 2465, a bill introduced on September 24, 1973, by Senators Bible, Fannin, Bartlett, Buckley, Church, Hansen, Haskell, Hatfield, Jackson, Johnston, McClure, and Metcalf, is to a considerable extent based upon the evidence of the investigation concerning the need for definition of the Federal role in geothermal energy.

The Subcommittee on Water and Power Resources held a hearing on S. 2465 on November 7, 1973. The text of S. 2465, with minor amendments, was adopted as a new title II of S. 1283 on November 27, 1973.

V. COMMITTEE AMENDMENTS

By unanimous consent, S. 598 was jointly referred to the Senate Interior and Insular Affairs Committee and the Joint Committee on Atomic Energy. Having considered S. 598 first, the Joint Committee amended the bill by striking everything after the enacting clause and substituting a new text. The amended bill was then referred to the Senate Interior Committee on May 6, 1975 and the Interior Committee amendments have been made to the bill referred by the Joint Committee. The changes made by the Interior Committee only concern the non-nuclear programs of ERDA and having not considered the nuclear programs nor the amendments made by the Joint Committee this report does not necessarily reflect endorsement of either the original request by the Administration nor the actions taken by the Joint Committee.

The principal changes in the next text, as amended by the Interior Committee, are as follows:

1. An increase in authorizations of \$370,653,000 for "operating expenses" in the non-nuclear programs administered by the Energy Research and Development Administration for fiscal year 1976.

2. Authorizations under "plant and capital equipment" for an additional eight demonstration-scale projects in non-nuclear technologies. For fiscal year 1976, such authorization would total \$78,000,000.

3. With respect to the recovery of oil from shale by the in situ method, the Administrator of ERDA is authorized, in cooperation with the Secretary of Interior, to select a tract of public land suitable for the demonstration of in situ oil shale recovery, and to enter into an agreement with private industry for the utilization of such tract for the demonstration of in situ oil shale recovery.

4. The Administrator of ERDA is authorized to establish a loan guarantee program for the commercial demonstration of synthetic fuels from coal and oil shale and of nonconventional energy sources.

5. An increase in authorizations of \$92,635,000 for "operating expenses" in the non-nuclear programs administered by the ERDA for the transition period to the new fiscal year.

6. Authorizations under "plant and capital equipment" for the transition period to the new fiscal year to continue funding for eight demonstration scale projects in non-nuclear technologies. For the transition period such authorizations would total \$19,500,000.

7. The Administrator of ERDA is given authority to transfer funds between programs so long as (1) such transfers do not result in the reduction of funding for any one program by more than 10% of the amount authorized and (2) appropriate Congressional committees do not object to such transfers within 15 days of the announcement of the proposed transfer.

8. The Administrator is required to submit to the Congress a report detailing the extent of small business and non-profit organizations participation in the ERDA programs.

VI. COMMITTEE RECOMMENDATION

The Committee on Interior and Insular Affairs, by unanimous vote of a quorum present at an open executive session on July 22, 1975, recommends that S. 598, as amended, be enacted.

VII. COMMITTEE COMMENTS

INTRODUCTION

Pursuant to section 305 of the Energy Reorganization Act of 1974, the Senate Interior and Insular Affairs Committee has reviewed the ERDA authorization request for operating expenses and for plant and capital equipment for fiscal year 1976 and the transition period.

The following program sections reflect ERDA's requests for "Operating expenses" and "Plant and capital equipment" and the Senate Interior Committee's recommendations for "Operating expenses" and "Plant and capital equipment" as well as additional amendments made by the Interior Committee.

1. FOSSIL ENERGY DEVELOPMENT

A. COAL

ERDA request

The ERDA requested \$279,473,000 for the operating expenses of the research and development program for coal. This amount reflects an increase of \$105,274,000 over the estimated costs for this program in fiscal year 1975. The proposed amounts for this program include the following sub-program increases (or decreases) over the estimated costs for fiscal year 1975: liquefaction, +\$42,265,000; high-Btu gasification, -\$15,003,000; low-Btu gasification, +\$29,363,000; advanced power systems, +\$1,304,000; direct combustion, +\$11,964,000; advanced research and supporting technology, +\$17,281,000; and, demonstration plants, +\$18,000,000.

The ERDA also requested authorization for plant and capital equipment for the coal program totaling \$20,000,000. This total authorization is for start of construction on a Clean Boiler Fuel Demonstration Plant.

Committee action

Members of the Interior Committee expressed concern that the ERDA's request to support programs in coal research and development did not adequately address the need to demonstrate, at commercial scale, various technologies for the utilization of coal. The Committee notes that funding is requested for only one commercial-sized demonstration plant to convert high sulfur coal to a clean liquid fuel. In view of the President's announced goals for the development of a synthetic fuels industry which will provide the country with an equivalent of one million barrels of oil per day by 1985 and to begin actual planning and construction of second generation synthetic fuel plants to demonstrate various technologies, the Interior Committee recommends that (1) a total of \$7,500,000 requested in "operating expenses" be transferred to "plant and capital equipment" and, (2) in addition, a total of \$410,733,000 be added to the coal program, in "plant and capital equipment" to initiate the construction of four (4) additional demonstration-scale plants utilizing coal technologies.

Thus, the Interior Committee recommends that a total of \$53,000,000 be added to the "plant and capital equipment" items in the coal program. Such a recommended increase would result in a total funding level (includes both "operating expenses" and "plant and capital equipment") of \$329,473,000 for the ERDA coal program. For F.Y. 1976, the Committee also recommends that a total of \$431,143,000 be authorized for the transition quarter.

The Interior Committee notes that the total U.S. coal resources are vast—3,200 billion tons according to the U.S. Geological Survey and that energy self-sufficiency depends, to a large extent upon the rapid and efficient utilization of this resource. To this end, the Committee believes that it will be necessary for all departments and agencies involved in coal extraction and utilization to coordinate and cooperate in developing technologies dealing with coal. Where necessary, it is the Committee's belief that inter-agency committees be formed and systems analyses be conducted to assure that no part of a demonstration program lag so far behind as to delay the rapid and efficient commercialization of any successful demonstration program. Finally, it is contemplated that planning and construction of demonstration plants will be in cooperation with private industry and that these projects will be cost-shared with industry.

(1) Coal liquefaction.—

	<i>Operating costs</i>	<i>Thousands</i>
Fiscal year 1975:		
Original request.....		\$96, 897
Committee action.....		0
Total		<u>96, 897</u>
Transition period:		
Original request.....		16, 000
Committee action.....		0
Total		<u>16, 000</u>

Of the various approaches for converting coal into an improved non-polluting energy source, liquefaction appears to be one of the most favored in terms of economics, confidence in reliable commercial operability, and the least time to achieve commercial implementation. Economic advantages derive from the fact that less chemical changes are required to convert solid coal into a liquid than to gases, and the energy-conversion efficiency is higher.

Experimentation on coal liquefaction has been conducted continuously in the United States (but with varying degrees of intensity) since World War II so that there is technical experience on which to build an expanded program.

The vast domestic resources of coal can be liquefied by a process which adds hydrogen to produce either a clean boiler fuel or a feed-stock suitable for conventional refinery use. Processes can be developed that can use coal of any rank so that plants need not be limited greatly by geographic considerations.

Specific prospects in the coal liquefaction program of ERDA include research and development in each of the four methods of converting coal to liquids, namely: (a) direct hydrogenation, (b) solvent extraction, (c) pyrolysis, and (d) indirect liquefaction. The products produced by each process differ and because data is insufficient to make sound economic comparisons at this time, ERDA believes that a parallel approach is desirable. Selected process options are being investigated through bench and pilot stage in order to build a broad technological base. From this base, ERDA believes that an efficient process or combination of processes can be developed. Five coal liquefaction pilot plants are proposed by ERDA to be funded by this legislation including the two operational plants.

Additionally, a number of process development units are proposed, representing the first scaleup of promising laboratory tests, prior to pilots plants. The program also includes support research and development, which provides the backup research for current process development and for the development of novel liquefaction processes as a second and third generation improvements in the technology. Support engineering work reveals areas needing research and development and guides the development to the most economic and reliable processes.

The committee has been advised that in its initial budget submissions for fiscal year 1976, ERDA requested \$2.8 million for the continuation of a woodwaste conversion project initiated by the Bureau of Mines at Albany, Oregon. The project was deleted from the budget requests by the Office of Management and Budget. In the committee's judgment this project should be continued as part of ERDA's coal liquefaction research program. Accordingly, it is the intention and expectation of the committee that \$2.8 million of the ERDA authorization for coal liquefaction research be used to fund the continuation of this project during fiscal year 1976.

Plant and capital equipment

	<i>Thousands</i>
Project 76-1-a, clean boiler fuel demonstration plant:	
Fiscal year 1976 original request-----	\$9,000
Committee action-----	0
Total -----	9,000
Transition period:	
Original request-----	3,500
Committee action-----	0
Total -----	3,500

This project provides for a chemical process plant to convert high sulfur coal to a clean liquid fuel. The plant is expected to process 100 tons of coal per hour to yield about 4,000 barrels per day of "oil" and 22 million cubic feet of pipeline quality gas. The "oil" expected to be produced will be sufficient to fuel a 125-175 megawatt power plant. Initial funding is needed for architect-engineering (A-E) design services and to place long-lead-time items of equipment on order to insure their availability to meet the established schedule for completion of the final plant. Long-lead-time equipment items include special instruments, high capacity compressors, heavy walled pressure vessels, air separation plants, and special support equipment required in each of these major areas.

This demonstration plant will be capable of converting typical high-sulfur Eastern bituminous coals to environmentally satisfactory low-sulfur, low-ash, boiler fuel. The plant will demonstrate both the technical and economic feasibility of processes to remove sulfur from coal. The products produced by the plant will be tested using commercial equipment.

In addition, approximately \$22,000,000 of research and development costs in the operating expense appropriation are associated with design and construction of this project. Upon completion of construction of the plan, annual operating costs are estimated by ERDA at \$15,000,000. These operating costs will be shared by industry and government.

The estimated cost for A-E services and long-lead procurement is \$20,000,000 (\$10,000,000 for A-E services and \$10,000,000 for procurement) in fiscal year 1976 and \$8,000,000 (\$3,000,000 for A-E and \$5,000,000 for procurement) in the Transition Period. The preliminary ERDA estimate of the total project cost for the demonstration plant is about \$166,000,000, consisting of approximately \$16,000,000 for A-E design and inspection and \$150,000,000 for construction. This estimate does not include escalation and is based on current dollars. Included within the above total project cost of \$166,000,000 is \$13,000,000 appropriated through fiscal year 1975 to the Office of Coal Research (\$3,000,000 for design and \$10,000,000 for long-lead procurement).

ERDA intends that the design and inspection costs for the project will be fully borne by the Government. Construction costs are anticipated to be shared by industry and the Government. The Federal Government's share of the total project including design, is estimated by ERDA at \$91,000,000 and the industry share is estimated at \$75,000,000.

(2) Coal high Btu gasification.—

<i>Operating costs</i>		<i>Thousands</i>
Fiscal year 1976:		
Original request	-----	\$42, 838
Committee action	-----	-5, 000
Total	-----	37, 838
Transition period:		
Original request	-----	8, 700
Committee action	-----	-1, 250
Total	-----	7, 450

The Interior Committee recommends a shift in funding from "operating expenses" of the high-Btu gasification sub-program to a capital account so that seed monies will be available to begin construction of a high-Btu gasification demonstration plant (additional discussion of the proposed demonstration plant below).

Natural gas demand has exceeded the current rate of discovery on new sources. Development of high-Btu gas would provide alternative energy sources equal in quality to natural gas. The ERDA budget reflects a shift in emphasis away from high-Btu gas to low-Btu gas and liquefaction research and development; for FY 1976, the budget request is \$15 million below the current fiscal year for high-Btu gasification.

High-Btu Gasification is the chemical transformation of solid coal into gas. This gas, composed essentially of methane, is virtually free of sulfur, contains no carbon monoxide, or free hydrogen, and has a heating value of about 1000 Btu/ft.³

This substitute for natural gas is manufactured from coal by producing a synthesis gas and treating it by purification and catalytic methanation. A typical process begins with coal preparation, in which coal is ground to a powder. Pretreatment with air or oxygen destroys the caking property, which otherwise causes some coals upon heating to swell and plug the reactor. In the gasification process, synthesis gas is formed when steam and oxygen react with coal. This gas contains varying amounts of carbon monoxide, hydrogen, and methane as valuable components. Carbon dioxide, sulfur compounds, and other impurities must be removed in further processing.

Activities will continue on a cooperative and jointly funded effort of industry-government to develop processes aimed at improving the nation's natural gas resources by producing substitute pipeline quality gas. Specifically, this program will continue development of each of five different, but technically feasible, processes for the conversion of coal to high-Btu gas. Concurrent development of each concept through the pilot plant stage could generate the data necessary to determine which of the five concepts is more suitable for implementation on a

commercial scale. The program is also directed toward the development of a suitable and compatible methanation process (to up-grade the gas produced in a state-of-the-art gasifier), and the development of advanced structural materials and processing equipment. Two pilot plants are presently operating and three others will begin operations within the near future. This work will continue to the point at which sufficient design and engineering data are available for industry to construct a commercial-sized facility. The present schedule calls for pilot plant operation through 1979 and construction of the demonstration plant to begin about 1977 with operation of such a plant by 1980.

Plant and capital equipment

<i>Plant and capital equipment</i>		<i>Thousands</i>
Project 76-1-b, High-Btu pipeline gas demonstration plant:		
Fiscal year 1976 original request	-----	\$20, 000
Committee action	-----	-----
Total	-----	20, 000
Transition period:		
Original request	-----	-----
Committee action	-----	5, 000
Total	-----	5, 000

This project provides for the conversion of coal to a high Btu, pipeline quality gas which can be introduced into already existing pipelines.

The increase of \$20 million for the Pipeline Gas Demonstration Plant will provide funds for early procurement of long-lead delivery equipment items. With this authority, early procurement of items such as special compressors, principal gasification vessels, oxygen plants, and other items of equipment with deliveries estimated to be in the range of 30-48 months will be placed on order as rapidly as specifications can be prepared.

The Pipeline Gas Project anticipates multiple awards. From designs prepared in Phase I, plants will be selected for final engineering and construction. As the work proceeds, general specifications to cover more than one process will be prepared for each item of equipment that analysis shows as a pacing item in construction of the plant. Placing of these orders at the appropriate time, to fit the construction schedule, will save a minimum of 12 months in terms of plant completion date. In some cases the time saving can be as long as two years.

The second phase of this project involves construction of the demonstration plant at a location chosen to insure ready deliverability of equipment and a broad range of available coals. Construction will be phased for the earliest possible operation of the gasifier. A significant feature of the design will be the ability to produce a range of products, as well as to test a variety of gasifiers. By modifying the shift cleanup system, the plant may be converted to the production of methanol or higher alcohol, motor fuel, waxes, and high-quality fuel (low-Btu) gas, as well as SNG. Earliest tests, of course, will be for the production of SNG.

During the operational phase, the plant will be operated to determine the commercial economics of coal gasification to produce SNG. As a follow-on, alternate products taken along or in combination with SNG

will be studied in detail to determine and fix commercial-scale economics. Also, it is expected that data on the gasifiers can be utilized to determine the best gasification system to produce hydrogen for liquid fuel plants.

(3) Coal low Btu gasification.—

<i>Operating costs</i>		<i>Thousands</i>
Fiscal year 1976 :		
Original request.....		51, 671
Committee action.....		-2, 500
Total		<u>49, 171</u>
Transition period :		
Original request.....		6, 500
Committee action.....		625
Total		<u>5, 875</u>

The Interior Committee recommends a shift in funding from "operating expenses" of the low-Btu gasification sub-program to a capital account so that seed monies will be available to begin construction of a low-gasification demonstration plant.

The low-Btu gasification program is designed to provide the technology necessary to produce a gas suitable for power generation and combined gas turbine/steam turbine power cycles, thus further employing coal as a utility fuel. The specific objectives of the program are (1) to develop at the earliest possible date one or more gasifier systems which are economically applicable for the use of coal as a substitute for oil and natural gas for power generation and industrial use, and (2) to provide the technology required to initiate the conceptual design of a demonstration plant and permit the widespread commercial utilization of low-Btu gasification by the mid-1980's.

Low-Btu gas is best used near its source, since pumping costs per Btu are high and the gas produced is hot and this heat is conserved by not transporting great distances. Both reduced process complexity which allows lower capital costs on an equivalent Btu basis and the fact that some energy consuming steps (e.g. methanation) would not be needed, thus increasing the overall thermal efficiency and lowering operating costs, makes the production of low-Btu gas attractive.

The program provides for the development of above ground gasification for operation at near atmospheric and higher than atmospheric pressures, supplemented by the development of underground coal gasification technology. According to ERDA, the state of development of near atmospheric gasification is currently more advanced than that of pressurized gasification. Therefore, the intent of the program is to promote the development of near atmospheric gasifiers as a primary objective and at the same time begin development of higher pressure gasifiers in order to provide a commercially acceptable process at the earliest possible date.

The Interior Committee specifically authorized an increase of \$7.5 million to permit a substantial expansion of the in situ coal gasification program. It is anticipated, by the Committee, that this increase, bringing the total level for this program to \$12.5 million, will permit a second field test (in addition to the Hanna, Wyoming Test) of a

process for deep, thick coals, a possible test of a process for thin eastern seams, site selection and process evaluation aimed at a pilot scale project, and exploration of new concepts as well as supporting laboratory and systems studies.

The following table delineates both the present \$5 million program and what ERDA might do with an additional \$7.5 million.

	<i>Additional millions of dollars</i>	<i>Fiscal year 1976 request</i>
Field test a 2d concept, the vertical packed bed process (Lawrence Livermore Lab)...	3.8	1.0
Possible field tests of a thin seam process (Morgantown Lab).....	1.8	1.0
Field instrumentation development (Sandia Lab).....	1.5	
Site selection for pilot scale project.....		
Laboratory support studies.....	} ERDA HQ .4	
Explore advanced concepts.....		
Laboratory support studies.....		
Laramie field test.....		3.0
Total	<u>7.5</u>	<u>5.0</u>

Plant and capital equipment

Project 76-1-c, Low, Btu fuel gas demonstration plant :		<i>Thousands</i>
Fiscal year 1976 original request.....		0
Committee action.....		\$15, 000
Total		<u>15, 000</u>
Transition period :		
Original request.....		0
Committee action.....		3, 750
Total		<u>3, 750</u>

This project provides for the conversion of coal to a low-Btu gas which could be used for fuel in conventional Rankine cycle electric power generation and also as a source of energy input to advanced cycle machines.

It is expected that ERDA will seek competitive bidding for preliminary engineering design of a commercially-scaled gasifier for electric power generation. It is expected that a number of designs will result, from which one or more will be selected for detailed construction design and costing of a demonstration plant. Construction and operation of the demonstration plant will then follow, at a location where integration with conventional and advanced cycle power generation can be accomplished. Both air-blown and oxygen enriched gasification will be tested to determine production costs for alternate power systems. Feasibility of using slagging as well as non-slagging coal will be tested. Optimum procedures for cleanup and disposal of slag and ash will be determined. The capacity for cleanup of an individual gasifier is expected to range upward to 3,000 tons per day of coal feedstock.

Early procurement of gasification equipment and supporting machinery will be materially assisted by provision of \$15 million for this important demonstration plant. Special designs for unusual items of equipment can be prepared and equipment placed on order based on preliminary analysis of the total plant concept. Substantially all

gasification equipment will be special and of a new and unique design. The \$15 million will enable completion of the finished plant from 15-21 months sooner than would be possible without this capital expenditure authority.

Special items of equipment being developed with both Federal and private funds to provide clean gas for use in an expansion turbine can be purchased as developments warrant. Provision can be made to purchase the expansion turbine needed with provision to utilize the output in the production of power and in the compression of combustion air or oxygen.

Plant and capital equipment

Project 76-1-d, Low-Btu combined cycle demonstration plant :		<i>Thousands</i>
Fiscal year 1976 original request	-----	0
Committee action	-----	\$5, 000
Total	-----	5, 000
Transition period :		
Original request	-----	0
Committee action	-----	1, 250
Total	-----	1, 250

This project will provide for the utilization of gas turbines in combination with steam turbines. This technological innovation is most likely to promote efficient use of fossil fuels in the generation of electricity. Combined-cycle (Brayton-Rankine) plants utilize the presently wasted hot exhaust from gas turbines to generate steam for conventional steam-electric generators. An additional increment of electricity is thus obtained with the same level of fuel consumption. This improvement in the efficiency of energy utilization in steam-electric plants is commonly expressed in terms of the heat rate.

An additional \$5 million for this important work will allow design and procurement of a special combustor gas turbine arrangement based on combustion characteristics of the fuel gas to be produced. The combustor/turbine must be of special design since all standard commercially available equipment uses high quality gas or high quality liquids. Exhaust gas from the cycle must be processed in a waste heat boiler and this unit, too, will be designed and placed on order. Early procurement will allow construction of the combustor and turbine and its testing with simulated low B.t.u. gas. A minimum of two years will be saved in terms of testing a gasifier/gas turbine plant by authorizing this early capital expenditure.

(4) Coal advanced power systems.—

Fiscal year :		<i>Thousands</i>
<i>Operating costs</i>		
Original request	-----	\$5, 261
Committee action	-----	3, 000
Total	-----	8, 261
Transition period :		
Original request	-----	1, 300
Committee action	-----	750
Total	-----	2, 050

These power systems are needed in order to generate electricity more efficiently from coal-derived fuels to alleviate the problems associated with high fuel costs, limited availability of fuels and the burden imposed on the environment by ash, waste heat and other by-products. Advanced power systems will enable us to obtain electricity to meet our needs at reduced comprehensive cost by requiring less fuel to generate the same amount of electricity. The compound growth of the demand for electricity has exacerbated the problem in the 1968-1973 period. Increased efficiency of power generation is essential. Advanced powerplants include higher temperature and pressure turbine systems, using steam, air, combustion products, alkali metal vapors, helium, carbon dioxide and other working fluids.

For primarily economic reasons, existing central station generating systems have reached an efficiency plateau of about 40 percent. Power requirements for stack gas scrubbers, where required, would produce lower overall efficiencies. Rising costs of coal-derived fuels could favor development of efficient supplemental power conversion systems at a temperature above that of the steam turbine plant or by replacement of the steam by a more efficient bottoming cycle. The Advanced Power program is primarily directed toward the development of power conversion "topping" systems, which when combined with a modern steam, would permit cost effective use of coal-derived fuels or the now more costly traditional clean fuels. Various power generation concepts exist that promise this achievement.

Greater and more efficient use of coal-derived fuels in power generation offers the benefit of freeing petroleum products and natural gas for residential, commercial, other industrial and transportation uses where their unique properties make their use essential. Also, conserving fuel by greater efficiency has important benefits in decreasing thermal and chemical pollution of water suppliers and the atmosphere and decreasing the disposal volume of ash and sulfur compounds.

(5) Coal direct combustion.—

Fiscal year 1976 :		<i>Thousands</i>
<i>Operating costs</i>		
Original request	-----	\$32, 645
Committee	-----	0
Total	-----	32, 645
Transition period :		
Original request	-----	5, 100
Committee action	-----	0
Total	-----	5, 100

The fossil energy program in the direct combustion of coal is designed to develop both atmospheric and pressurized systems capable of burning high sulfur coals of all degrees of rank and quality directly in fluidized-bed combustors. Combustion of coal in this manner would be used for power generation and industrial heat. Fluidized-bed combustion is a special application of low-Btu gasification and this program will be coordinated with the latter. Fluidized-bed boilers have been under development for several years and have been successfully operated for up to 7,000 hours with all types of coal, including an-

thracite and char. Presently, a 30 Mw atmospheric pressure fluidized-bed boiler has been designed and is being installed at a power utility site. The program anticipates the design of a 200 Mw atmospheric pressure fluidized-bed boiler. The program also contemplates continued work on the pressurization of the fluidized-bed.

With respect to the fluidized bed boiler the Interior Committee believes this technically is a promising way to utilize coal directly as an energy source in the production of electric power. These boilers have been shown to have great potential for reduced investment cost and better stack gas control vis-a-vis conventional boilers. Work has proceeded on the development of both atmospheric pressure and elevated pressure boilers. This work is now in the pilot plant stage and early construction of a demonstration plant is clearly warranted.

Plant and capital equipment

	<i>Thousands</i>
Project 76-1-e, Fluidized bed direct combustion demonstration plant:	
Fiscal year 1976 original request.....	0
Committee action.....	\$13, 000
Total	<u>13, 000</u>
Transition period:	
Original request.....	0
Committee action.....	3, 250
Total	<u>3, 250</u>

This project contemplates the ERDA will request proposals for design of a fluidized-bed boiler powerplant with boiler operating pressure to be at the proposer's option. Installed powerplant capacity is expected to be up to 800 MWe.

Provision of \$13 million will allow design and procurement of principal components of the fluid bed boiler. During design, provision will be made in the design to test alternate fuels including high and low sulfur coal, char, and heavy synthetic liquid. With appropriate changes, the boiler can be adapted to raising steam for use in a conventional turbine or heating gas in a closed cycle/gas turbine system.

Provision of funds in the FY 1976 budget will save a minimum of two years in the development of this vitally important item of equipment.

(6) Coal advanced research and supporting technology.—

Operating costs

	<i>Thousands</i>
Fiscal year 1976:	
Original request.....	\$32, 061
Committee action.....	0
Total	<u>32, 061</u>
Transition period:	
Original request.....	4, 600
Committee action.....	0
Total	<u>4, 600</u>

This program is divided into four major areas: advanced coal conversion processes, advanced direct coal utilization processes, advanced supporting research, and systems studies. The first area involves explor-

atory process research and engineering through early process development. The second area is concerned primarily with advanced technology pertaining to coal preparation and beneficiation, combustion and energy conversion, and removal of sulfur dioxide and particulate matter from hot combustion gases. The third area, advanced supporting research, involves research on materials, environmental problems, and studies in basic coal science. The fourth area, systems studies, includes projects to evaluate development of coal processes in the context of near, mid and long-term national needs and priorities to assure that economic, social and environmental constraints are satisfied, and to determine the best uses for coal and coal conversion processes.

The Interior Committee has approved increased authorizations in ERDA programs under the direction of the Assistant Administrator on Environment and Safety. The program descriptions provided by ERDA indicate to the Committee the possibility of a duplication of efforts. It is therefore the Committee's expectation that ERDA coordinate efforts in this area so that no duplication takes place within ERDA.

B. PETROLEUM AND NATURAL GAS

ERDA request

The ERDA requested \$23,647,000 for the operating expenses in the research and development program for petroleum and natural gas stimulation. This amount reflects an increase of \$6,380,000 over the estimated costs for this program in fiscal year 1975. The proposed amounts for this program include the following sub-program increases over the estimated costs for fiscal year 1975: gas and oil extraction, +\$5,823,000; and gas and oil utilization, +\$557,000.

Committee action

The Energy Research and Development Administration has issued the first comprehensive research, development and demonstration plan required under section 6 of the Federal Nonnuclear Energy Research and Development Act of 1974. The Act requires that the Plan discuss and describe a program to achieve solutions to energy supply systems and associated environmental problems in three time frames (a) the immediate and short term (present to 1985); (b) the middle term (1985-2000); and the long term (beyond 2000). The Committee notes that the Plan contemplates that use of enhanced recovery methods of petroleum and natural gas is vital because success in this area would buy the Nation an additional 10 years before there would be a serious crunch in liquid fuels. This program is thus vitally important.

The Committee notes that petroleum and natural gas are the forms of energy that can be expanded rapidly enough to have a significant effect within five years. Resources of 290 billion barrels of residual oil, most of it onshore, will remain after present conventional production operations are completed. Also, there are approximately 600 trillion cubic feet of natural gas (non-commercial) in deep Rocky Mountain basins alone. These resources are the target for enhanced recovery. Of this target, ERDA maintains that 40 to 60 billion barrels of tertiary oil and 300 trillion cubic feet of natural gas are recoverable by known, but unrefined, technology. Finally, more than 100 billion barrels of heavy oil and some 35 billion barrels of bitumen

in tar-sand deposits are known to exist domestically. This, is recovered, would more than double the nation's proved reserves.

The Committee notes that in fiscal year 1974, about \$2.5 million out of a total budget of \$7.3 million budget authority was available for contracts and grants for oil and gas-stimulation program. Budget authority increased to \$26 million in fiscal year 1975, out of which about \$19 million was available for contracts and grants for oil and gas stimulation. The budget authority proposed by ERDA for fiscal year 1976 is essentially the same level as in fiscal year 1975 while costs increased from \$16.2 million in fiscal year 1975 to \$22 million in fiscal year 1976.

ERDA requested \$22,065,000 to improve gas and oil extraction, a large part of which is anticipated to be spent for existing demonstrations. The Committee increased this funding for fiscal year 1976 by \$20 million for the transition period by \$5 million.

(1) Petroleum and natural gas extraction.—

	<i>Operating costs</i>	<i>Thousands</i>
Fiscal year 1976 :		
Original request.....		\$22, 065
Committee action.....		20, 000
Total		42, 065
Transitional period :		
Original request.....		6, 730
Committee action.....		5, 000
Total		11, 730

The objective of the ERDA oil- and gas-stimulation program is to demonstrate, on a meaningful scale, the application of existing and improved technology and the development of new technology for stimulating production from known domestic deposits of petroleum, natural gas, heavy oils, and bitumen in tar-sands as a near-term means of augmenting domestic supplies of oil and gas. Another objective is the transfer of technology to all segments of the domestic petroleum and natural gas industries through prompt disclosure of data resulting.

The present average efficiency of domestic petroleum production is about one-third of the original oil-in-place. The efficiency of gas production is considerably higher in formations with adequate permeability. But there are appreciable deposits of natural gas in low-permeability formations in Rocky Mountain basins and in eastern shale deposits from which commercial production has not been possible by using available well-completion techniques.

The technology of stimulating oil production by secondary and tertiary recovery exists today. It includes micellar-polymer flooding byproduct carbon dioxide injection improved waterfloods and thermal methods. Gas stimulation involves the fracturing of low-permeability (tight) formations by massive hydraulic fracturing combinations of hydraulic and chemical-explosive fracturing and fracturing wells deviated from vertical to intersect natural fractures. The production of oil from heavy-oil and tar-sand deposits involves the use of solvents and heat.

The nearest-term impact that can be made in supplementing domestic energy supplies is in fracturing tight gas-bearing formations,

for production increases can be evaluated quite rapidly. From two to four years after initiation may be required to evaluate oil-production-stimulation demonstrations; however, the impact still falls within the near-term time frame.

Oil extraction efforts emphasize the demonstration of existing and improved secondary and tertiary recovery techniques rather than new refinery technology, an area where industry possesses a broad technological base. ERDA advises that industry budgets for research on oil production are much smaller than those for refining.

ERDA states that the economics associated with advanced recovery projects are uncertain and contends that until these economics improve, the industry will probably not do this needed work. The work is needed now. Time is the critical element.

Government participation with industry will foster a more rapid development of enhanced oil recovery technology and expedite the transfer of this technology to the entire industry. The Committee wants to stress that this aspect of the program is an important one.

The natural gas stimulation efforts are designed to stimulate the commercial production of natural gas from formations containing vast quantities of natural gas but having natural permeability so low that commercial production to date has not been feasible.

Many arguments have been presented on the number of demonstrations required to reach the goal of an additional one million barrels per day by 1982. Whatever the number may be, the initial increment to attain it has not been reached. Early successes will reduce the number of demonstrations of any given method required before industry will commit major funds as it now does with waterflooding. Systems analyses have been initiated to develop improved predictive methods. These methods will have to be self-corrective and depend on early results for later extrapolations.

Natural gas stimulation (particularly from tight formations such as the Devonian Shale) is a major part of this program. The use of chemical and/or gaseous explosives and massive hydraulic fracturing are near commercialization. However, their applicability to very tight formations must be demonstrated before they will be accepted commercially.

ERDA informs the Committee that the program has been well received and is progressing well. It appears that the incentives provided to help demonstrate known but unproven technology are effective. However, these demonstrations are of three or four years duration and have been funded incrementally to get a reasonable number (about 12 in 1975) started:

It is the judgment of the Interior Committee that an increase of \$25 million is needed to continue this program at a reasonably accelerated rate. The Committee anticipates that this increased authorization will be used for additional demonstration projects.

Thus, the Committee intends that the increase in funds of \$25 million in the petroleum and natural gas stimulation program will provide for six additional demonstration projects for testing oil recovery and four additional projects for natural gas stimulation. To achieve enhanced oil and gas production, it will be necessary to pursue an aggressive program of field demonstrations in enhanced recovery tech-

niques. Therefore, the Committee expects this increased funding to be used for the following:

Additional field demonstrations (cost shared with industry):

<i>Petroleum production</i>		<i>Millions</i>
Fluid injection (5):		
Micellar-polymer (2)-----		\$6
Chemical additives (1)-----		3
Carbon dioxide (2)-----		3
Thermal stimulation (1)-----		2
		14
		14
<i>Gas stimulation</i>		
Chemical explosive/hydraulic fracturing (2)-----		3
Massive hydraulic fracturing (1)-----		2
Environmental effects-----		1
Massive hydraulic fracturing in Devonian shale (1)-----		5
		11

The Committee expects the Energy Research and Development Administration to carry out assurances made to Congressional Committees by the ERDA Administrator that nuclear bombs will not be used to stimulate the production of natural gas now locked in tight rock formations.

The Interior Committee takes special note of the ERDA program in technology development related, directly and indirectly, to the stimulation of natural gas from the Devonian shale which underlies most of the Appalachian area. The Federal Power Commission has already advised mid-Western States that a natural gas curtailment is anticipated this winter. While the technology to enhance recovery of natural gas from this tight formations is not immediately forthcoming and will not enhance natural gas supplies within the near future, the Committee expects the Administrator of ERDA to proceed with all due diligence and believes that the recovery of natural gas from Devonian shale should be of the highest priority.

It is the Committee's judgment that research and development on releasing gas from the Devonian Shale in those areas that have not been naturally fractured is not being pursued at the maximum rate by ERDA. The specific authorization of \$5 million for natural gas stimulation in Devonian Shale should be directed toward pursuing an accelerated research and development program on unfractured Devonian Shale. This effort should be conducted in parallel with current ERDA research and development efforts in massive hydraulic fracturing and the research and development efforts in Western shale where other massive natural gas sources are believed to exist.

The \$5 million increase will be used to initiate a cost sharing project with industry for a test program which will concentrate on new well completion and gas production stimulation techniques in the Devonian Shale. This program will be conducted in areas of the Devonian Shale where extensive natural fracturing has not occurred so that it will complement current or planned programs in massive hydraulic fracturing in the Devonian Shale.

The \$5 million increase in the ERDA budget will accomplish a 1 to 3 year time saving in the Devonian Shale R&D.

Furthermore the Committee notes that the original budget request made by the Energy Research and Development Administration anticipates a program specifically related to Devonian Shale amounting to approximately \$2,449,000 in fiscal year 1976. In addition to this amount, approximately \$1.7 million of the original ERDA budget request will involve the development of natural gas stimulation technology which will be directly applicable to the requirements for natural gas stimulation in Devonian Shale. Furthermore, the Interior Committee has authorized \$5 million (above the \$5 million specifically authorized to Devonian Shale) for natural gas stimulation. The Committee is informed by ERDA that the technology acquired from this increased program effort will be directly applicable to the natural gas locked in Devonian Shale.

In summary, the Committee is satisfied that with the increased authorizations an aggressive program effort will be achieved to stimulate natural gas from Devonian shale. In addition to the approximately \$15 million that will be devoted directly or indirectly to Devonian shale, industry is expected to share costs by contributing to any stimulation programs.

(2) Petroleum and natural gas utilization.—

<i>Costs</i>		<i>Thousands</i>
<i>Fiscal year 1976:</i>		
Original request-----		\$1,582
Committee action-----		0
		1,582
		1,582
<i>Transitional period:</i>		
Original request-----		500
Committee action-----		0
		500
		500

Improved end use of petroleum products and natural gas and increased efficiency in processing are vital because of limited resources of these fossil fuels. Shifting to lower quality feedstocks also is necessary; use of high grade crude oils as feedstocks for products that could be produced from heavier, more asphaltic stock is a luxury that can no longer be maintained. The research proposed involves continuation and expansion studies of improved processing of heavy crude oils and asphalt; use of waste lubricating oil as a feedstock (recycling); automotive engine studies to permit use of lower quality gasoline and other fuels; and providing required fundamental data on physical, chemical, and thermodynamic properties of hydrocarbons and related products.

This program will also attempt to evaluate products of various other energy programs as substitutes for typical petroleum products. This program has been redirected to permit extended studies of the many "syncrudes" and "synthoils" that are being produced. Methods for refining and using "crude oils" from fossil fuel sources such as coal will be developed and evaluated. Several of the crude products of oil shale retorting or coal reforming may prove amenable to usual refinery processes. The refined products from such sources also may resemble traditional fuels to various extents. The characteristics of such products including their performance in automotive engines will be determined.

In addition, the resource base for petroleum products will be broadened by using various waste products, such as lubricating oils, as premium quality feedstocks. Use of lower grade feedstocks including those of high sulfur and metals content, also will be investigated to further broaden the fossil fuel natural resource base.

C. OIL SHALE

ERDA request

The ERDA requested \$8,147,000 for the operating expenses in the research and development program for oil shale. This amount reflects an increase of \$4,693,000 over the estimated costs for this program in fiscal year 1975. The proposed amounts for this program include the following sub-program increases over the estimated costs for fiscal year 1975: in situ processing, + \$4,131,000; and composition and characterization, + \$562,000.

Committee action

The Interior Committee believes that the proposed ERDA program for the research and development of the Nation's vast oil shale deposits reflects a modest and insubstantial program. Considering the potential increases to over-all energy supply, if oil from shale can be extracted commercially, the level of effort in this program should be increased manifold.

Oil shales of the Green River Formation in Colorado, Utah, and Wyoming constitute the world's largest known hydrocarbon deposit. This deposit represents some 1.8 trillion barrels of in-place shale oil, including approximately 600 billion barrels of represented by higher quality shales having an assay value of 25 gallons or more per ton. Despite its immensity, this resource has yet to be used productively.

Economic considerations and lack of a Government leasing policy (some 80 percent of the resource is found on public lands) are among the factors that have, in the past, inhibited commercial operations.

The Committee notes that four prototype oil shale leases were issued as a result of the oil shale lease sales held in early 1974. However, bids were not submitted on two additional tracts of public domain lands for the in situ development of oil shale. The Department of Interior has published a call for nominations of lands for prospective oil shale leasing for in situ development. Under present plans two of the nominated tracts could be competitively leased by mid-1976.

In order to enhance the program for development of the in situ method for recovering oil from shale, the Interior Committee adopted an increase of \$16,966,000 for in situ processing so that the program is authorized at a funding level of \$24,000,000. Furthermore, in order to accelerate the in situ program, the Interior Committee adopted an amendment to authorize the Administrator of ERDA, in cooperation with the Secretary of Interior, to select a normal sized tract of public land and to offer that tract as the government's contribution to a cooperative program with private industry in the demonstration of an in situ method.

It is the Interior Committee's intention that the oil shale in situ program be greatly accelerated and that the Energy Research and

Development Administration utilize the resources made available through this legislation to determine, at the earliest possible date, the feasibility of extracting oil from shale through the in situ method.

(1) Oil shale in situ processing.—

<i>Operating costs</i>		<i>Thousands</i>
Fiscal year 1976:		
Original request.....		\$7,034
Committee action.....		16,966
Total.....		24,000
Transitional period:		
Original request.....		2,000
Committee action.....		4,240
Total.....		6,240

In situ recovery of oil from oil shale is a potential major resource that has experienced only a minor development. In situ processing has several advantages over alternative methods of oil recovery. It is potentially more economical, requires less water, and could result in greatly reduced environmental effects. Major technical issues to be resolved include the method to be used for fracturing the shale bed to increase its permeability, maintaining and controlling the retorting process, and optimizing resource recovery.

In situ, or underground processing, of oil shale offers many potential advantages over the technologies that will be employed on the public lands leased under the Department of Interior's Prototype Oil Shale Leasing Program. As compared to mining and surface processing of oil shale, for example, it is estimated that in-situ production of shale oil would require:

- Two-thirds fewer people to operate the process,
- One-half the amount of water, and
- One-third or less disposal of waste oil shale.

In situ processing also offers the possibility of application to low-grade oil shales. This advantage is important in that some 1.2 trillion of the total resource of 1.8 trillion barrels of shale oil is in low-grade deposits that may never be recovered by conventional mining techniques.

The current ERDA program consists of a number of sequential tests at one site in Wyoming. This is a small test (under 10 acres) at a depth of about 150 feet. This research will be continued as an in-house project. Additionally, four other field tests covering 1 to 10 acres will be initiated. These will lead to a final demonstration of a true in situ process on a 50-acre site. These latter four tests will be performed on a contract basis, starting with design and procurement in fiscal year 1976.

Concurrent with the field tests, a strong supporting effort will be maintained as an in-house function. These range from laboratory investigations of means to fracture oil shale formations, simulated in situ retorting tests, environmental studies, and compositional and conversion and characterization research.

Increased authorization for the in situ oil shale development program will enable ERDA to begin an accelerated program. The Com-

mittee intends by the increase in authorizations to allow preparation for four additional oil shale production field tests, acceleration of gasification research and development of environmental safeguards tailored to each process as it is developed.

The Committee specifically recognizes that there is a possibility that oil shale deposits located in portions of several eastern states could be developed and produced. Indeed, on May 8, 1975, two companies testified before another committee on this potential. The eastern deposits have drawn the attention of state and local government and private enterprise for many years. An *in situ* method of extraction for these reserves is being developed. While considerable progress has been achieved, more development is necessary before the technique is commercially feasible.

This increase in program funding is also intended by the Committee to allow for aggressive development of *in situ* methods for Eastern oil shale on the Antrim shale deposits in Michigan.

(2) Oil shale composition and characterization.—

	<i>Costs</i>	<i>Thousands</i>
Fiscal year 1976:		
Original request.....		1,113
Committee action.....		0
Total		1,113
Transitional period:		
Original request.....		300
Committee action.....		0
Total		300

With growing interest and activity by industry and Government in oil shale development, the need also is increasing for reliable scientific information to support development, scaleup, and improvement of processes and to provide a technical base for policy decisions. Laboratory and bench-scale research on composition and characterization of oil shale and shale oil is a primary source of information. This funding will permit the minimal expansion of capability needed to keep pace with the requirements of such information. Work will be continued to extend knowledge about the Green River Formation oil shale comprising the deposits of the Piceance Creek Basin in Colorado, the Uinta Basin of Utah, and the Washakie and Green River Basins in Wyoming. More knowledge about the resource recovery of eastern oil shales must also be developed.

Ongoing research to develop and improve the technology for producing clean end-use fuels from various shale oils or oil shale will be directed to an increasing extent to newer shale oils expected to be available, such as from the Paraho retort now being developed at the Anvil Points facilities near Rifle, Colorado, and from the present *in situ* retorting project at Rock Springs, Wyoming.

Refining research will be continued with emphasis being shifted to hydrocracking of total crude shale oils to produce liquid and gaseous fuels in comparison to relatively complex, established approaches involving preparatory steps such as coking and prefractionation into prescribed distillates as hydrogenation charge stocks.

Pioneering work directed toward development of new technology for oil shale processing is expected to reach the point where current research on the steam-carbon monoxide process for converting oil shale can be evaluated during FY 1976, potentially leading to plans for larger-scale testing. Concurrently, other more advanced ways to furnish the energy required for converting the kerogen in oil shale to useful products, such as by ultrasonics and microwave heating, will be investigated.

2. SOLAR ENERGY DEVELOPMENT

Fiscal year 1976.....	\$96,200,000
Transition period.....	24,300,000
Plant and capital equipment.....	10,000,000
Transition period.....	2,500,000

[In thousands of dollars]

	<i>Fiscal year 1976</i>	<i>Transition period</i>
Solar energy for buildings and facilities.....	31,600	7,400
Solar thermal.....	11,000	3,200
Photovoltaic.....	21,000	5,650
Wind energy conversion.....	15,000	4,000
Bioconversion to fuels.....	6,000	1,150
Ocean thermal energy conversion.....	5,100	1,250
Resource analysis.....	1,500	400
Solar institute.....	5,000	1,250
Plant and capital equipment.....	10,000	2,500
Total	106,200	28,800

The national search for alternative clean energy sources includes solar-based energy systems as one of the most attractive and promising of the nation's alternative energy prospects.

Congressional authorization and guidance for establishment of a National Solar Energy Program was provided in Public Law 93-473, the Solar Energy Research, Development, and Demonstration Act of 1974, enacted at the end of the 2nd Session of the 93rd Congress. P.L. 93-473 was enacted to further the conduct of research, development, and demonstrations in solar energy technologies, to establish a solar energy coordination and management project, to provide for scientific and technical training in solar energy, to establish a Solar Energy Research Institute, to provide for the development of suitable incentives to assure the rapid commercial utilization of solar energy, and for other purposes.

The objective of the Act is to bring a number of solar energy technologies to commercial development as soon as possible. To attain this objective, the Act establishes explicit national goals for solar energy resource determination and assessment, solar energy research and development, and solar energy technology demonstration.

The purpose of the research and development program required by the 1974 Act is to resolve the major technical problems inhibiting widespread use of solar energy. The specific solar energy technologies to be addressed include heating and cooling of buildings, industrial process heating, thermal generation of electricity, bioconversion, photovoltaic conversion, ocean thermal gradient conversion, wind power conversion, and storage of solar energy.

The Act provides that commercial demonstration projects will be undertaken in those solar energy technologies which have resulted

from successfully completed development programs and have met criteria including those related to technological feasibility, environmental impact, potential for technology transfer and others. The demonstrations may be carried out under cooperative agreements between Federal agencies and non-federal entities or solely through appropriate Federal agencies should cooperative agreements not be feasible. However, it is the intent of the 1974 Act, and the expectation of the Committee, that private industry and enterprise will be deeply involved in all phases of the solar energy program in order to accelerate the transition of solar technology to the commercial sector. The early involvement of potential users in the research process and in the formulation and monitoring of the program elements ensures that specific energy systems or study results conform to market needs and constraints.

As a result of research and development projects underway and planned, it is anticipated that by the early 1980's, solar energy systems for heating and cooling of buildings, wind energy, and bioconversion to fuels, will be commercially available at competitive prices for selected applications. Present indications are that other technologies—solar thermal, photovoltaic, and ocean thermal will require more practiced research, development and demonstration efforts. The general assumptions underlying the development of solar energy systems are: there are no insurmountable technical barriers to their commercial application and numerous conversion methods are known; there is promise of achieving cost competitiveness; and utilization of solar energy has minimal environmental impact. In addition, solar energy systems will conserve domestic fossil fuels, reduce imports of energy, create new exportable technology products, and thereby improve the Nation's balance of trade.

The major problem in each technology area is to develop systems that are economically acceptable to the public and commercial sectors. This requires innovative engineering as well as new and improved approaches to solar energy collection, energy storage, transport and conversion; new system approaches; and, perhaps most importantly, investigation of new and cheaper materials to improve system performance, reliability, and economic acceptability. Important problems must also be solved dealing with social, legal, regulatory, environmental, and economic factors associated with widespread utilization of solar energy systems.

SOLAR ENERGY FOR BUILDINGS AND FACILITIES

[In thousands of dollars]

	<i>Fiscal year</i> 1976	<i>Transition</i> <i>period</i>
Heating and cooling research, development and demonstration -----	31,600	7,400

Approximately twenty-five percent of the energy consumed in the United States is used for heating, cooling and supplying the hot water needs of buildings. The overall objective of this program is to establish the full technology base for the widespread availability and utilization of solar energy systems to help meet the heating and cooling needs of all types of buildings in all of the climatic regions of the United States to the degree that such applications can be made economically viable and socially and environmentally acceptable. To accomplish this objec-

tive, a demonstration program and a supporting research effort have been established.

The demonstration program reflects congressional guidance included in the Solar Heating and Cooling Demonstration Act of 1974. The Act authorizes \$60 million over a five year period for the commercial demonstration of the technology for solar heating and combined solar heating and cooling of residential and commercial buildings. The demonstration program will be conducted in two phases, under the Administrator of ERDA, with the objective of equipping several thousand residential units throughout the Nation for solar heating or combined heating and cooling by the fall of 1979.

The Act also provides for:

Establishment of a Solar Heating and Cooling Information Data Bank.

Studies and investigations of legal and other problems associated with widespread use of solar energy for heating and cooling.

Increased ceilings on federally-assisted mortgages, federally-constructed housing on floor area limitations for buildings involved in the demonstration.

Adequate participation by small business firms.

Adequate utilization of publicly assisted housing.

As noted, the goal of this subprogram is to achieve the widespread utilization of solar heating systems and combined heating and cooling systems for all purposes that are economically viable as well as socially and environmentally acceptable. These purposes include all types of buildings in all regions of the U.S. and include agricultural applications, such as crop drying, and water heating for a wide range of domestic and industrial needs. To accomplish this goal, the major emphasis in the coming fiscal year will be on activities associated with the implementation of the Solar Heating and Cooling Demonstration Act, including a research program to complement the demonstration program. Under the Demonstration Program, ERDA is assisted by NASA in technology testing and evaluation, by the Department of Housing and Urban Development in private building demonstrations, by the National Bureau of Standards in technology criteria, and by the Defense Department, the General Services Administration and possibly other agencies in Federal building demonstrations.

The demonstration and research activities in this subprogram are structured to achieve the following specific objectives: (1) employ climatic and insolation data in feasibility determinations and system designs; (2) perform analyses of the performance and operational data resulting from solar heating and cooling systems installed in a variety of buildings; (3) reduce technical and financial risk associated with the introduction of a new technology; (4) prove the practical viability and reliability of promising new concepts and system configurations; (5) acquire performance and cost data and document design, construction, and operational experience; (6) establish a viable range of system applications and compile extensive performance, reliability, aesthetic, safety and life cycle cost data; (7) demonstrate the economics of solar systems for industrial, building, and banking communities; and (8) expedite widespread utilization of solar energy to the degree that such applications can be made economically viable and

socially and environmentally acceptable. To accomplish this objective, a demonstration program and a supporting research effort have been established.

A number of heating and cooling projects were initiated in the predecessor solar programs. Heating experiments on four schools were begun by NSF and a fifth in Atlanta, Georgia is being retrofitted for both heating and cooling. Air conditioning tests utilizing a 150 ton absorption water chiller will be conducted in one of the original four schools, Timonium outside of Baltimore, Maryland. The Atlanta and Timonium tests will be the first involving absorption units on commercial sized buildings. The tests have involved different types of systems and separate contractors.

A Transportable Solar Energy Laboratory is continuing to visit cities throughout the country while conducting field tests under varying location and weather conditions. Associated meetings with local officials and private sector representatives serve to highlight institutional issues which must be addressed in concert with technology development and demonstration.

Cooperative projects with the State of Connecticut involving homes for the elderly, with the General Services Administration regarding federal buildings, with HEW involving a new hospital for an Indian Reservation in Ship Rock, New Mexico, with the Postal Service in support of an experimental post office in Ridley Park, Pennsylvania and retrofit solar heating in a Colorado post office, and with Colorado Springs, Colorado and Santa Clara, California involving local buildings are examples of solar energy projects already under consideration or being implemented in the buildings and facilities area.

Also, a series of grain drying experiments were conducted with U.S. Department of Agriculture in the past year. The joint effort is being expanded to include the entire farming industry, with, for example, a study at Auburn University of solar energy applications in poultry farming.

The special projects, e.g., school heat augmentation experiments, mobile laboratory, and agricultural experiments, and the other experiments resulting from the National Solar Energy Program activities in FY 1974 and FY 1975 are being integrated into the first phases of the demonstration projects under the Heating and Cooling Demonstration Act. The activities and results of these experiments will provide a solid technology and experience base for the acceleration of construction under the phased planning of the Demonstration Act. First phase solar system design studies initiated in FY 1975 under the new Act will be followed by additional system design studies and selection of demonstration projects in FY 1976.

A program of research will be continued in cooperation with the private sector to meet the primary needs for the widespread application of solar energy in the heating and cooling of buildings, to reduce acquisition costs and improve performance, and to prove advanced subsystems and systems. Innovative system and subsystem concepts will be studied and evaluated through experiments conducted where warranted. Improvement over existing technology are required to obtain economic viability in the varied applications required to make a significant energy impact.

Research and development activities in this subprogram under the predecessor NSF program and the current ERDA program have been planned to provide the technological advances required to support a successful heating and cooling demonstration program. FY 1975 R&D efforts included development with the National Bureau of Standards of a uniform procedure for testing solar collectors and storage subsystems; study of methods to reduce collector heat losses to improve efficiency by, among others, UCLA, Lockheed Missiles and Space Company and Hannibal Scientific, Inc.; study of cost reduction methods for efficiency increasing materials and techniques, and research with materials to increase the durability of collector absorber plates. Other advanced system component and subsystems are also under development. Particular emphasis has been placed on development of cost effective solar cooling equipment, including improved absorption cycle refrigeration systems, potential application of the Vuilleumier cycle. Nitinol engines, and new types of Rankine machines. Complete system studies have also been initiated, such as a program supported by General Electric Company and Skyline Homes to develop solar heated and cooled mobile homes. These supporting R&D efforts will be expanded in FY 1976, with continued emphasis on the development of advanced components and subsystems suitable for eventual incorporation in heating and cooling demonstrations.

The support of technology transfer activities also will be continued. Such activities include the preparation of technical material for professional semiprofessional (e.g., builders and contractors), and specialized journals of various user groups, as well as the dissemination of research results through information systems, public media, educational institutions, workshops, symposia, and demonstration centers. The American Society of Heating, Refrigerating, and Air Conditioning Engineers will continue to incorporate research material into the "ASHRAE Guide for the Use of Engineers Engaged in Designing Solar Heating and Cooling Systems." The development of other handbooks will be continued with organizations such as the American Institute of Architects, American Society of Mechanical Engineers, and the National Association of Home Builders.

Technical developments required for the application of solar energy technology include component and system improvements, system optimization, and cost reduction. Major cost reductions are expected based upon engineering innovation, technology breakthroughs, and development of new concepts. Research will be focused on specific areas such as: (1) collectors, (2) storage subsystems, (3) cooling systems, (4) integrated building and solar energy system design, and (5) criteria for selecting among alternative technologies. Also, investigations will include material selection; service life; ease of maintenance; safety; reduction of energy losses; increased collector temperatures (particularly to improve cooling cycle efficiency); reduction of manufacturing, distribution, and installation costs; integration of collectors with roofs and walls; use of collectors as shading devices; and suitability for addition to existing buildings as well as new structures. Improved methods of energy storage will be investigated. Systems and subsystems including controls, heat pumps, heat exchangers, and fluid circulating systems will be optimized for solar applications.

The planning under the Heating and Cooling Demonstration Act is projecting a large number of projects over the four-year period beginning with FY 1975 including residential, single and multi-family, and commercial and industrial building systems. Phased construction of these projects over a period of about four years allows the introduction of improved systems based upon results from research projects and from earlier experiments. Of the candidate designs developed in FY 1975, for early demonstrations, several residential and non-residential projects will begin in FY 1975 and will be in operation in FY 1976.

The first phase of design activity associated with the Heating and Cooling Demonstration Act of 1974 will be initiated in FY 1975 and will be completed early in FY 1976. Upon completion of this design activity, a sufficient number of candidate sites/building types/systems will be available to enable selection of additional demonstrations for initiation in FY 1976. Several of the projects initiated in FY 1975 will become operational in FY 1976 and will provide operational experience and data necessary for the design of improved systems to be initiated in FY 1976. Further consideration will be given to the use of Federal buildings for these projects, tests, and evaluations of solar heating and cooling systems. Initially, the Defense Department will install solar units in FY 1976 in 50 buildings in bases throughout the country. The General Services Administration may also install units in one or more federal buildings under construction in FY 1976. These projects will be conducted in various climatic regions of the United States consistent with the overall program plan.

ERDA Request and Committee Action

The ERDA authorization request for the Solar Energy for Buildings and Facilities subprogram for fiscal year 1976 totals \$21,600,000, of which \$16,000,000 is to be used to implement the Solar Heating and Cooling Demonstration Act of 1974, and the balance for a program of supporting research and development designed to improve the performance and reliability and to reduce the costs of equipment and systems associated with the subprogram. In the Committee's Judgment this subprogram holds great promise for bringing relatively near-term, significant conservation of conventional energy supplies, and should be advanced as rapidly as possible. To accelerate the agency's planned program the Committee has increased the requested authorization by \$10,000,000 for fiscal year 1976. Of the additional funds authorized, \$5,000,000 is directed to strengthening ERDA's implementation of the Heating and Cooling Demonstration Act and to increasing the number of heating and cooling demonstration projects to be undertaken during the fiscal year. The balance of the Committee increase (\$5,000,000) has been added to enable the agency to undertake an accelerated program for the establishment of accredited test facilities for certifying the reliability of solar heating and cooling equipment and systems. In the Committee's judgment consumer and user confidence is essential to the success of the solar heating and cooling program. Accredited and accessible testing services must be made available throughout the Nation to afford the public the means for determining the reliability and energy efficiency of solar equipment and systems, including the soundness of installation procedures. It is the Committee's expectation that ERDA will, in concert with

nationally-recognized standards organizations and the National Bureau of Standards, take such steps as may be necessary to provide a network of certified organizations capable of evaluating solar equipment and systems now being produced and yet-to-be produced, and of informing the public concerning them.

SOLAR THERMAL

[In thousands of dollars]

Fiscal year 1976.....	11,000
Transition period.....	3,200
Plant and capital equipment.....	10,000
Transition period.....	2,500

The goals of the Solar Thermal subprogram are to (1) provide a full technology base for the production of thermal and electric power in the mid-1980's to meet electric utility requirements for load-following or intermediate load electric power generating systems, and (2) provide a full technology base for total energy systems for Federal installations, urban complexes, rural communities, and industrial parks.

To achieve the goals of the Solar Thermal subprogram area, ERDA has set the following objectives: (1) design, fabrication, and testing of prototype components and subsystems that are critical to the success of the central receiver concept for solar thermal electric plants; (2) design, fabrication, and utilization of facilities to permit testing of components and subsystems of solar thermal electric plants, and total energy systems; (3) evaluation of total energy system applications for Federal installations, urban and rural communities, and industrial parks; (4) investigation of critical interface problems and issues associated with the implementation of solar electric and total energy systems; (5) research and development of materials, components, and subsystems and of improved and advanced subsystems and concepts; and (6) continued cost-benefit studies to identify cost and performance criteria for components, subsystems and systems.

Research will continue on the requirements, use, and scale of solar thermal electric power plants; parametric studies of the technical and economic variables of a variety of solar thermal conversion concepts; and system point designs for central receiver concepts and for distributed collector concepts involving, for example, parabolic trough collectors. Subsystems and component research activities will continue on the fabrication and test of novel collectors, development of high efficiency solar absorption coatings, and studies of components required for unconventional cycles and energy storage.

Research activities in FY 1975 resulted in fabrication and test of a portable instrument to measure the relative angular variation of solar radiation intensity, and the instrument is now in use. Also, a large heliostat, approximately 5 meters by 5 meters in area is being tested at the Naval Weapons Center, China Lake, California. Measurements are being made of, among other things, accuracy and image quality. The results of this research are being used to establish specifications for future units. Increased emphasis will be placed on the heliostat subsystem as the driving economic system in the future.

Advances in second generation components, subsystems, and systems are expected to improve the economic viability of solar thermal conversion. Efforts directed toward improved component performance will include studies of environmental degradation processes, interference films, surface geometry, and techniques for large-scale, low-cost deposition of coatings. Thermal storage subsystems research for power plant applications will include studies utilizing sensible heat, change of phase, and chemical processes in the storage system. Some emphasis will be placed upon studies of unconventional cycles for conversion of collected heat to electricity.

Initiation of construction of a 5 MWe solar test facility for testing and evaluating components and advanced conceptual designs is planned for FY 1976. Assessment of solar thermal systems and their economic viability will be continued. Studies of the environmental and social impact of solar thermal systems will be pursued including plant site location studies that involve institutional constraints, such as land use requirements, and the establishment of an insolation data base. The design of a 10 MWe pilot plant will be initiated. Preliminary cost estimates of this facility will be obtained.

A systems analysis of a 100 MWe central receiver power plant will be initiated. The system configuration chosen for implementation is based on optical transmission using heliostat arrays focused upon a central receiver supported by a tower. Information developed through the system definition studies, subsystem analyses, and component testing will be used to establish a set of feasible alternative subsystems. Interface requirements will be identified and tradeoff benefits analyzed to determine the most cost effective configuration possible using first generation subsystems and components. The problem of scaling up from the 10 MWe power output level will be studied. The preliminary design schedule will be formulated so that a 100 MWe power plant can be in operation by the mid-1980's.

The development of non-focusing solar collectors which do not require daily tracking will be investigated carefully for their potential for increased collector performance and reduction in system costs for a distributed collector solar thermal power plant.

Solar total energy systems are designed to produce both thermal and electrical energy, with the thermal energy used for space heating or as process heat. Solar thermal conversion program plans have included initial assessments of such systems for applications meeting the thermal and electrical energy requirements of communities, Federal installations, industrial parks, and rural areas. The preliminary design studies for two solar energy plants will be initiated in FY 1976.

ERDA Request and Committee Action

The ERDA authorization request for the Solar Thermal subprogram for fiscal year 1976 totals \$11,000,000 for operating expenses. After reviewing the administration request, ERDA's program plan for fiscal year 1976, and the record before the Committee respecting the Solar Thermal subprogram, the Committee is not satisfied that the agency's program reflects a sufficient commitment to the early development of the physical plant needed to demonstrate the feasibility of generating electricity for utility use from solar energy. The record before the Committee indicates that the high concentration central

receiver option for generating electric power from solar energy is a highly promising prospect from the technical/economic standpoint. The Electric Power Research Institute, which is itself engaged in a concerted Solar Thermal research program complementary to the Federal program, has urged that the commitment to a 10 MWe central collector solar thermal facility be given a high priority in the ERDA program. The record before the Committee indicates that the central receiver concept for harnessing solar energy for the generation of electric power is advanced sufficiently to warrant a firm commitment to construction of facilities. Accordingly, in addition to the \$11,000,000 in operating expenses requested by the administration the Committee recommends a further \$10,000,000 in capital and equipment funding to permit the prompt commencement of long lead time procurement, site acquisition, architect-engineering, and other activities and services required for the construction of solar thermal facilities. \$5,000,000 is recommended for Project 76-1-f, a 5 MWe solar thermal test facility. The additional \$5,000,000 is provided to fund commencement of construction of Project 76-1-g, a 10 MWe central receiver solar thermal power plant.

ERDA is requested to provide, and the Committee will expect to receive, cost-to-complete data and a timetable for further advancing these projects as part of ERDA's fiscal year 1977 authorization cycle. It is anticipated that providing the recommended plant and capital equipment authorizations at this time will significantly advance the timetable for bringing such facilities on line. Such action also demonstrates this Committee's firm intention to see to it that promising new energy technologies be moved out of the laboratory and into practical demonstration projects as rapidly as possible.

PHOTOVOLTAIC CONVERSION

[In thousands of dollars]

Fiscal year 1975-----	21,000
Transition period -----	5,650

The overall goal of this subprogram is to develop economically viable photovoltaic electric power systems that are suitable for a variety of terrestrial applications and are capable of providing a significant amount of the Nation's energy requirements by the year 2000. An intermediate goal is to produce over 5000 kWe of solar arrays per year at a price of about \$500 per peak kWe.

To assist in achieving this goal, this ERDA program has the following four specific objectives: (1) to conduct research and experiments to show a factor of ten reduction in solar array costs and to establish this technological capability in the latter half of this decade; (2) to conduct a focused research effort on advanced fabrication technologies for photovoltaic devices that show a potential for a factor of one hundred or greater reduction in production cases; (3) to conduct experimental demonstrations of this advanced technology in the first half of the next decade; and (4) to conduct systems and applications studies to identify suitable experiments of cost-effective photovoltaic energy conversion systems.

Activities in the program will build on the predecessor NSF research program, which in FY 1975 resulted in several promising advances. For instance, recent experiments at Mobil-Tyco Solar

Energy Corporation performed in collaboration with investigators from Harvard University have produced continuous ribbons of crystalline silicon about 2.5 centimeters in width, 250 micrometers in thickness, and lengths (routinely of 10-20 feet and in one recent case to 41 feet) that lead the investigators to believe that ribbons well over 100 feet long will be produced routinely as newer, more automated equipment is adapted to the ribbon-pulling system. To date, these ribbons appear to be of sufficient quality to be made into solar cells with efficiencies as high as ten percent. Such a result would provide an important step toward the achievement of the FY 1985 goal of the photovoltaic energy conversion program area.

Recent tests and analyses at Texas Instruments, Inc., and Southern Methodist University, suggest that solar grade polycrystalline silicon feed material (at an anticipated price of about \$10 per kg) should produce solar cells with electrical characteristics equivalent to conventional silicon cells made with semiconductor grade polycrystalline silicon at a current price of about \$60 per kg. The use of cheaper feed material coupled with the anticipated recycling of the silicon cutting losses could provide a viable alternative to meeting the program's FY 1985 goal, based on improved state-of-the-art Czochralski-grown silicon wafer technology.

A number of samples of p-n junction polycrystalline silicon solar cells have been fabricated successfully on metallurgical grade silicon. Thin film silicon solar cells having efficiencies up to 2.6% have been fabricated from the samples by a university-industry team. This approach is an important low-cost production alternative for large-scale implementation of photovoltaic arrays.

The University of Delaware has succeeded in preparing over 1000 full-size 3' x 3' cadmium sulfide/copper sulfide solar cells with up to 6% efficiency. No degradation in performance has been observed for the 104-cell arrays on a residential solar house rooftop for over 12 months. Accelerated lifetime tests indicate a life expectancy for encapsulated cadmium sulfide cells in excess of 15 years (at rooftop conditions).

Major milestones to be accomplished in FY 1976 include: (1) initiation of terrestrial testing of cells and arrays; (2) completion of a project to define solar grade polycrystalline silicon; (3) completion and distribution of a solar cell measurement procedures manual; (4) selection of a design for a prototype residential system experiment; (5) completion of two preliminary systems analyses of photovoltaic systems and applications; (6) fabrication of solar-grade silicon single crystal ribbons in greater than 100 foot lengths; and, (7) completion of two experimental pilot lines using different approaches for producing CdS/Cu₂S solar cells.

Continued emphasis will be placed in FY 1976 on low-cost silicon (Si) solar array technology and the analysis of photovoltaic conversion power system designs to determine the most effective ways to apply this technology. The low-cost Si array effort includes: cost reduction of the polycrystalline silicon feed material; the continuous production of single crystal Si ribbon; automated fabrication of solar cells and arrays; and the production scale-up for low-cost solar cells. These improvements will be incorporated into early systems tests.

The further development of techniques for the continuous drawing of silicon ribbon will be emphasized. Research efforts will also be directed to advanced designs and fabrication techniques for single crystal Si solar cells. Feasibility of \$500 per peak kWe is planned to be established by 1980, and an annual production rate of 5000 kWe (peak) per year of silicon solar arrays is a goal for 1985.

Project management for the development of silicon single crystal device and array technology, including fabrication and materials projects, is being accompanied by the Jet Propulsion Laboratory (JPL) under the administrative and general technical program guidance of ERDA Headquarters staff. An interagency agreement has been signed with NASA and the Jet Propulsion Laboratory to manage a set of specific projects focused upon mutually agreed goals and objectives. These goals, objectives, and general projects are a part of the long range plan for the National Solar Energy Program. Funds will be transferred to NASA and JPL on a year-to-year transfer based upon an annually revised project development plan.

Research on photovoltaic conversion systems which have the greatest potential for high production volume will also be emphasized along with low-cost arrays such as those fabricated from thin films of cadmium sulfide-copper sulfide, and silicon. Feasibility of less than \$100 per peak kWe is planned to be established by the early 1980's.

Analysis will continue on the requirements for power conditioning, energy storage, interfaces with solar heating and cooling systems, ties to power grids, and total energy system. System economics, institutional problems, and environmental impact of various photovoltaic systems and applications will continue to be evaluated.

Accelerated environmental testing will be initiated to estimate the long-term effects of particular terrestrial environmental conditions on system electrical performance characteristics as well as physical and chemical properties of photovoltaic conversion devices and subsystems.

ERDA Request and Committee Action

The ERDA authorization request for the Photovoltaic Conversion subprogram totalled \$10,000,000 for fiscal year 1976. The Committee recommends an increase of \$11,000,000. The photovoltaic conversion program is a solar cell research program. Solar cells are familiar to many Americans because of their prominence in the NASA Space Program where they have supplied the electric power for space vehicles and satellites. Solar cells convert solar energy directly into dc current. They have the advantage of producing electricity at the load point where the power is needed and without the need for cooling sources and transmission lines. Their cost has been acceptable as part of the space program but is presently unacceptable for terrestrial applications. As noted above, the goals of the subprogram are to focus concerted research on silicon, cadmium sulfide and other types of solar cell materials to improve their quality, conversion efficiency and durability. The objective is to develop improved fabrication and mass production techniques that will bring the costs within a range where solar cells will be economically acceptable for widespread use for power generation. When that objective is achieved, it is expected that photovoltaic conversion devices will provide a major source of power generation for

residential and commercial buildings, and for industrial purposes throughout the nation.

Under ERDA's present planning photovoltaic conversion is viewed not as a near-term, but as a mid-term to long-term new energy prospect, with meaningful demonstrations of the technology not anticipated until 1985 and beyond. The Committee recognizes that substantial materials and technological problems beset this area of research. However the nation's need for clean alternative energy sources is such that the Committee feels that a greater sense of urgency should attend this subprogram. A great deal of experience exists in this area thanks to the space program. The need now is to mount and maintain a vigorous program of basic materials research and to bring the nation's expertise in mass production techniques promptly to bear. The Committee is advised that the additional funding recommended by the Committee for fiscal year 1976 can be used effectively by ERDA and will advance the photovoltaic conversion program beyond what was initially planned for the period. It is the judgment of the Committee that the increased authorization now recommended will, at the same time, demonstrate the Congress' commitment to see to it that this highly promising energy technology is brought within economic reach at the earliest date possible.

WIND ENERGY CONVERSION

[In thousands of dollars]

Fiscal year 1976.....	15,000
Transition period.....	4,000

The key deterrent to expanded use of large wind power systems in the U.S. in this century has been the relatively high cost of these systems. Several systems of 100 KW to 1.25 MW were built in the 1930s through the 1950s, and while proving technical feasibility, they were ultimately uneconomical in the marketplace of that era. Small, farm-type systems also became uneconomical after rural electrification provided cheap and reliable electrical power. The technological developments of the past twenty years in such fields as materials, helicopter technology, automatic controls, and computer modeling have not been systematically applied to wind systems because of the availability of inexpensive power from other sources and problems associated with the short-term variability in the wind. In this era of energy shortage, however, advanced wind power systems, which will take advantage of these new developments have the potential of providing for domestic use significant amounts of non-depletable, non-polluting energy.

The objective of this research program is to expedite the development of the technology for economically viable wind energy conversion systems suitable for large-scale utilization.

The program provides for advanced research and technology to reduce cost (and cost uncertainty) per unit performance, and for a phased set of experiments through systems demonstration to establish the full technology base for widespread utilization of cost-effective wind energy conversion systems.

In FY 1975 several tests of wind systems commenced. At the Oklahoma State University, two experimental windmills incorporating an advanced electrical generator were constructed. The field modulated generator is capable of producing constant frequency and constant

voltage over wide ranges of windmill shaft speed. The generator, in combination with a recently developed rim-driven rotor, provides a system capability to produce electric power for utility grids in which the overall system does not require complex gear boxes and blade pitch controls for small systems.

The experimental windmills were connected to the Stillwater Municipal Power System and, while the power output was small compared to the city supply, the power was coupled successfully with the power grid. This is believed to be the first time in thirty years that such a connection has been made in this country.

A 5 kW commercial windmill, the largest currently manufactured, is under test at the NASA Lewis Research Center (LRC) as a preparation for testing of a 100 kW experimental system currently being fabricated. The two 62.5 foot blades making up the two-bladed propeller are in final construction at the Lockheed Aircraft Company. This 100 kW system will commence testing at the Lewis Research Center's test site near Plum Brook, Ohio, in July 1975 and will be the largest system constructed in this country since 1940. This system has the third largest set of rotor blades ever constructed.

A Program Solicitation was issued to address six of the major categories and needs for research on wind energy. Nearly three hundred proposals were received, a measure of the interest in developing wind energy. Thirty projects have been selected and are in the process of being awarded. The six program elements, each of which encompass multiple projects, consist of:

Mission Analysis—Investigation of the overall potential and utility of wind energy and an assessment of the possible impacts of the development of wind energy.

Applications of Wind Energy Systems—Detailed systems analysis of user requirements and the relationship between wind potential and energy demand in specific regions and user applications.

Wind Characteristics—Research into improving the capability of locating and validating high wind potential sites.

Advanced Subsystems—Development of both analytical methods and component hardware to improve future systems.

Advanced Systems—Investigation of the feasibility of advanced and innovative concepts.

Advanced Farm and Rural Home Systems—Development of systems for agricultural use and for applications such as crop drying, aeration, and heating.

Preliminary studies, design, and component development of more advanced MW scale systems will be undertaken in FY 1976 utilizing the results of the advanced research efforts oriented to achieve more cost effective second generation systems. In addition, studies will commence to examine the utilization and operational considerations of multi-unit wind energy systems for supplying large-scale blocks of power. Two key areas receiving early emphasis will be: (1) interconnection and interfacing requirements of utility users with predominantly conventional energy sources, and (2) spatial distribution requirements and the effects of spatial wind distribution on the smoothing of power output. Research into the public reaction to such systems

will be expanded in FY 1976 to ensure understanding of the types of locations, applications and spacing of systems which can be considered realistic.

The farm system element will be expanded in FY 1976 to include experiments on a series of agricultural applications wherein particularly good fits to the characteristics of wind systems may exist such as crop drying, hydrogen use on farms, fertilizer and methane production.

Major milestones to be accomplished in FY 1976 include the following: (1) completion of construction for a 100 KWe MOD-0 system; (2) completion of initial testing of the MOD-0 100 KWe system; (3) completion of system preliminary design and initiation of detailed design and fabrication of field worthy 100 KWe and MWe systems; (4) completion of initial testing of a vertical axis wind turbine system; (5) completion of assessment studies of wind system concepts and applications and of wind data; (6) completion of initial testing of wind systems for farm applications; (7) initial testing of wind systems used for direct space heating systems.

Development and construction of large-scale wind energy systems for test in user environments will be initiated in FY 1976 based on the preliminary designs completed in FY 1975. The detailed design will be performed on the Mod 1, 100 kW wind system utilizing the experience gained from the Mod 0, 100 kW system currently under construction at the NASA Lewis Research Center. The Mod 1 system will be designed for cost minimization rather than as a research tool, and will be developed to supply power directly to users requiring moderate capacity power production. Three such systems will be constructed and installed in three different climatic areas. These systems will provide operating, performance, and economic data regarding wind systems operating in a user environment and supplementing other sources of power.

The detailed design of a one MWe system will be completed and the construction initiated in FY 1976. This system will be used to supply electrical power to the grid of a large utility system and is the type of system contemplated for use in the eventual supplying of large-scale power from wind energy systems. The actual size will be determined as a result of preliminary design optimizations currently underway to yield a cost optimized size. The largest system constructed in the past was the Smith Putman machine rated at 1.25 MWe constructed in 1940. The Mod 1, MW scale system, according to preliminary designs, will consist of a single rotor, horizontal axis generator using advanced technology and will be installed at and interfaced with an existing utility supply.

ERDA Request and Committee Action

The ERDA authorization request for the Wind Energy Conversion for fiscal year 1976 includes \$9,000,000 for fiscal year 1976. The committee recommends a total authorization of \$15,000,000. As noted in the foregoing description of the ERDA program, wind energy conversion technology is well-known and has recently been materially improved. The major thrust of the present effort is to reduce system and component costs and to demonstrate refinements in technology. ERDA describes wind energy conversion as a promising near-term en-

ergy prospect. In view of the prospect that wind conversion systems could make a significant near-term contribution to the power requirements of some utility systems the committee feels this subprogram should be advanced as rapidly as possible. In the committee's view, concerted and immediate attention must be focused on the early demonstration of both land-based and off-shore wind-electric generating units. The additional authorization recommended by the committee is intended to provide ERDA the wherewithal to materially advance its mission analysis and wind characteristics studies, to permit a larger number of field tests than is presently programmed, and to accelerate the development of cost-efficient megawatt-size systems. The committee expects that during fiscal year 1976 and the Transition Period steps will be taken to initiate construction of a megawatt size land-based wind-electric generating project, and that preparations for a megawatt size off-shore demonstration of wind conversion technology will be materially advanced. In addition, wind energy conversion presents attractive prospects for supplying energy for agriculture applications and for providing energy for hydrogen, fertilizer and methane production. The committee feels that the potential near-term benefits of this technology fully warrant a major strengthening of ERDA's fiscal year 1976 program.

BIOCONVERSION

[In thousands of dollars]

Fiscal year 1976	6,000
Transition period	1,150

Bioconversion to Fuels system offer the potential of converting replenishable supplies (biomass) to clean hydrocarbon fuel and to energy in various forms. Estimates indicate that significant amount of the Nation's current gas and oil requirements could be provided by means of these systems. However, the extent to which these projections can be fulfilled will depend upon the amount of space available for biomass production and the economy of energy farming practices and of systems to convert organic material to useful fuels. Major problems to be solved include increasing biomass growth rates and yields, devising economical means of biomass harvesting and processing, and improving the efficiencies and reducing the cost of various conversion processes.

The overall objective of the program is to establish the commercial practicability of producing significant, economic quantities of plant biomass and converting this biomass and other organic products currently considered wastes into clean fuels. Four major sources of plant biomass energy feedstocks are considered in this program—urban solid wastes, agricultural residues, and terrestrial and marine crops, grown for their energy content. Fuels and energy products that may be produced include synthetic natural gas, alcohol fuels, solid fuels, heat, electricity, ammonia nitrogen fertilizer, and petrochemical substitutes. Two important considerations tend to set this solar energy research program apart from others. First, the number of potential plant biomass energy feedstocks and conversion process alternatives is very large. Second, the degree of technology development required for the different biomass production and conversion processes varies greatly.

This program is aimed at demonstrating to the private sector by the mid-1980's the technology base for one or more major fuel and energy systems. Commercial practicability will be shown by achieving efficient performance levels and acceptable costs in experiments and demonstrations. Research on plant biomass energy feedstock production and source development and on biomass conversion processes will proceed in parallel. An additional program objective is to evaluate the technical feasibility of processing hydrogen by photosynthetic and biochemical means by 1980.

Studies completed by the Stanford Research Institute indicate that synthetic natural gas and electric energy can be produced on "energy farms" for costs on the order of \$2.25 to \$3.00 per million Btu (approximately equivalent to crude oil priced at \$13.50 to \$18.00 per barrel). These costs might be decreased significantly by using "energy farms" to produce food and other high value commodities such as industrial chemicals concurrently.

The California Institute of Technology has initiated growth studies of the giant kelp, *Macrocystis pyrifera* for use as an energy crop. An important aspect of this effort is concerned with evaluating the feasibility of growing plants attached to artificial supports that might be used in deep ocean waters. An experimental kelp growing farm of about seven acres is located off the coast of California and is being studied to determine operating and performance characteristics of kelp beds grown on floating structures. The results of these experiments should prove useful in planning future large-scale open-ocean experiments.

A pilot plant project is being planned for evaluating a process for producing pipe line quality fuel gas from urban solid wastes. Based on economic and engineering feasibility studies completed by the Dynatech Corporation of Cambridge, Massachusetts, this bioconversion process employing methane fermentation appears to be capable of producing gas in quantities and at costs of interest to the natural gas industry. The detailed design phase of this experiment leading to the construction of the pilot plant will be initiated in FY 1975.

Current studies at the Stanford Research Institute and at Cornell University indicate that some agricultural operations produce organic residues that are economically attractive energy feedstocks. These studies also have shown that many agricultural residues are not a significant or economic source of energy.

The pilot plant project design phase, initiated in FY 1975 involving the anaerobic fermentation process for obtaining methane gas from urban solid wastes, will be completed in FY 1976. Construction will be initiated in early FY 1976. An award for the operation and testing phase of this project is scheduled for the latter half of FY 1976.

Two additional comprehensive systems studies of promising energy farming concepts are planned for FY 1976 supplementing similar studies begun in FY 1975. These studies will deal with such problems as: (1) identification of alternative system configurations including evaluation of their economic and technical feasibility, (2) identification of subsystem elements requiring further research and development, (3) identification and evaluation of environmental, resource, and institutional problems and constraints, and (4) tentative defini-

tion of future pilot plants. It is anticipated that these studies will be carried out by system analysis centers with appropriate technical support from industry, universities, and Government research laboratories.

A total system evaluation of major agri-waste energy conversion opportunities similar to those contemplated for energy farming concepts will be initiated during FY 1976. It also is planned to initiate a preliminary design study of potential application experiments involving promising agri-waste energy conversion systems.

Exploratory and advanced research and development of plant biomass energy conversion methods and processes will be continued in FY 1976. University-based research initiated earlier and concerned with improving the efficiency of the methane fermentation process will be carried forward. A study will be supported involving the coupling of the methane fermentation and the hydrolyticenzyme conversion processes. Work also will be initiated on adapting and applying methyl fuel and ammonia nitrogen producing processes to production of fuels such as methanol and initiate studies to explore the development of methanol as a gasoline additive including revision of the problems of corrosion and phase separation.

Technical evaluation and exploratory studies of potentially important new sources of plant biomass energy feedstocks will be continued and expanded in FY 1976. A major aspect of this phase of the program will be the continued support of kelp growth experiments such as those currently under way at the California Institute of Technology and the Ocean Energy Farming technology development efforts recently started at the Naval Underseas Center in San Diego, California. These projects are intended to fill significant knowledge or technology gaps rather than to refine established technical and economic information.

The research effort in biophotolysis will be continued in FY 1976. This research is still in an exploratory stage and results to date are encouraging. It is planned to support this area of the program at approximately the same level as in FY 1975.

Major milestones to be completed in FY 1976 include the following: (1) completion of the detailed system design of a pilot plant for bioconversion of urban organic wastes to methane gas; (2) initiation of construction of the above pilot plant; (3) initiation of a total system evaluation of agricultural waste conversion opportunities; (4) completion of a system study of land energy-farm concepts; (5) initiation of a system analysis of systems and applications for an ocean energy-farming concept; and (6) initiation of construction of an agricultural waste bioconversion experiment.

ERDA Request and Action

The ERDA authorization request for the Bioconversion subprogram for fiscal year 1976 includes \$3,000,000 for the Bioconversion subprogram for fiscal year 1976. Based on its review of ERDA's program planning for the next fiscal year, and the record before the committee, the committee recommends a fiscal year 1976 authorization of \$6,000,000. Here, again, ERDA has indicated that Bioconversion offers near-term prospects for making a meaningful contribution to the nation's fuels requirements. As noted in the foregoing description

of the ERDA program, present agency planning anticipates demonstrating to the private sector by the mid-1980's the technology base for one or more major fuels and energy systems. The nation's need for synthetic fuel alternatives to natural gas is such that the committee feels strongly that this target date should be materially advanced. In the committee's judgment added emphasis should be given to the ongoing efforts to demonstrate processes for producing pipeline quality gas from urban solid wastes. Fermentation processes for obtaining methane gas should be moved as rapidly as possible from the design to the demonstration stage, as should the present program to demonstrate the feasibility of processing hydrogen by photosynthetic and biochemical methods. In the committee's judgment every reasonable effort must be made to move promising bioconversion process out of the conceptual and design phases as promptly as possible and to endeavor to demonstrate their potential for economic applications. The increased authorization recommended by the committee is designed to and will provide ERDA the wherewithal to advance this subprogram and to attain its goals sooner than presently scheduled.

OCEAN THERMAL CONVERSION

[In thousands of dollars]

Fiscal year 1976	5,100
Transition period	1,250

The goal of this program is to establish a technically and economically viable technology base leading to the demonstration and commercial implementation of large-scale floating power plants capable of converting ocean heat into significant quantities of electric energy.

The collection and storage of heat by the oceans is a solar energy process similar to hydropower, where nature acts to smooth out the intermittence of the source. Ocean thermal energy can potentially make a substantial contribution to the Nation's energy needs, through the use of large scale floating power plants. Such plants will be most suitable for operation in a low and temperate band of latitudes, and there they offer considerable flexibility of location in providing energy and energy-intensive products. For example, they can be situated on the high seas, or at points proximate to population or industrial processing centers. These plants can be flexible in product, in that they can provide base-load requirements for electricity and/or produce fuels (such as hydrogen) and ammonia for fertilizer.

Other possible process options associated with ocean thermal energy conversion include the production of protein, fresh water, and the refining of ocean minerals. Ocean thermal power plants may represent an attractive alternative, with the potential for a relatively moderate energy cost and a high load-factor.

Some significant recent achievements are described in the following paragraphs:

Two teams of industrial organizations (Lockhead/Bechtel and TRW/Global Marine/United Engineers) have performed independent engineering evaluations into the technical and economic feasibility of previously available concepts for ocean thermal energy conversion systems. These studies are nearly completed, and have made substantial progress in identifying ocean thermal system concepts that are encouraging from the standpoint of projected costs, which tentatively

appear to be competitive with the projected costs of other energy alternatives. In the concluding phase of these studies, the industrial teams are defining the requirements for a testing program, leading to the conceptual design of test facilities that will be needed for the development of the subsystems and components for an ocean thermal pilot plant.

Two industrial teams (Union Carbide and DSS Engineers) are completing studies of potential approaches to heat exchangers for the ocean thermal application, including both metallic and plastic options that are typical of the current state-of-the-art, as a basis from which to generate optimum designs from a total power-plant standpoint.

A program solicitation requesting proposals for studies on advanced research and development applicable to ocean thermal energy conversion requirements led to the submission of eighty-four proposals, about one-fourth of which are being funded. The projects funded will emphasize problems in power technology and ocean technology.

On the basis of system requirements that are developed, several preliminary design alternatives for system testing will be considered, through independent evaluations by several contractors of candidate system alternatives. These studies will lead to the design of an optimum system for experimental development. A site will be selected for the experimental system, and monitoring of an environmental baseline for that site will be initiated. These activities will ultimately provide the basis for an anticipated ocean thermal pilot plant of about 25 megawatt capacity by the early 1980's.

Major milestones to be accomplished in FY 1976 include the following: (1) completion of industrial system analyses of ocean thermal concepts and review of program planning; (2) initiation of design and construction of test facilities for component and subsystems of ocean thermal plants; (3) initiation of design and construction of ocean thermal hardware—components and systems; (4) initiation of testing of components and subsystems; (5) initiation of experiments on corrosion, materials problems, biofouling and hydrodynamics; and (6) completion of results of environmental impact, legal, energy delivery, and by-product studies.

ERDA Request and Committee Action

The ERDA authorization request for fiscal year 1976 includes \$2,500,000 for the Ocean Thermal Conversion subprogram. The committee recommends that the administration's request be increased to \$5,100,000. Based on its review of ERDA's subprogram planning for the next fiscal year, and the record before the committee, the committee feels that this subprogram warrants substantially more emphasis than presently programmed by ERDA. The Committee notes particularly proposals that have been advanced for employing ocean thermal conversion technology for the generation of electricity for the production of ammonia, aluminum, magnesium, liquid hydrogen and other energy-intensive materials aboard ocean thermal plant ships. Such proposal promise substantial savings in the large volume natural gas now required for the production of such materials. Production of ammonia, aboard ocean thermal plant ships is proposed as a cost-efficient, cost-competitive method of meeting the nation's increasing requirements for ammonia for fertilizers. The committee understands that there are difficult materials and equipment problems

to be overcome. However, it appears that the basic technology for ocean thermal energy conversion is well-known. In the committee's judgment this is another research and development area that should be advanced out of the conceptual stage and into practical demonstrations of the required technology on an accelerated schedule. The committee's recommendation increases ERDA's cost budget request by more than 100% and is designed to enable ERDA to substantially increase this subprogram in fiscal year 1976 with a view to the early demonstration of ocean thermal conversion technologies. Again, the recommended increase reflects the committee's commitment to the movement of this program out of the conceptual into the demonstration stage.

SOLAR RESOURCE ANALYSIS

[In thousands of dollars]

Fiscal year 1976.....	1,500
Transition period	400

The resource analysis subprogram is a new, separate program within the overall National Solar Energy Plan. Predecessor plans included various solar resource analysis efforts within other program activities and as discrete studies. The expanded and programmatically unified effort in FY 76 will focus on accelerated acquisition of solar flux and meteorological data for input into the other technical development programs. The data will provide a basis for more definitive economic assessments and geographically dependent performance predictions.

SOLAR ENERGY RESEARCH INSTITUTE

[In thousands of dollars]

Fiscal year 1976.....	5,000
Transition period	1,250

The Solar Energy Research Institute was established by congressional direction in Public Law 93-473. ERDA currently is examining potential functions and program interactions with the ERDA solar programs for the Institute. Consideration is being given to questions such as single versus multiple institutes and new versus existing institutional settings. Outside organizations, such as the National Academies of Science and Engineering will provide assistance in consideration of the various questions in implementing the congressional directive. A general plan for organization, will be prepared early in FY 76. The funding authorized for the Institute in FY 76 will support start-up costs associated with development and implementation of the Solar Energy Research Institute planning.

3. GEOTHERMAL ENERGY DEVELOPMENT

Fiscal year 1976.....	\$ 33,870,000
Transition period.....	4,425,000
Plant and capital equipment.....	10,485,000
Transition period	2,650,000

[In thousands of dollars]

	Fiscal year 1976	Transition period
Resource utilization	17,870	1,500
Supporting R & D.....	16,000	2,925
Plant and capital equipment.....	10,485	2,650
Total	44,355	7,075

Geothermal energy utilization began on an industrial scale in Italy in 1904 when electricity was first produced at the Larderello field south of Florence. Today, approximately 400 MWe is being generated in Italy, 400 MWe at the Geysers in the United States and slightly more than 1,000 MWe worldwide. Geothermal energy has been extensively used for municipal heating in Iceland since the 1930's and has also been utilized in the United States.

Some studies of U.S. geothermal resource have compared its potential favorably with that of present U.S. oil and gas reserves. The theoretical energy recovery is cooling a cubic mile of granite from 300 to 100 degrees Celsius is sufficient to supply all the U.S. requirements for one week. The currently exploitable geothermal resources are located in the less populated western third of the United States, but their development could have considerable impact on providing the electrical power requirements of large load centers. For instance, the Imperial Valley in California has been estimated to be capable of sustaining a generating capacity of as much as 100,000 MWe for 50 years. The principal problems which appear to be inhibiting the growth of geothermal energy utilization in the United States are: (1) a lack of confidence on the part of energy industries in geothermal reservoirs as a reliable, long-term supply of energy; (2) institutional, legal, and environmental problems associated with the development of such reservoirs; and (3) unsolved technical problems and economic uncertainties concerning the utilization of geothermal energy in an environmentally acceptable manner. The purpose of the ERDA subprogram is to accelerate solutions to these problems.

The mid-range goal of the ERDA Geothermal Energy research, development and demonstration subprogram is to provide the full technology base for the cost effective commercial production of 20,000 to 30,000 MW of electrical power from domestic resources by 1985. This could save on the order of 1,000,000 barrels of oil per day. Accomplishment of this goal implies geothermal energy production capabilities may exceed 100,000 MWe as we move into the next century, with equivalent daily oil savings of from 3,000,000 to 6,000,000 barrels of oil per day. Important contributions to the conservation of fossil fuels can also be achieved by utilizing geothermal heat and associated fluids for non-electric purposes, such as space heating and air conditioning.

The ERDA geothermal program is now based on Congressional guidance contained in the Geothermal Energy Research, Development, and Demonstration Act of 1974, Public Law 94-410. Passage of the Act reflects the strong Congressional support for accelerated development of a commercialized geothermal industry in the United States.

The purpose of Public Law 93-410 is to provide effective management of a Federal program to bring presently unused geothermal energy resources to commercial utilization. The scope of the Act includes research, development, and demonstration of geothermal resources. Specific provisions of the Act authorize mechanisms for:

- Coordinated geothermal R&D management.
- Resource exploration and assessment.
- Research, development, and demonstration of geothermal technologies of various resource types.
- Government guaranteed loans for these purposes.

The bill sets a goal of producing electricity (1-to-10 megawatt per plant) from hot dry rock, geopressured zones and hydrothermal systems by the end of fiscal 1980.

The overall management of this program will rest with the Energy Research and Development Administration.

The National geothermal energy program includes work in five general areas.

Resources Exploration and Assessment;
Environmental, Legal and Institutional Studies;
Geothermal Energy Demonstrations;
Resource Utilization Projects; and
Supporting Research and Technology.

The ERDA Geothermal Energy Development Program consists of two major subprograms: plants which includes pilot and demonstration; Resource Utilization Technology plants; and Supporting Research and Development.

The U.S. Geological Survey has the principal Federal responsibility for geothermal resource exploration and assessment. The USGS program under the Department of the Interior has been concerned primarily with delineation of geothermal resources. ERDA is supporting additional efforts focused on the evaluation of extractable energy from known resources.

Emphasis in FY 1976 will be on resource assessment projects which have high potential for providing industry with a realistic basis for economic evaluation of geothermal resources. Included will be two projects to improve geoscientific and exploratory drilling technology for assessment of hot dry rock resources. These are the resources with the greatest potential for long-term contribution to geothermal energy supplies, and which present the greatest problems of extraction and conversion. In addition, exploration of hydrothermal systems associated with magmatic heat resources will continue.

ERDA has responsibility for developing and demonstrating technologies needed to utilize all types of geothermal resources. Under the resource utilization category, test facilities appropriate to each resource type will be established, and tests and demonstrations of the technologies for electric power production and other applications utilizing geothermal waters will be conducted. ERDA also is responsible for supporting research and technology which aims to improve the state of the art of geothermal conversion facilities and exploration techniques. The supporting research and development area addresses a wide variety of technical problems and eventually results in specific equipment or hardware especially designed for geothermal utilization.

ERDA's geothermal program is based on plans for relatively short-term Government involvement in the development and demonstration of energy production. As this program begins to pay off, it is anticipated that the private sector will assume an increasing role in developing this resource. In this research phase, the ERDA program will place strong emphasis on a close and continuous working relationship with industry. One way ERDA will accomplish this is through cooperative programs with the Electric Power Research Institute (EPRI). ERDA has initiated discussions with EPRI to this end. Another way is through direct contracts with industrial research

organizations for specific research efforts. The aim of these cooperative arrangements is to assure rapid transfer of research results and acceleration of the development of U.S. geothermal resources. In FY 1976 ERDA expects the percentage of direct industrial projects to increase significantly.

RESOURCE UTILIZATION TECHNOLOGY

	[In thousands of dollars]	
Fiscal year 1976.....		17, 870
Transition period		1, 500

The Resources Utilization Technology subprogram consists of R&D efforts involving the following types of geothermal resources:

Hydrothermal systems;
Geopressurized systems;
Hot, dry rock systems; and
Normal gradient geothermal resources.

Hydrothermal resources

A large portion of the FY 1976 Resources Utilization program will be directed toward projects involving hydrothermal resources.

Sites under consideration for ERDA hydrothermal facilities include: Niland, California, for hydrothermal hot brines; Heber, California and the Basin and Range Province in northern Nevada and Utah for high-temperature fluids of low to moderate salinity; East Mesa, California and Raft River, Idaho, for hydrothermal fluids of moderate temperatures and low salinity. The East Mesa site would be utilized under arrangements with the Bureau of Reclamation, Department of the Interior.

Projects at these locations will be carried out in cooperation with private industry and will permit direct comparison with alternative, promising power conversion systems. Each facility will provide for testing and evaluation of advanced technology in drilling, reservoir engineering extraction and conversion systems, and environmental control systems. Projects at research test facilities may also include residential and commercial applications, and agricultural applications.

These plans are based on progress in the past year in connection with hydrothermal resource exploitation. Included among these was the discovery in February 1975 of a large geothermal reservoir at a depth of 4,500 feet, in the Raft River Valley of south-central Idaho. This drilling was jointly funded by ERDA, the State of Idaho and the Raft River Electric Corporation. The drilling site was located there based upon an extensive resource assessment program completed in the fall of 1974 by the U.S. Geological Survey. Future production tests are planned for this project.

During FY 1975, two industrial studies were also completed for the design of experimental resource test facilities of up to 10MW electric capacity which would be capable of evaluating electric power generation systems and new and advanced components under field conditions. One study by TRW Systems, developed plans for a facility in the East Mesa, California, area. The other, by Bechtel Corporation, developed plans for a facility at Heber, California.

In addition, a test facility was completed at ERDA's Lawrence Livermore Laboratory for the development of the total-flow concept

for energy recovery. This concept would be applied to Salton Sea geothermal brines which are highly saline and corrosive but potentially of large energy content. In field tests, satisfactory resistance to corrosion and precipitation was exhibited by teflon-coated steel which can be utilized for turbine structural elements. High nozzle efficiencies were achieved for a design that would be used in a turbine concept that would operate with gas-liquid mixtures similar to those expected from the Salton Sea reservoirs.

Geopressurized resources

For geophysical resources the FY 1976 program will focus on the fundamental questions of reservoir lifetime and production rates. There will be detailed planning for a regional resource test facility and production testing of several abandoned gas and oil wells which demonstrated geopressurized formations. Approximately one-ninth of the Resource Utilization programs will be directed to such efforts. Critical information will be obtained relative to reservoir engineering, geopressurized field composition and characteristics, and commercial utilization.

Recent events in this field include initiation of ERDA funded studies at the University of Texas to assess the commercial potential of geopressurized resources along the Gulf Coast. These studies are aimed at determining the size, deliverability and longevity of this resource, the economics of total flow utilization, and environmental and institutional implications.

Hot dry rock resources

In hot, dry rock resources, drilling will be completed in FY 1975 for a deep system to demonstrate a potential utilization concept. In this concept, water is pumped down one hole into a hot dry rock reservoir, circulated through the hot rock, and returned through a second hole at temperatures high enough for power generation. An experimental flow loop and a heat exchanger installation will be employed in the heat extraction experiments. Extensive data will be obtained both on the operation of the fluid circulation and demonstration system and its geochemistry. About one-fifth of the Resource Utilization Technology program for FY 1976 will be devoted to such efforts.

Other significant activities during FY 1976 will include work on methods for locating and assessing hot, dry rock geothermal deposits and alternative, innovative approaches for the fracturing and heat extraction of the available energy. As the technology emerges from the hot dry rock program, it will be incorporated into plans and studies aimed at utilizing the deeper normal-gradient geothermal resources.

SUPPORTING RESEARCH AND DEVELOPMENT

[In thousands of dollars]

Fiscal year 1976.....	16,000
Transition period.....	2,925

The Supporting Research and Development subprogram incorporates efforts to solve technical problems across the entire spectrum of industrial functions critical to geothermal energy development. Areas of emphasis include drilling technology, reservoir engineering and management, geothermal energy extraction, power conversion systems,

thermal waters utilization systems, environmental monitoring and control systems, and cooperative efforts with the USGS in resource exploration and assessment technology.

Emphasis in FY 1976 will be placed on technological advances and new systems and components for more economical development. Priority will be assigned to advanced drilling components and techniques, reservoir modeling studies, reservoir stimulation techniques, downhole measurement systems, downhole pumping systems, research on scaling and corrosion, advanced geothermal power cycles and heat exchangers, and noxious gas abatement systems.

Some of the efforts that will be funded include work in the area of drilling technology development which will stress high-temperature drill bits, downhole replaceable bits and non-conventional methods, such as the Subterrene technique, explosive and spark drilling, and water jet drilling.

In addition, support will continue for laboratory experiments on a potentially effective alternative to pumping—flashing and two-phase flow of water and steam in the well. The experiments involving vertical two-phase flow will be aimed at gaining the understanding required to predict flow modes and select control methods.

Research on scaling and corrosion will be expanded to reach a basic understanding of the chemistry of hot brines under dynamic conditions and to develop methods to minimize scale buildup. Research will also be pursued on stress corrosion cracking in steel and other materials involved in the extraction and conversion of high-salinity geofluids.

An expanded program on advanced geothermal power cycle concepts will place priority on the total flow concept. Emphasis will be placed on the rotary helical screw expander and the impulse turbine, and will include work on a bladeless turbine concept. Field tests will also be made with at least three advanced heat exchangers of the liquid-to-liquid, direct contact and fluidized bed types.

In environmental control technology, an expanded program will place emphasis on field testing of hydrogen sulfide control devices, abatement of other noncondensable gases, improved instrumentation for monitoring noxious gas emissions at geothermal sites and advanced injection techniques that would avoid contaminating ground waters with waste geothermal fluids.

Exploration and assessment projects will provide reservoir assessment for Resource Utilization Projects and explore the feasibility of normal gradient resources. Drilling technology will stress high temperature drill bits, downhole replaceable bits, and advanced methods such as melting, explosive and spark drilling, and water jet drilling. Reservoir engineering research will provide a better understanding of fluid flow, heat transfer and chemical reactions in subsurface porous media leading to improved production planning. Extraction technology projects will include continuation of downhole pump development and studies of vertical two-phase flow to develop a predictive understanding of flow modes and control methods. Research will continue on advanced geothermal power cycle concepts such as total flow systems. Environmental monitoring and control projects will stress spent brine injection and noxious gas abatement, although some work will also be done on sampling and analysis methods, advanced cooling towers and seismic and subsidence measurements.

In support of planning needs for the national program, a model is being constructed which will provide economic analyses and cost-benefit evaluations for all types of geothermal resources and for both electric power and non-electric uses. The establishment and use of this model will provide analyses that will identify research and development requirements and improved strategies for development of the resource by industry and Government.

ERDA Request and Committee Action

The ERDA authorization request for fiscal year 1976 includes \$28,370,000 for operating expenses and \$485,000 for capital equipment not related to construction. Of the total operating expense budget \$17,870,000 was requested for the Resource Utilization subprogram and \$10,500,000 for the Supporting Research and Development subprogram.

The basic legislation to advance the development of the nation's geothermal resources emanated from this committee: the Geothermal Steam Act of 1970 (P.L. 91-581) and the Geothermal Energy Research, Development, and Demonstration of 1974 (P.L. 94-410). The Committee views geothermal energy as a national resource of enormous potential and has continuously stressed its support for an aggressive development program.

Resource Utilization

Based on its review of ERDA's program plan for the next fiscal year, and the record before the committee, the committee feels that while the proposed Resource Utilization subprogram is basically sound it fails to give adequate attention to the need for an aggressive program of pilot and demonstration projects to test available geothermal technology in the field. As indicated elsewhere in this report the committee believes very strongly that every effort must be made to accelerate the movement of new energy technologies beyond the conceptual and laboratory stages into pilot and field demonstration projects. Geothermal development is no exception. The timetable for the construction of geothermal demonstration facilities must be markedly advanced.

The record shows that in the course of budgetary review prior to the transmittal of ERDA's authorization requests to the Congress two Division requests for capital funding for geothermal power plants for on-going programs in Idaho and Nevada were disallowed. The committee feels it is essential that such on-going projects be carried forward to the demonstration stage.

The committee believes that ERDA's request for the Resource Utilization subprogram is reasonable and recommends authorization of the requested \$17,870,000 for fiscal year 1976. The committee also recommends approval of the \$485,000 requested by ERDA for capital equipment not related to construction. This request covers laboratory and other equipment needed to conduct and evaluate geothermal experiments. In addition, and as evidence of the committee's determination to see to it that on-going geothermal programs be moved as promptly as possible to the demonstration stage, the committee recommends the following additions to ERDA's plant and capital equipment authorization: Project 76-1-h to provide initial funding for A-E and long-

lead time procurement for a geothermal powerplant (steam) at Raft River, Idaho, \$5,000,000; and Project 76-1-i to provide initial funding for a geothermal powerplant at Buffalo Valley, Nevada, \$5,000,000—both of which are on-going geothermal development programs.

Supporting Research and Development

The ERDA request for this subprogram totals \$10,500,000. The committee recommends that the requested authorization be increased \$5,500,000 to a total authorization of \$16,000,000. This subprogram supports technological research throughout the entire geothermal research and development program. It includes essential research on specialized drilling and other technologies required for geothermal development, reservoir modeling studies, reservoir stimulation techniques, downhole measurement and pumping systems, research on corrosion and scaling problems, and work related to environmental problems associated with geothermal development.

The committee notes particularly that the development of advanced drilling technology is vitally important to the successful exploitation of geothermal resources, which are often associated with extremely hard rock geological formations and high temperatures. The record before the committee makes it clear that special attention must be focused on this area. In increasing the authorization for this subprogram it is the committee's intention and expectation that \$5,000,000 will be expended on an advanced drilling technology program in fiscal year 1976. In the committee's judgment such a specially focused effort is essential to the early advancement of the nation's geothermal recovery program.

Cooperative Arrangements

The committee is informed that ERDA and the Raft River Rural Electric Cooperative, Inc., and its wholly-owned subsidiary the Raft River Geothermal Development Cooperative, Inc., Malta, Idaho, the non-federal participants in the Idaho Geothermal R&D Project are currently negotiating a cooperative research and development agreement to provide a written framework generally defining the responsibilities of the parties for the duration of the project.

In this connection, the committee is advised that concern exists on the part of the non-federal participants respecting the ultimate disposition of the rights to the geothermal production fields, project facilities, and electric power output assuming the research and development project is successful. The Raft River Rural Electric Cooperative, Inc. is a not for profit cooperative utility organized pursuant to the Rural Electrification Acts and is owned by its members and customers. The cooperative serves about 1800 customers within an area of over 10,000 square miles in southcentral Idaho, including the project area in the Raft River Valley. Its winter peak load runs about 12 MWe. During the summer irrigation season the peak load is about 40 MWe. Electrical energy sold by the cooperative historically has been purchased from the Bonneville Power Administration.

The geothermal power potential of the Raft River Valley has figured prominently in this cooperative's advance planning to meet its future electric power needs. There has been an indication from the Bonneville Power Administration that due to an insufficiency of power the Ad-

ministration may not be able to provide sufficient power in the future to meet the cooperative's requirements. Hence, the need to develop an alternate source within the next few years has taken on added emphasis.

Consequently, the Raft River Cooperative has involved itself deeply in the present effort to define and exploit the geothermal resources within its service area. It has acquired rights to some 100,000 acres of geothermal lands in the Raft River Valley. It has conducted or has participated in the conduct of extensive geological, geophysical, and geochemical studies of the resource and has been heavily committed to the Idaho Geothermal Project since its inception.

The concern expressed by the Raft River Cooperative raises an important question respecting the policy to be applied by ERDA in disposing of successful geothermal projects. In the committee's judgment, that policy should take special account of the needs of the local community for new energy sources, and of the community's involvement in the geothermal project in question. In the case of Raft River, the cooperative's special relationship to the Idaho Geothermal Project should weigh heavily in any future decisions ERDA may make respecting the continuing conduct of the research and development program and the ultimate disposition of the production wells, plant and equipment, and power capacity developed as part of the project.

The Raft River Electric Cooperative pioneered the development of the geothermal resources in the Raft River Valley. In view of its heavy involvement in the Idaho Geothermal Project, and because a new energy source will be needed to meet the future electric power requirements within its service area, the cooperative's hope to acquire the project as part of its electric utility system, if the research and development program is successful, should in the Committee's judgment receive every possible consideration. In the committee's view, if the geothermal resources of the Raft River Valley are successfully harnessed for electric power generation those resources should logically be made available to the Raft River Electric Cooperative. In addition, the cooperative's special stake in the outcome of the present research and development effort should be reflected in ERDA's continuing decisions respecting the project. To the extent ERDA is authorized to do so, it is the committee's judgment that the Raft River Electric Cooperative should be accorded a preferred position respecting the ultimate disposal of the project and its facilities.

Geothermal Resources in Oregon

The State of Oregon is rich in geothermal resources, and has a long history of interest in and use of the resource. In the city of Klamath Falls, Oregon homes, hospitals, schools, and other buildings have been heated by the energy from geothermal steam wells for many years. Klamath Falls and other geothermal communities in Oregon represent a working laboratory demonstrating useful applications of the energy potential of lower and moderate temperature geothermal resources. The State of Oregon and the colleges and universities of the State, including Oregon State University, and the Oregon Institute of Technology have conducted extensive studies in geothermal sciences and technology and have developed a wide expertise in the field.

In the committee's judgment, ERDA should focus special attention on Oregon's experience with the lower temperature geothermal resources that abound in that State, and should take advantage of the expertise that has been developed there in dealing with the resource and its problems and prospects. The committee understands that a consortium of universities, including the Oregon schools referred to above, Washington State University, the Pacific Northwest Regional Commission, the Pacific Power and Light Company, and others have proposed a broad planning study to assess the potential of lower temperature geothermal resources for meeting nonelectric energy requirements for space and process heat, the need for research and development on components and hardware, the need for testing facilities, and the need for expanded educational and public information programs to broaden public awareness and knowledge of the available and potential applications of this category of geothermal resource.

In the committee's view, geothermal energy for space heat and process heat is an alternate clean energy prospect that holds great promise not only for residential uses but for agricultural and industrial uses as well. Expanded use of this resource could well bring substantial savings in already short supplies of conventional fuels. The committee expects that ERDA will accelerate its program in this area in cooperation with interested State and local governments and educational institutions.

4. PHYSICAL RESEARCH

A. ERDA REQUEST

The ERDA requested \$312,500,000 for the operating expenses of the physical research program for FY 1976, an increase of \$30,900,000 over the estimated costs for this program in FY 1975. The proposed amounts for this program include the following sub-program increases: high energy physics, \$16,800,000; nuclear science, \$6,400,000; materials sciences, \$3,800,000; and molecular sciences, \$3,900,000. In addition, for the transition period the ERDA requested \$83,800,000 for the operating expenses.

(In thousands of dollars)

	Actual costs fiscal year 1974	Estimated costs fiscal year 1975	ERDA request fiscal year 1976	Transition period
High energy physics.....	\$125,842	\$131,500	\$148,300	\$37,800
Nuclear science.....	64,360	71,700	78,100	14,400
Materials sciences.....	32,487	39,800	43,600	14,100
Molecular sciences.....	30,136	38,600	42,500	12,500
Total, physical research program.....	252,825	281,600	312,500	83,800

The ERDA physical research program is the successor to the long existing physical research program managed by the Atomic Energy Commission. Although the AEC program was basically multidirectional, its emphasis and primary focus naturally has been on research with some relationship to existing or projected requirements for applied programs, mainly nuclear programs. In many cases at the

major laboratories, in fact, research has been conducted in the same areas in which development programs were being pursued. As a result, much of the AEC physical research activity has been directly motivated by and closely related to the requirements of applied nuclear programs.

Consistent with the broader energy research responsibilities of the ERDA, encompassing both nuclear and nonnuclear energy research, the ERDA will expand the physical research program in FY 76. The FY 76 program will be expanded to include additional research in the materials sciences and molecular sciences subprograms in research areas which potentially will be supportive of the ERDA non-nuclear applied programs, as well as those multi-directional in character. Program emphasis will be on research required for the development and understanding of new energy sources and for the solution of energy related problems.

B. COMMITTEE ACTION

In accordance with an agreement with the Joint Committee on Atomic Energy, the Committee reviewed the ERDA budget request for only those subprograms with a direct relevance to non-nuclear energy technologies—namely, materials sciences and molecular sciences. These two subprograms were also reviewed by the JCAE since they also have relevance to nuclear energy technologies.

During its consideration of S. 598, the JCAE authorized funds equal to the Presidential budget request for material and molecular sciences to support nuclear programs. In the opinion of the Senate Interior Committee the Presidential budget was decidedly inadequate for support of nonnuclear programs because the requested percentage increase was less than inflation in the preceding year. Without funds in excess of the Presidential request these subprograms would actually be retarded at the very time when the ERDA mandate has been broadened to include research, development, and demonstration in non-nuclear energy technologies. Without adequate support for the physical research subprograms of materials and molecular sciences, a sufficient corps of scientific expertise will not be available to be brought to bear on major technical problems which are bound to occur when major demonstration plants are built on an accelerated time scale. The costs for retrofitting and lengthy delays in the construction of non-nuclear demonstration built with borrowed monies can quickly exceed the cost of several years of research in real terms and can in indirect terms cause public discontent with the programs due to costly overruns and delays.

Accordingly, the Committee has authorized increases in both the materials and molecular sciences beyond those levels requested by the President. The materials sciences budget was increased by \$8.5 million to \$52.1 million for FY 76 and by \$2.125 million to \$14.025 million for the transition period. The molecular sciences authorization was increased by \$9.5 million to \$52.0 million for FY 76 and by \$2.375 million to \$13.575 million for the transition period.

The Committee recognizes that fact that it is difficult to categorize most basic research as either nuclear or nonnuclear. Fundamental scientific knowledge can frequently be used interchangeably to help

solve problems which arise in many energy technologies, both nuclear and nonnuclear. The Division of Physical Research currently has a reasonably balanced basic research effort in support of the AEC nuclear programs transferred to the ERDA. However, the Division of Physical Research of the ERDA has the responsibility of carrying out fundamental research relevant to all energy technologies, and currently it lacks an adequate program of support for basic research related to nonnuclear energy technologies. Therefore, the Committee expects that, to the extent practicable, the increases authorized by this Committee will be directed to initiate and expand programs in those areas with high potential for relevance to nonnuclear energy technologies.

In the current organizational structure of the ERDA the Division of Physical Research is assigned to the Assistant Administrator for Solar, Geothermal, and Advanced Energy Systems. Questions have been raised by the Office of Technology and Assessment panel and others regarding the advisability of this organizational assignment in light of the applicability of the results of physical research programs to all of the ERDA programs. Questions have also been raised regarding the ERDA approach organizationally and philosophically to insure that all of the necessary research, ranging from very basic to very applied, is being properly directed to provide the foundations for development and demonstration of all energy technologies. While basic research by extremely gifted scientists in support of the ERDA programs is undoubtedly desirable, supporting research programs more directly relevant to each of the energy programs is also very important. A carefully constructed research program encompassing the spectrum from basic to applied research is needed to meet the challenge of achieving fundamental understanding and yet providing answers to difficult questions which arise in the rush to demonstrate various energy technologies. The Committee directs the Administrator to clarify the ERDA position on these questions and issues by transmitting written communication to the Committee by no later than February 1, 1976.

5. ADVANCED ENERGY SYSTEMS

A. ERDA REQUEST

The ERDA requested for fiscal year 1976 the sum of \$13,773,000 for the operating expenses of the research and development program in magnetohydrodynamics (MHD) and \$500,000 for the operating expenses of the research and development program in fuel cells. The fiscal year 1976 request for MHD constitutes an increase of \$6,189,000 over the amount estimated to be expended in fiscal year 1975. Secondly, the fiscal year 1976 request for fuel cells represents no increase over the amount estimated to be expended in fiscal year 1975.

COMMITTEE ACTION

The development and successful utilization of these advanced technologies hold great promise for efficiently meeting energy demands. The Interior Committee is therefore very enthusiastic over these po-

tential technologies and expects the ERDA to aggressively pursue both programs. To this end, the Committee authorized an increase in programs so that fuel cells will be authorized at a level of \$10 million and MHD at a level of \$50 million.

(1) *Magnetohydrodynamics (MHD)*

[In thousands of dollars]		<i>Operating costs</i>
Fiscal year 1976:		
Original request.....		\$13, 773
Committee action.....		36, 227
Total		50, 000
Transition period:		
Original request.....		2, 200
Committee action.....		9, 055
Total		11, 255

The incorporation of MHD generators into the topping stage of binary power cycles offers the potential of high overall thermal efficiency and low pollution levels with the direct utilization of coal. Work over the past four years has led to preliminary engineering of developmental generators and other key components.

At the level of funding requested by ERDA, during fiscal year 1976, the major program actions to be taken will involve focusing work on specifically defined engineering goals. This process has already been initiated in FY 1975 and includes the organization of interdisciplinary design review teams to regularly evaluate progress on the major hardware projects. Recognizing that the engineering experience and data base for the design and construction of pilot scale facilities (50-100 megawatt, electrical) is not now available for coal fired systems, the program is being organized to insure that the design of test components and the supporting test schedules and conditions address the objectives of the defined engineering goals of a logical program.

An outgrowth of U.S. rocket technology, MHD generates electricity by interacting a high temperature gas with a magnetic field. The technology offers high promise of great increases in conversion efficiency (up to 60%) over present power generation systems (which achieve above 40%). Other major claims for the MHD technology are that it involves greatly reduced thermal and atmospheric pollution, reduced water requirements, and hold great promise for power generation from Western coals where water is scarce. The MHD technology is being actively pursued by the Soviet Union and Japan. U.S. Government support has been slow and at a low ebb.

The Interior Committee has specifically authorized \$50,000,000 for continuation of a program for magnetohydrodynamics.

Public Law 93-404 directed \$5,000,000 of FY 1975 funds to be used to design and plan an engineering test facility large enough so as to provide a legitimate engineering basis which when achieved will enable the immediate construction of a commercial scale MHD plant for possible operations in the mid-1980's. In the past, the Office of Coal Research, under Interior and now under ERDA, has shown little inclination to move ahead rapidly with a program of MHD development in compliance with the law.

The Committee strongly believes that, in its search for alternative sources of energy, the nation cannot afford to allow a system such as MHD to go by the wayside simply for lack of funding or direction. With this act, Congress is giving ERDA authorization for funds to move the MHD program at a pace consistent with the demands of existing law and it is incumbent upon ERDA to provide the direction necessary to carry out the intent of Congress that the MHD program progress rapidly.

In addition, the Committee expects ERDA to elevate the already existing MHD Project Office to a position of prominence and high visibility within the ERDA organizational structure. The Committee also believes that consolidation of all aspects of the MHD program within the MHD Project Office is of extreme importance to the success of the program.

The Committee expects to be advised periodically of the progress made in the development of the MHD technology and to any impediments that may slow the pace of such development.

(2) *Fuel cells*

[In thousands of dollars]		<i>Operating costs</i>
Fiscal year 1976:		
Original request.....		\$500
Committee action.....		9, 500
Total		10, 000
Transition period:		
Original request.....		200
Committee action.....		2, 375
Total		2, 575

Fuel cell development to date has concentrated mainly on designs using specialized clean fuels such as methane and hydrogen. Under the program originally transmitted to the Congress by ERDA efforts will concentrate first on evaluating existing fuel cells with coal-derived fuel and on matching coal-derived fuels with the most compatible fuel cell concepts. This program is said to be necessary in order to determine which fuel cell-fuel combinations can lead to practical, reliable, economic systems for implementation.

Fuels cells convert chemical energy directly to electrical energy and figured prominently in the nation's Space Program. Technology development, to date, indicates that fuel cells are capable of delivering up to 30 percent more energy from a given amount of fuel than conventional generating systems. Because fuel cell generators can range in output anywhere from a few kilowatts to hundreds of megawatts, they can be located at or near where the power is needed, thereby minimizing the inefficiency associated with the transmission and distribution. Furthermore, the Interior Committee has been informed that because of its high efficiency at relatively low power ratings, the fuel cell is ideally suited to use by smaller utilities—particularly those public systems owned and operated by smaller cities and towns and by rural cooperatives.

To date, the specific technology developed for the Government's needs is oriented to the use of pure hydrogen and pure oxygen as the fuel and oxidant. The effort now must be to develop cells tolerant of the impurities of fossil fuels. Through 1976 the electric utilities have invested some \$37 million in fuel cell research and development. Gas utilities another \$39 million and the Electric Power Research Institute has a \$9 million research program underway.

The Committee believes that ERDA should pursue an aggressive program in the development of fuel cells which can use fossil fuels. If successful, such a device would provide a highly clean and efficient source for decentralized power generation.

Because of the large pay-offs involved if research and development are successful, the Interior Committee has authorized a substantial increase in this program and expects ERDA to administer a program reflective of the increased authorization.

(3) supporting activities

[In thousands of dollars]		Operating costs
Fiscal year 1976:		
Original request.....		8,900
Committee action.....		0
Total		8,900
Transition period:		
Original request.....		1,630
Committee action.....		0
Total		1,630

This subprogram covers system studies encompassing all energy sources. The work includes examinations of all aspects of the energy systems including technological, environmental, economic, societal, regulatory and legal questions. The objective of the subprogram is to provide a coordinated approach to understanding interrelationships among energy supply and demand options. The FY '76 program will emphasize technology transfer studies, including the question how the transfer of technology from Government to industry can best be handled.

6. CONSERVATION RESEARCH AND DEVELOPMENT

A. ERDA REQUEST

The ERDA authorization request for operating expenses for the conservation research and development programs in the fiscal year 1976 is \$32,170,000 which is an increase of \$15,508,000 over the operating costs for fiscal year 1975. The requested expenditures for this program include the following subprogram amounts: electric power transmission, \$11,830,000; energy storage systems, \$9,100,000; advanced automotive power system, \$8,240,000; and end-use conservation, \$3,000,000. A capital expense authorization of \$2,450,000 was submitted for fiscal year 1976.

[In thousands of dollars]

	Actual costs in fiscal year 1974	Estimated costs in fiscal year 1975	ERDA request	
			Fiscal year 1976	Transition period
Electric power transmission.....	1,531	6,372	11,830	2,673
Energy storage systems.....	1,689	5,800	9,100	2,000
Advanced automotive power systems.....	1,500	4,490	8,240	2,060
End use conversion.....	0	0	3,000	1,000
Improved conversion efficiency.....	0	0	0	0
Urban waste conversion.....	0	0	0	0
Total.....	4,720	16,662	32,170	7,733

During the transition period the ERDA requested authorization of \$7,733,000 for operating expenses and \$500,000 for plant and capital equipment.

The U.S. has been growing more energy-intensive for many decades, in the face of decreasing relative energy prices. Buildings are poorly insulated. Industrial energy consumption per unit output is much greater than in other industrialized nations. Electrical energy conversion and transmission efficiency improved for decades, but has made no significant gains in recent years; the problem of peak loads has been getting worse. Our transportation system moves steadily toward energy intensiveness.

Several studies have been made to identify the kind and extent of research, development, and demonstration programs that should and could be carried out in support of energy conservation goals. While the studies differ in detail they uniformly indicate that major research and development can and should be undertaken immediately.

The electric power transmission program is being carried out in close cooperation with the utility industry, particularly with the Electric Power Research Institute (EPRI). ERDA now participates with EPRI in several joint transmission and distribution R&D programs.

The ERDA electric power transmission program includes activities in underground transmission, overhead AC and DC transmission, systems control and development, and distribution and use management. The FY 76 electric power transmission program basically is a continuation of predecessor programs at approximately the same level of activity.

Energy storage has significant potential in electric utility and transportation systems and can also be applied to residential, commercial, and industrial use. Application of new energy storage technologies will: (1) permit more efficient use of central station power plants, (2) provide for improved operating economy of utility systems, (3) reduce the need for scarce petroleum fuels by shifting to more plentiful fuels such as coal, (4) reduce the demand for electrical transmission and distribution facilities, and (5) provide certain environmental benefits. Additionally, energy storage is necessary for the full implementation of new energy resources such as solar and wind which are intermittent. Thus, storage is required to match the time of availability of the resource to the timing of its demand or consumption.

The ERDA program includes activities in several areas of energy storage technology, including batteries, chemical, superconducting

magnetic energy storage, thermal, mechanical and systems analysis. Although based on similar predecessor programs, the FY 76 program represents a several times expansion of activity in storage R&D.

The ERDA advanced automotive power systems program is the successor to and an expansion of the NSF advanced automotive power systems program and EPA R&D activities relating to internal combustion engines. The expanded ERDA program will encompass R&D in a broader range of transportation modes and technical issue areas including aircraft systems, rail systems, water systems, pipeline systems, and intermodal transportation studies, as well as an expanded highway vehicle systems follow on to the predecessor advance automotive program.

The ERDA program in end-use conservation is a substantially expanded effort in fiscal year 1976 which is designed to supplement the increased energy efficiencies now being achieved by the private sector in response to markedly increased fuel and energy costs. The objective of the program is to develop and demonstrate end-use technologies which have increased effectiveness and conservation and which probably would not be developed at all or within a comparable time frame by private industry. The impetus of Federal funding and the application of national R&D, demonstration and technology transfer capabilities to what otherwise would be solely individual industry research funding and capability, if at all, is intended to ensure the early availability and utilization of end-use conservation technology.

B. COMMITTEE ACTION

In reviewing the budget request for conservation research and development the Committee found deficiencies in the authorization request for every program except one—electric power transmission. The Committee approved increases in the authorization of the conservation programs to the following levels:

[In thousands of dollars]

	Senate Interior Committee recommendation	
	Fiscal year 1976	Transition period
Electric power transmission.....	11,830	2,673
Advanced automotive power systems.....	18,060	4,500
Energy storage systems.....	23,100	5,500
End use energy conservation.....	31,000	8,000
Improved conversion efficiency.....	5,000	1,230
Urban waste conversion.....	30,000	7,500
Total.....	118,990	28,903

These increases were approved because of the Committee's firm conviction that although various studies of the potential for research and development to contribute to energy conservation may differ in detail, they do indicate that major research, development and demonstration efforts can and should be undertaken immediately. The ERDA conservation research and development programs provide one of the major areas for potential contributions in the short-term (before 1985) to reducing the domestic energy shortfall.

The Committee accepted the budget request for electric power transmission as submitted with no proposed change.

The major concern of the Committee was that an increased funding level might cause a corresponding decrease in research support in the private sector by such organizations as the Electric Power Research Institute. However, the Committee invites the Administrator to request additional authorization of funds in electric power transmission if the need for such additional funds can be demonstrated.

The Committee recognizes that research and development efforts in energy storage systems will explore a number of approaches with each having applicability to probably more than one energy source. The consensus of the Committee members is that particular attention should be paid to those storage techniques which have strong potential for use in solar energy systems. The Committee expects the Assistant Administrator for Conservation to plan the energy storage program in cooperation with and in support of the solar energy program.

The Committee believes that as hydrogen is a relatively clean-burning fuel, with production costs which are easily competitive with other fuels, that the Energy Storage Systems and Advanced Automotive Power divisions of ERDA should examine proposals now before the Administration to demonstrate the feasibility of a hydrogen-powered transportation fleet, such as the proposal to operate a portion of the Idaho National Engineering Laboratory's bus fleet on hydrogen.

Before the Senate and House Appropriations Committees act on the ERDA appropriations bill the Assistant Administrator for Conservation must inform the Committee in written communication what the detailed plans are for supporting research in advanced automotive power systems with the \$18 million authorized by the Committee.

In connection with the advanced transportation power systems program the Committee directs ERDA, to undertake a comprehensive analysis to determine the feasibility and desirability of using methanol as a blend with gasoline for automotive fuel purposes. In addition, the Committee directs ERDA to study the feasibility and desirability of using methanol as a fuel to power the gas turbines frequently used by the electric utilities to meet periods of peak demand.

In conducting his activities in end-use conservation research and development the Assistant Administrator for Conservation is directed by the Committee to investigate, in coordination with the Department of Housing and Urban Development, potential R&D programs for improvements in mobile home design.

The improved conversion efficiency budget approved by the Committee will provide funds for advanced energy conversion efforts aimed at the development and demonstration of both bottoming and topping cycles, as well as hybrid power cycles. The additional funding will allow development of alternative methods of waste heat recovery and the development of competitive, alternative bottoming cycles utilizing this presently wasted resource.

The Interior Committee is especially interested in research and development efforts directed toward recovery of energy and agricultural fertilizer from liquid wastes. While the ERDA's waste utilization program is in the formative stages, research and demonstration of tech-

nologies in liquid wastes to energy concepts should proceed as expeditiously as possible. For many years, very wet wastes have been digested utilizing biological/biochemical techniques which, in turn, can produce methane for in-plant power.

While the Committee recognizes the proven utility of the biological/biochemical approach, the specific concern of large urban and metropolitan areas in processing liquid waste efficiently mandates so that more effective technologies be developed to handle such wastes. The conversion of liquid wastes to energy is appealing from the standpoint of both the net energy results that may be achievable and the decreased environmental impact to the nation's waterways if such technologies are made commercially feasible.

The Committee specifically notes that additional authorizations have been approved for research, development, and demonstrations in the treatment and utilization of liquid waste/sewage sludge. This funding has been authorized in two divisions of ERDA, Conservation (Improved Conversion Efficiency) and Environmental and Biomedical R & D (Environmental Studies). Furthermore, the Committee is aware that the Environmental Protection Agency has statutory authority to consider the efficient treatment and disposal of sewage sludge. Therefore, this Committee directs that ERDA coordinate programs among its divisions and between other government agencies. Periodically, and not less than annually, the Committee directs the Administrator of ERDA to transmit to the authorizing and appropriating Committees of Congress, a report or reports on the coordination and progress that has taken place between agencies in carrying out this program. Also, because the EPA, ERDA, and HUD each have an interest in the management of liquid wastes, ERDA is directed to establish an interagency task force comprising representatives of HUD, ERDA, and EPA to investigate the cost of converting liquid waste to energy and to coordinate the R & D of methods to efficiently handle these wastes.

In addition to funds included elsewhere in the ERDA authorization for FY 1976 for waste systems and utilization research and development activities, the Committee has included and authorized for Conservation Research and Development the amount of \$30,000,000 to be used for a program of assistance to state and local governments for the design, construction and operation of demonstration facilities for the recovery of energy and useful material resources from solid wastes. The Committee anticipates that such assistance will take the form of federal loans, price guarantees and other types of federal financial assistance authorized by Section 7.(a) of the Federal Non-nuclear Energy Research and Development Act of 1974 (Public Law 93-577).

7. ENVIRONMENTAL AND SAFETY RESEARCH

A. ERDA REQUEST

The ERDA requested authorization of \$196,075,000 for the fiscal year 1976 operating expenses of the environmental and safety research program (formerly the Biomedical and Environmental Research and Safety program), a net increase of \$31,080,000 over the estimated op-

erating costs for fiscal year 1975. The requested amounts are for (1) biomedical and environmental research, \$156,515,000, (2) waste management, \$36,000,000, and (3) operational safety, \$3,560,000.

The net increase over fiscal year 1975 is attributable to an increase for biomedical and environmental research (up \$24,300,000), and increase for waste management (up \$6,430,000), and an increase for operational safety (up \$350,000).

The ERDA also requested for this program for fiscal year 1976 authorization of \$24,200,000 for plant and capital equipment, consisting of \$5,620,000 for general plant projects, \$3,200,000 for a new construction project, \$1,000,000 for a previously authorized construction project, and \$14,380,000 for capital equipment not related to construction.

The ERDA requested authorization during the transition period of \$51,500,000 for the operating expenses of this program and \$5,050,000 for plant and capital equipment expenses.

(Fiscal years)
[In thousands of dollars]

	Actual costs in 1974	Estimated costs in 1975	ERDA request	
			1976	Transition period
Biomedical and environmental:				
Health studies.....	32,718	35,904	\$44,180	\$11,280
Environmental studies.....	21,291	36,972	43,765	11,050
Biological studies.....	37,564	41,608	47,470	12,420
Physical and analytical.....	9,700	13,572	17,850	4,900
Heart devices.....	2,640	1,761	0	0
Nuclear education and training.....	2,347	2,398	3,250	850
Nonnuclear education and training.....	0	0	0	0
Total.....	106,260	132,215	156,515	40,500

The budget submitted to the Congress for environment and safety was constructed prior to the establishment of ERDA to continue nuclear energy programs which had their origins in the Atomic Energy Commission. No direct provisions were made in the Presidential budget for biomedical and environmental programs germane to non-nuclear energy technologies. With only the expenditure level provided in the submitted budget the Assistant Administrator for Environment and Safety would be forced to reallocate monies from nuclear energy programs in biomedical and environmental research to institute non-nuclear programs. In fact, the Office of Management and Budget recommended that the Assistant Administrator for Environment and Safety shift \$20 million to non-nuclear energy technologies.

While there is an on-going program for nuclear education and training within ERDA, there was a total lack of funds designated for the education and training of technical manpower in energy-related disciplines to carry out the non-nuclear mission of ERDA. Any new education programs would also be under the direction of the Assistant Administrator for Environment and Safety.

During its consideration of the ERDA budget the Joint Committee recommended authorization of \$163,015,000 for the operating expenses of ERDA biomedical and environmental research program

for fiscal year 1976. This is an increase of \$6.5 million above that which was requested. Also, the Joint Committee recommended that \$41,650,000 be authorized for the transition quarter, an increase of \$1,150,000 above the amount requested.

The Joint Committee specified that the additional authorization be utilized as follows:

1. \$3.5 million in fiscal year 1976 and \$900 in the transition period for continuation of the artificial heart program,
2. \$2 million in fiscal year 1976 for additional effort in the ERDA program in nuclear medicine, and
3. \$1 million in fiscal year 1976 and \$250,000 in the transition period to provide for additional traineeships in nuclear energy education.

B. COMMITTEE ACTION

With the public concern over the safety and environmental effects of nuclear energy sources, the sentiment of the members of the Committee is that it is ill-advised to divest funds from the nuclear programs to initiate programs in biomedical and environmental research pertaining to non-nuclear energy technologies. Therefore, the Committee approved an increase of \$31.5 million in the authorization level for biomedical and environmental research. The Committee directs that these additional funds be used to initiate programs for which the primary aim is to address questions regarding the biomedical and environmental effects associated with the use of the non-nuclear energy technologies being developed by ERDA.

The Committee increased the authorization level for biomedical and environmental research by the \$31.5 million after receiving a detailed report on the types of research efforts which were needed to investigate the effects of widespread usage of new non-nuclear energy sources.

It is the intent of the Committee that the \$31.5 million increase be allocated in the following manner:

- Health Studies, \$4,660,000.
- Environmental Studies, \$12,672,000.
- Biological Studies, \$2,240,000.
- Physical and Analytical, \$6,928,000.
- Non-nuclear Education and training, \$5,000,000.

The Committee approved the increase for health effects studies to permit the evaluation of the hazards of exposure of human populations to different levels of toxic agents from non-nuclear energy sources and to develop methods for correcting and preventing the damage caused by these hazardous agents.

The Committee's increase for environmental studies will provide support for an accelerated ERDA program for research, development, and demonstration relating to energy resource extraction. The agency has key responsibilities which includes all aspects of the fuel cycle for present fuels. Programs which relate directly to the increased use of coal for synthetic fuel purposes should be appropriately emphasized.

The Committee's increases will permit new research efforts on the biological aspects of matters such as pulmonary disease caused by coal-carcinogenic and mutagenic activity of chemical pollutants in human

populations and biological aspects of geothermal energy related pollutants. An instrumentation program will support epidemiological studies, especially with respect to the relationship between level of exposure and disease effect.

The Committee increased the physical and analytical subprogram for FY 76 and for the transition period, to support a range of activities covering rehabilitation of coal lands; coal-related pulmonary diseases; broad aspects of coal conversion technologies, as well as the possible health, environmental, and social impact of renewable energy sources such as wind, ocean thermal gradients, hydropower and others.

The Committee expects that the approved increase in authorizations for the Division of Biomedical and Environmental Research will enable ERDA to actively pursue work in identifying and measuring multiple pollutants from various sources.

Furthermore, ERDA should do such work, that is not duplicative of other agencies, in the development of biological test systems and instrumentation for such identification and measurement of multiple pollutants and to research, develop, and demonstrate new approaches to improve present methods.

The Committee is keenly aware that there are environmental programs already established in other governmental agencies and that there is a serious potential for needless duplication of effort in establishing within ERDA programs in biomedical and environmental research pertaining to non-nuclear energy technologies. The Committee is also concerned that no gaps be allowed to occur in our ability to develop the non-nuclear resources in environmentally safe and acceptable ways.

The Committee believes that a complete program in environmental research can be achieved without needless duplication provided that areas of principal responsibility for each active Federal agency is defined by mutual agreement. The Committee is encouraged by the recent agreements on relative responsibilities which were determined cooperatively by those Federal agencies engaged in environmental research and which were described in the Report of the Interagency Working Group on Health and Environmental Effects of Energy Use—a document prepared for the Office of Management and Budget and the Council on Environmental Quality.

The Committee is convinced that the Assistant Administrator must be a vigilant critic of every proposed project for a new nonnuclear energy source to insure that environment and safety concerns are properly evaluated at the bench-scale and later stages in the development of each energy source. No technical approach to energy extraction or production should proceed beyond the pilot plant stage until environmental and safety considerations have been completely satisfied. In other words, the Assistant Administrator is expected to be an internal policeman against ill-advised projects proposed by other assistant administrators. The Assistant Administrator should not grant contracts for environmental and safety studies relating to an energy technology to an entity which has contracts pertaining to the development of that same technology from another assistant administrator.

In accordance with Section 110 of the Energy Reorganization Act of 1974 (Public Law 93-438) the Committee directs the Assistant

Administrator for Environment and Safety to coordinate with other Federal agencies those programs in biomedical and environmental research which pertain to non-nuclear energy technologies. The Committee believes that the Federal program in environment and safety research must cover all important areas. The Committee directs the Assistant Administrator to initiate inter-agency communications to delineate areas of responsibility and to enter into interagency agreements which will develop cooperative programs and avoid unnecessary duplication. The Assistant Administrator should be particularly mindful of the health and safety programs and the responsibilities of the Mine Enforcement and Safety Administration and of the National Institute of Occupational Safety as well as the programs and responsibilities of the National Oceanic and Atmospheric Administration. Further, the Assistant Administrator is directed to inform the Committee by written communication of any such arrangements in biomedical and environmental research to avoid needless duplication.

The Geothermal Energy Research, Development, and Demonstration Act of 1974 (P.L. 93-410) and the Solar Energy Research, Development and Demonstration Act of 1974 (P.L. 93-473) both specifically require ERDA to establish and support scientific and technical education programs in these areas. This need for scientific and technical training is viewed as deserving high priority. It should be emphasized that the program should encompass all energy-related education and training for non-nuclear technologies such as vocational training, undergraduate education, graduate and post-doctoral education, and retraining of scientists and technicians.

The Committee directs the Assistant Administrator to initiate with the \$5.0 million authorization education and training programs which will insure the development of an adequate resource of technical experts to conduct the research, development, and demonstration programs in those non-nuclear energy technologies where there exists or is expected to exist a critical shortage of skilled individuals. Pursuant to previously enacted legislation, ERDA may wish to transfer funds related to scientific and technical education to another Federal agency for incorporation into an existing program.

8. MISCELLANEOUS

A TRANSFER OF FUNDS

ERDA Request

In spite of the enactment of the Federal Non-nuclear Energy Research and Development Act of 1974 (Public Law 93-577) which provided for explicit fund transfers to other Federal agencies there was no corresponding request for such funds in the Presidential budget request.

Committee Action

In accordance with the provisions in Section 16 of P.L. 93-577, the Committee authorized (Section 101(a)(b)(c)) and directed ERDA to transfer funds for fiscal year 1976 in the amount of \$500,000 to the Council on Environmental Quality and \$1,000,000 to the Water Resources Council to provide the implementation of the responsibilities of these two agencies as set forth in Sections 11 and 13 respectively.

Additionally, the Committee requested and received testimony from the National Bureau of Standards regarding the implementation by that Agency of the provisions in Section 14 of P.L. 93-577.

Based on the testimony presented and the strong sentiment of the Committee members regarding the importance of an office for energy-related inventions, the Committee authorized and directed ERDA to transfer to the National Bureau of Standards funds in the amount of \$1.7 million for fiscal year 1976. The Committee expects that the ERDA and the NBS will work closely to insure that promising energy-related inventions which are submitted for examination are carefully reviewed. Inventions which are found to be potentially beneficial to the reduction of the shortfall in our domestic energy supply shall be carefully considered by ERDA for research and development grants, if needed, to permit the further improvement and evaluation of the innovation.

For the transition period the Committee authorized and directed ERDA to transfer funds in the amount of \$125,000 to the Council on Environmental Quality; \$250,000 to the Water Resources Council; and \$425,000 to the National Bureau of Standards.

With respect to funds authorized for transfer to the National Bureau of Standards, the committee believes that the Office of Energy-Related Inventions, set up in the National Bureau of Standards in response to Section 14 of the Federal Nonnuclear Energy Research and Development Act of 1974, should actively provide the sorely needed function of expediting nonnuclear energy-related technological innovation. Too frequently, inventions have gone undeveloped because of non-technological barriers to innovation, which could alleviate or solve energy-related problems.

It is the committee's understanding that the Office of Energy-Related Inventions is responsible for assisting in the application of inventions which would advice the nonnuclear energy needs of the nation. Selected inventions would be forwarded to the appropriate program administrator within ERDA with or without specific recommendations of support. The optional recommendations for support would include, but not be limited to, requests for (1) financial or managerial assistance in the application of the invention, (2) mandating performance levels achieved by the invention in government contracting procurement, (3) further evaluation and testing of the invention in government or private laboratories under contract, (4) funding of demonstration projects and feasibility studies, (5) rulemaking to set performance levels achieved by the inventions in areas where rulemaking is authorized, and (6) public dissemination of the technical advances illustrated by inventions as they relate to the use of non-nuclear energy resources.

The Office of Energy-Related Inventions is expected to encourage the technical innovation in the private sector by publication of evaluations, recommendations, and any other resultant agency actions on referred inventions in its own periodical or other widely circulated publications. Cooperation with private enterprise through invention conferences and provision of managerial advice in promoting inventions is expected to promote innovation in nonnuclear energy-related areas.

The committee expects that a section in the ERDA annual report to Congress will describe the activities of the Office of Energy-Related Inventions to carry out its duties. The report should provide detailed summaries and explanations of current activities and future plans.

B CAPITAL EQUIPMENT NOT RELATED TO CONSTRUCTION

ERDA Request

The ERDA has requested authorization of \$232,347,000 for fiscal year 1976 and \$56,676,000 for the transition period for capital equipment not related to construction. The amount requested for fiscal year 1976 is a net increase of \$21,960,000 over the estimated obligations for fiscal year 1975.

The Joint Committee recommended that an additional \$4.0 million for fiscal year 1976 and \$1.0 million for the transition period be authorized for the controlled thermonuclear fusion program.

The Joint Committee also recommends that an additional \$4.0 million for fiscal year 1976 and \$1,250,000 for the transition period be authorized for laser fusion capital equipment not related to construction.

The Joint Committee's overall recommendation for capital equipment not related to construction, was that \$240,347,000 be authorized for fiscal year 1976 and \$58,926,000 be authorized for the transition period.

Committee Action

The Committee approved an increase of \$5.0 million for the transition period in the capital expense category of capital equipment not related to construction. The Committee intends that this increased fund be used to provide equipment for investigators who receive grants in the physical research subprograms of materials and molecular sciences to conduct research in areas with relevance primarily to non-nuclear energy technologies. The Committee approved this increase to insure that researchers supported by operating expenses are not denied the equipment needed to pursue successfully their intended projects.

C PROGRAM SUPPORT

ERDA Request

The ERDA requested authorization of \$200,018,000 for the fiscal year 1976 operating expenses to carry out those activities relating to program support, an increase of \$24,120,000 above the estimated costs for fiscal year 1975. Of the amount requested \$168,614,000 is intended for the activity termed operational program direction. The ERDA requested authorization of \$52,488,000 for the transition period operating expenses including \$44,547,000 for program direction.

The activity termed "program support" has five categories of which only one—operational program direction—was reviewed by the Interior Committee. In its review of operational program direction the Joint Committee recommended approval of the full amount requested in the ERDA budget. Additionally, the Joint Committee authorized increases in the remaining four categories totalling \$2,242,000 for fiscal year 1976 and \$308,000 for the transition period.

Committee Action

The Interior Committee in its review of the operational program direction found the proposed increase in the Presidential budget request totally inconsistent with the need for the ERDA to expand its staff for management of non-nuclear energy technologies. The principal effort associated with operational program direction is the providing of management direction for the various ERDA operating programs conducted through the ERDA field offices and the Washington headquarters.

Without adequate staff to manage its programs, the efforts of ERDA to utilize the increased funding provided for non-nuclear programs will be hopelessly encumbered. In the Committee's view, it is essential that the ERDA be permitted to increase its staff accordingly as its programs expand. Restrictions placed on ERDA staff ceilings by the Office of Management and Budget can only defeat the important attempt to develop and demonstrate new non-nuclear energy technologies.

The Committee therefore approved moneys for an increase of 400 staff positions during fiscal year 1976. The increases were \$9.0 million for fiscal year 1976 and \$2.25 million for the transition period. The Committee fully expects that the OMB will increase the staff ceiling as needed during the course of the year instead of restricting the level until the end of the fiscal year. The Committee directs ERDA to use this additional staff to manage programs in non-nuclear energy technologies.

D LOAN GUARANTEES

The Committee recognizes that the Congress' immediate concerns should be Federal programs to cope with our country's economic problems such as the recession, inflation, and unemployment. It is the judgment of the Committee, however, that this period also must be used to implement national programs to improve our country's energy posture over the long-term. The groundwork must be laid at this time for the enormous, sustained energy programs necessary to assure sufficient domestic energy supplies to maintain a strong economy, once our present economic problems are brought under control.

In creating the Energy Research and Development Administration last year and enacting the Federal Non-Nuclear Energy Research and Development Policy Act, the Congress intended to launch a comprehensive Federal energy research, development, and demonstration program to provide and create new energy choices for the United States in the future. In this regard perhaps the most significant energy supply need of the United States is the development of alternative fuel sources to domestic natural gas and oil. In the Committee's judgment it is not enough to speak of research on new energy technologies; time schedules also must be established for the commercial demonstration of synthetic fuels and other non-conventional energy supplies.

The need for a Federal synthetic fuels program was enunciated by President Ford in his 1975 State of the Union message. At the time the Chief Executive proposed a National Synthetic Fuels Commercialization Program capable by 1985 of producing 1 million barrels of synthetic fuels and shale oil per day. Subsequently, in February, 1975, Senator Pastore's Ad Hoc Committee to the Senate Demo-

cratic Conference recommended in the Congressional Program of Economic Recovery and Energy Sufficiency that "a commercial demonstration of new synthetic fuels from coal should be undertaken with an ultimate production goal (by 1985) reaching the equivalent of 500,000 barrels of oil per day."

In order to achieve this Congressional and Administration endorsed objective, on July 8, 1975, Senator Jennings Randolph (D-W.Va.) introduced S. 2066, the Synthetic Fuels Act of 1975; this measure was cosponsored by Senator Henry M. Jackson (D-Wash.). At the time Senator Randolph characterized the bill as "the single most important action that can be taken by the Federal government to expedite the commercial development of a domestic synthetic fuels industry."

Subsequently, during the Committee's consideration of S. 598 on July 22, 1975, Senator Jackson offered as an amendment and the Committee approved with amendments the provisions of S. 2066 as Section 103 of S. 598. As adopted section 103 provides the Administrator of the Energy Research and Development Administration with authority to guarantee loans for the commercial demonstration of synthetic fuels. The purposes of this section are to—

Assure adequate Federal support to foster a joint government and industry demonstration program capable by 1985 of producing synthetic fuels from coal and oil shale equivalent to at least one million barrels of oil per day, and to assure adequate financial support to those enterprises seeking to employ renewable energy sources to generate power or heat on a commercial scale; and

Further the national energy policies enunciated in the Federal Non Nuclear Energy Research and Development Act of 1974.

In order to accomplish these purposes, the measure authorizes the ERDA Administrator to guarantee and to make commitments to guarantee the payment of interest on, and the principal balance of, bonds, debentures, notes, and other obligations issued by or on behalf of any person for the purpose of financing the construction and operation of—

Commercial facilities for the conversion of domestic coal and oil shale into synthetic fuels, including but not limited to, such synthetic fuels from coal as high-Btu gaseous fuels compatible for mixture and transportation with natural gas by pipeline, low-Btu gaseous fuels suitable for boiler use in compliance with applicable environmental requirements, liquid fuels for transportation uses, and petrochemicals; and

Facilities to generate power or heat in commercial quantities utilizing as their energy source direct solar, wind, ocean thermal gradient, bioconversion, or geothermal resources.

The total outstanding indebtedness that may be guaranteed, at any time, by the Administrator is limited to \$6 billion. However, the Committee intends that the Administrator give the highest priority to the gasification of coal to produce high-Btu gaseous fuels compatible for mixture and transportation with natural gas by pipeline. For this purpose the Committee ear-marked \$2.5 billion of guarantees.

Individual project guarantees are not to exceed 75 percent of the project cost for the facility; however, at any time during the period

of actual construction of the facility the Administrator may guarantee in excess of 75 percent; up to 100 percent of the project cost until construction of the facility is completed, at which time the guarantee shall be restricted to a maximum of 75 percent of the project cost.

The Committee recognizes that synthetic fuel projects can involve both mining and manufacturing facilities requiring extensive investment in resource assessment, resource acquisition, and development of necessary infrastructures and community facilities. Protection of the environment also can require costly environmental analysis and safeguards. Therefore, the Committee intends that the loan guarantee program be administered in a manner which recognizes the range of necessary investments to assure the project's viability consistent with applicable Federal and State environmental requirements. In this regard the Committee intends that the Administrator exercise the authority contained in section 103 so as to permit the project's costs to include, as necessary to assure the project's economic viability, any costs incurred in the acquisition or construction of a facility and in the preparation of the facility for normal operation, including, but not limited to, the costs of acquisition or construction of the plant and equipment, the acquisition of the technology, the acquisition of raw material reserves, site development, environmental analysis and environmental protection measures, community planning and development, and interest during construction.

In exchange for the guarantee of loans by the Administrator pursuant to this section, the Committee intends that the persons receiving or benefiting from the guarantee pledge all assets of the project, including raw material reserves, plant, support facilities and technology rights to the Administrator so that, in the event of default, the Administrator would be in a position to operate, lease, or operate the project. This is intended to assure the Administrator the rights of a mortgagee and, if foreclosure should become necessary, the federal government would obtain title to a complete facility, including the reserves and technology necessary for operation.

In the interest of assuring Congressional oversight of this loan guarantee program the Administrator is required to submit to the Congress within 90 days of enactment of this section his recommendations on the best opportunities to implement a program of Federal financial assistance with the objectives of demonstrating production of the equivalent of 1 million barrels of oil per day by synthetic fuels processes by 1985 utilizing the authority in this program and other forms of financial assistance available to him pursuant to the Federal Non Nuclear Energy Research and Development Act of 1974.

In addition a report is to be submitted to the Congress on each proposed guarantee or commitment to guarantee a project pursuant to this program. Such proposal shall reside before the Congress subject to Congressional disapproval for 90 days before it may be finalized by the Administrator. At any time during this period the Administrator may withdraw his recommendation.

In the Committee's judgment, greater Federal incentives are needed to cut the Gordian Knot of economics for the first generation of pioneer synthetic fuels plants in this country. The market place does not now provide sufficient incentives or an adequate mechanism for encouragement of the establishment of this industry.

At the present time, our country does not possess an adequate infrastructure to support the expeditious design construction and management of a domestic synthetic fuels industry. Moreover, there is a need to verify, on a commercial scale, the economic value or cost-effectiveness of alternative processes particularly with respect to synthetic fuels production from a variety of domestic coal types. The Committee believes that if these objectives are to be achieved in a timely fashion the Federal government must encourage the private sector to commercialize first generation synthetic fuels technologies.

For example, technologies for the conversion of coal to gaseous (methane) or liquid (methanol) fuels are fully demonstrated. Extensive successful tests have been performed on coals from Illinois, North Dakota, Montana, and New Mexico. Large-scale applications and uses exist, or existed, in Germany, England, Australia, and South Africa. The basic technologies of gasification as well as the conversion of products to methanol is 50 years old and in wide-scale use in other parts of the world.

Several first generation technologies applicable to non-caking and mildly-caking United States' coals for the production of low-Btu gas, high-Btu gas, and methanol are now ready for commercialization in this country.

The Committee notes that the present research and development efforts of ERDA anticipate reducing synthetic gas prices by more than 10 percent but, significantly, not more than 15 percent. The Committee also observes, however, that under today's inflationary conditions this advantage would disappear in less than two years even should the second generation processes under consideration by ERDA should prove fully successful. In other words, a synthetic gaseous fuels plant built today with known technology will be competitive with a plant built in 3 or 4 years with technology now under development.

The principal constraint to deployment of these technologies at the present time is the availability of sufficient capital at reasonable interest rates. For example, production by 1985 of synthetic gas equivalent to 1 million barrels of oil per day will require a total capital investment over the next 5 to 7 years of about \$20 billion. While this appears monumental by comparison it represents less than 10 percent of the planned investment in new electric power generation over the same period and is thus realistic.

While it is often perceived that synthetic fuels are expensive this is not necessarily the case. For example, although synthetic substitutes for natural gas from coal are expensive their costs nevertheless compare very favorably with electric power generation from coal, which is accepted as a matter of course. The cost of electricity from coal varies from \$8 to \$10 per million Btu's, while methane from coal costs about \$3 to \$4 per million Btu's.

For comparable capital investments the conversion of coal to methane is cheaper in first cost, more efficient, and produces much lower cost energy supply which also is cheaper to distribute than electricity. In summary the gasification of coal is competitive with electrification for the delivery of clean energy from a domestic source for commercial and residential use.

On the other hand synthetic liquid fuels are not now competitive with conventional supplies. Moreover, the state of this art is now

essentially in the pilot plant stage ready for semi-commercial scale demonstration.

Compared to conventional oil exploration, production, and refining, the required capital investment for a coal mine and a synthetic fuels plant to produce comparable products is about one-half as much.

During this period when our country is faced with the dual problems of severe capital limitations and a shortage of environmentally acceptable fuels, a case can certainly be made for encouraging synthetics.

First generation technology for the production of synthetic fuel from oil shale has reached the stage where construction of the first commercial scale facilities is warranted. Four oil shale production processes have been tested at the pilot plant stage which appear to offer promise for commercial-size demonstration.

Evidence suggests that if the Nation relies solely on private enterprise to construct commercial oil shale plants in the normal course of business, industry spokesmen believe that the first experimental plants will not get underway before 1979 or 1980; and significant shale oil production could not be expected before 1995. The Federal Government, however, can expedite oil shale development and prove or disprove the viability of this resource before 1980 by means of guaranteed loans. Further, government loan guarantees would enable independent oil producing companies as well as consumers of oil (including farm cooperatives) to participate in oil shale ventures.

A Federal loan guarantee program will permit prospective oil shale producers to overcome the present impasse resulting from the virtual unavailability of venture capital for oil shale commercialization. With the private participants being required to bear at least the first 25 percent of project investment risk, there will be an incentive to assure that the plants are built and operated in an efficient manner.

With regard to renewable energy sources, the Committee observes that uncertainty in government policies and the generally tight credit situation also make it difficult to obtain financing for commercial-scale development projects in such alternative energy areas as solar and geothermal. While specific authority to guarantee loans was provided under the Geothermal Energy Research and Development Act of 1974, in the Committee's judgment the limit of \$25 million provided for by that law appears inadequate. In the solar area, advanced designs for solar thermal powerplants, solar stills for desalination, and commercial-scale wind generators are nearing the demonstration stage. Further in the future, ocean thermal gradient systems are now in the conceptual design phase. However, loan guarantees are not available for the demonstration of solar energy under existing law.

The Committee intends that the Administrator exercise discretion in determining the appropriate point in the development cycle of such energy technologies as direct solar, wind, ocean thermal gradient, bio-conversion (energy recovery from renewable organic material), and geothermal resources where loan guarantees would aid in their demonstration or commercialization.

In authorizing loan guarantees the Committee intends that the ERDA Administrator launch a Federal program to assure a limited number of plants are constructed to prove the technical and economic feasibility of commercial production of synthetic fuels. In the Com-

mittee's judgment this must be undertaken recognizing that any major reliance on synthetic energy supplies will require enormous capital investments and manpower. Because of the higher prices that will be associated with synthetic fuels the costs must be clearly delineated in advance. Nevertheless, the Committee believes that it is essential that the United States possess in 1985 an established synthetic fuels industry.

E. SMALL BUSINESS REPORT

The Interior Committee dopted (section 306) an amendment which requires the Administrator of ERDA to periodically report to the Congress on the participation of small businesses and non-profit organizations in ERDA's research, development and demonstration programs. The Committee strongly believes that the Energy Research and Development Administration must actively pursue and encourage participation by small businesses and non-profit organizations.

In submitting a report to the Congress the following items should be included in such a report: (1) contracts awarded to small business, (2) the nature of ERDA's efforts to include small business and their general success, and (3) a substantive description of the criteria that went into awarding contracts where the awards had the effect of increasing the role and market share of major corporations.

While the Administrator of ERDA is expected to report on all non-profit organization and small business activities the Committee is especially concerned that small businesses, consumer groups and others are deeply involved in the solar research, development and demonstration program.

In the course of its deliberations on the bill the committee considered a proposal that ERDA be required to expend with small business enterprises not less than 25 percent of the amount authorized for solar research and development.

The committee notes that section 2(d) of ERDA's enabling legislation, the Energy Reorganization Act of 1974 (P.L. 93-438) declares it the policy of the Congress that small business concerns be given a reasonable opportunity to participate, insofar as is possible, fairly and equitably in grants, contracts, purchases, and other Federal activities relating to research, development, and demonstration of sources of energy efficiency, and utilization and conservation of energy. In carrying out this policy, ERDA is required to consult with the Administrator of the Small Business Administration. Section 14 of the Solar Heating and Cooling Demonstration Act (P.L. 93-409) specifically requires ERDA and other Federal agencies to take whatever steps are needed to assure that small business concerns will have realistic and adequate opportunities to participate in the solar program authorized by that Act. Further, section 14 of the Federal Nonnuclear Energy Research and Development Act (P.L. 93-577) requires that particular attention shall be given to promising energy-related inventions submitted by individuals and small companies for the purpose of obtaining grants from ERDA.

The committee is advised that the present procurement policies of ERDA include provisions to implement those portions of the Federal Procurement Regulations that pertain to small business concerns. The ERDA procurement regulations also implement programs developed

cooperatively with the Small Business Administration and other Government agencies having procurement responsibility. Each of ERDA's field offices has a staff member designated to review procurement actions to assure compliance with the regulations pertaining to small business concerns. In addition, the committee has been informed by ERDA that Dr. Seamans, the Administrator, has instructed ERDA's top management and the heads of all field offices to use every appropriate opportunity to assist in the creation and continuing support of both small and minority businesses. This includes participation as contractors, subcontractors and bankers in ERDA programs, and provisions by ERDA of management, technical and financial assistance to such businesses where feasible.

Further, the committee has been advised that in ERDA's drafting of the National Plan for Solar Heating and Cooling, considerable thought has been given to the role of the small business segment of industry. That plan is intended to establish new product lines within an existing industry that is already strongly represented by small business—such as heating, ventilating, airconditioning, and sheet metal contractors. The solar heating and cooling demonstration program being developed by ERDA envisages the extensive participation of small builders, architects, engineers, contractors, suppliers, manufacturers and service organizations throughout the country. The committee has been advised that one of ERDA's first actions will be to circulate and widely advertise a request asking industry to list present products that pertain to solar heating and cooling, and that this solicitation will be designed so that small business firms will be able to respond with a minimum of effort.

The committee is dedicated to seeing to it that the small business policy enunciated in ERDA's basic legislation is, in fact, implemented.

F. CHANGES IN SELECTED RESOURCES

ERDA request

The budget structure for "Operating expenses" reflects the estimated total costs to be incurred for each of ERDA's major functional programs in fiscal year 1976 and the transition quarter. In order to determine the total new obligational authority to be requested from Congress, consideration must be given to (1) funds to be appropriated for fiscal year 1976 and the transition quarter, (2) amounts that must be obligated in fiscal year 1976 and the transition quarter, although used to cover future years' costs, and (3) assets or funds available from prior appropriations. Thus, changes in selected resources is the financial adjustment between estimated operating costs and the new obligational authority requested.

Selected resources consist of inventories, collateral funds and other deposits, and goods and services on order. The latter category includes the cost of materials and services to be delivered after the end of fiscal year 1976 and the transition quarter, and the prefinancing of certain contractors' costs beyond the end of fiscal year 1976 and the transition quarter to insure continuity of operations.

The balance of selected resources expected to be available for future applications at the end of fiscal year 1976 is \$332,349,000 more than the balance expected at the end of fiscal year 1975. The total increase

consists of a net increase of \$47,120,000 in inventory levels and an increase of \$285,229,000 in the level of goods and services on order.

The balance of selected resources expected to be available for future applications at the end of the transition quarter is \$124,505,000 more than the estimated balance at the end of fiscal year 1976.

Committee action

The Interior Committee has recommended increases to the authorization requested for the operating expenses of several of the Administration's programs during fiscal year 1976 and the transition quarter, as reflected elsewhere in this report. The increase in the prefinancing of certain of these programs for fiscal year 1977 is reflected in the selected resources category on the basis of fiscal year 1976 and transition quarter estimated costs. Therefore, the committee recommends an increase of \$93,100,000 for fiscal year 1976 and \$23,225,000 for the transition quarter in selected resources to properly reflect the related prefinancing requirements.

G. OTHER COMMITTEE ACTIONS AND VIEWS

In addition to adopting amendments to increase (and decrease) authorizations for the Energy Research and Development Administration for the Fiscal Year 1976 and the transition quarter, the Interior Committee submits the following views:

Energy Advisory Service

An effective national energy program depends on public understanding of the important energy issues. This is true for implementing programs as well as for making decisions.

The Committee believes that in as much as ERDA will represent the major federal energy research and development effort in the years to come, it is essential that the means be established now to enable ERDA to create and maintain a public awareness of these efforts and to provide services of an advisory nature as a way of assuring the dissemination of information and knowledge to industry, government and the public on energy technologies.

To insure prompt application of these new energy technologies on a nationwide basis, the Committee feels strongly that ERDA should explore the possibility of establishing an "Energy Advisory Service" as a national undertaking with programs and activities which focus on the state and local level, and all pertinent elements of the private and public sectors. It would provide expertise, consultation, dissemination of information, and receive advice on the nature of energy use and problems.

The Energy Advisory Service could fulfill this need in much the same way that the present Agricultural Extension Service has fulfilled the need in agriculture, or the Sea Grant College Program has fulfilled the need in Marine Advisory Services. The energy field is vastly more complex than fields served by other advisory programs and the urgency for the activities is far greater. It is essential, therefore, that the information delivery system be put together so that all the public can be reached both through proven mechanisms and newly developed techniques.

Active ongoing models for this already exist in state governments and in many of the nation's outstanding universities. These are available in implementing a program quickly at the individual citizen level. Through short courses, work shops, conferences, specialized publications, active use of the media and personal consultations, the ability and experience of universities and other groups can be used to reach the appropriate audience, whether the subject be agricultural, industrial, governmental or other.

Such a service could answer questions and give advice to individuals, businesses, and state and local government officials on energy conservation measures and alternative energy systems, for example, the use of home insulation, solar heating and cooling equipment, or the cooperative use of solid waste by farmers and users to produce energy.

There are immediately available vehicles through which ERDA can initiate a comprehensive "Energy Advisory Service" with a national focus and with strong local participation, and these vehicles should be used when possible. During fiscal year 1976 and the transition quarter, planning and initial demonstration of this concept, using funds from the Conservation and Solar budgets, should be of high priority to ERDA.

In furtherance of the Interior Committee's intent that ERDA develop an effective program of information dissemination, the Committee expects ERDA to investigate the possibility of using public and private organizations to promote new energy technologies like those which may eventually be available in solar energy technologies.

VIII. SECTION-BY-SECTION ANALYSIS

Section 101

Section 101 of the bill authorizes appropriations to the Energy Research and Development Administration, in accordance with the provisions of section 261 of the Atomic Energy Act of 1954, as amended, section 305 of the Energy Reorganization Act of 1974, and section 16 of the Federal Nonnuclear Energy Research and Development Act of 1974, for "Operating expenses" and "Plant and capital equipment."

Section 101(a) authorizes specific amounts of money, on a cost accounting basis, for the following programs: Fossil Energy for various areas, \$348,733,000; Solar Energy—\$96,200,000; Geothermal Energy—\$33,870,000; Advanced Energy Systems—\$68,900,000; Conservation—\$118,930,000 for various areas. In addition, sub-program expenditures were provided: Environment and Safety Research and non-nuclear scientific and technical education—\$31,500,000; Physical Research in molecular and materials sciences for non-nuclear energy technologies—\$18,000,000; and a total of \$3,200,000 to support National Bureau of Standards, Council of Environmental Quality and Water Resources Council pursuant to Public Law 93-577.

The Senate Interior Committee is recommending authorization of \$3,826,440,000 for fiscal year 1976 "Operating Expenses." Note that this includes \$772,033,000 of non-nuclear energy research, development and demonstration. The Committee has not reviewed the nuclear programs of ERDA, and makes no judgment concerning those programs.

It is the Interior Committee's intent that the amounts provided for all programs and sub-programs specified be expended on the basis of testimony and plans submitted to the Committee on both a formal and informal basis. Specific authority is given to the Administration to increase any non-nuclear program through re-programming actions, provided that no program shall suffer a decrease of more than 10 per cent, and no Senate or House Committee having jurisdiction shall object.

Section 101(b) provides specific amounts for Plant and Capital Equipment, identifying nine nonnuclear demonstration plants by specific project number, viz:

- 76-1-a, Clean boiler fuel, \$20,000,000.
- 76-1-b, High BTU synthetic gas, \$20,000,000.
- 76-1-c, Low BTU fuel gas, \$15,000,000.
- 76-1-d, Low BTU combined cycle, \$5,000,000.
- 76-1-e, Fluidized bed direct combustion, \$13,000,000.
- 76-1-f, Five megawatt solar thermal test, \$5,000,000.
- 76-1-g, Ten megawatt solar thermal power plant, \$5,000,000.
- 76-1-h, Raft River, Idaho, Geothermal, \$5,000,000.
- 76-1-i, Buffalo Valley, Nevada, Geothermal, \$5,000,000.

It is noted that the money authorized is in many cases insufficient to cover the entire facility cost, and the Committee's intent is that long-lead time items and Architect/Engineer services be procured in those cases in the interest of accelerating development and that detailed total cost figures will be submitted in due course.

In addition, project 76-2-a for acceleration and reactor improvements is authorized \$4,000,000. Various nuclear energy development programs, not under the Committee's jurisdiction are also listed by project number; no Committee endorsement is implied by this listing. In addition, the amount of \$245,347,000 is authorized for capital equipment not related to construction. The Committee authorizes a total of \$97,000,000 of non-nuclear construction projects, a total of \$299,970,000 for nuclear plant projects, and \$245,347,000 for other capital equipment.

Section 102

Section 102 provides specific direction to ERDA to identify and lease pursuant to P.L. 93-577 a tract of public land for demonstration of in situ oil shale production. ERDA is then authorized to select and enter into cooperative arrangement with a non-Federal entity to ultimately demonstrate commercial production of at least 30,000 barrels per day of oil from shale for at least one year.

Section 103

Section 103 provides ERDA with authority to provide loan guarantees to commercial-scale demonstration plants:

- (a) producing synthetic fuels from coal and oil shale; or,
- (b) generating heat and power from solar and geothermal sources.

Certain provisions are made concerning selection of entities for loan programs, period of loan, default procedure and reporting mechanisms to be followed by ERDA. Outstanding indebtedness is limited to \$6 billion, and no more than 75 per cent of the total facility costs may be so financed.

Sections 104, 105 and 106

These sections provide language identical to Report 94-104 of the Joint Committee on Atomic Energy.

Section 201

Section 201 authorizes appropriations to ERDA in accordance with section 261 of the Atomic Energy Act of 1954, as amended, section 305 of the Energy Reorganization Act of 1974, and section 16 of the Federal Nonnuclear Energy Research and Development Act of 1974 for the transition period July 1, 1976 through September 30, 1976.

Section 201(a) authorizes, for operating expenses, a total of \$1,090,021,000 for the transition quarter, including \$151,088,000 for non-nuclear programs, and \$800,000 pursuant to P.L. 93-577.

Section 201(b) authorizes, for projects identified by a specific project number, \$34,250,000, including \$27,250,000 for non-nuclear plant projects. A total of \$77,576,000 is authorized for general projects and capital equipment. The Interior Committee authorizes a total to \$111,826,000 for plant and capital equipment during the transition quarter.

Sections 202, 203

These sections provide language identical to Report 94-104 of the Joint Committee on Atomic Energy.

Section 301

Section 301 provides specific re-programming authority to ERDA for certain paragraphs of section 101(a), 201(a), 101(b) and 201(b) relating to non-nuclear programs. This section provides that programs may be increased provided that no programs may be decreased by over 10 per cent and provided that committees of the House and Senate having jurisdiction do not object to such re-programming.

Sections 302, 303, 304, and 305

These sections provide language identical to Report 94-104 of the Joint Committee on Atomic Energy.

Section 306

Section 306 provides for a specific report by ERDA for each fiscal year detailing the extent to which small businesses and non-profit organizations are being funded and encouraged by ERDA.

Section 401

This section provides language identical to Report 94-104 of the Joint Committee on Atomic Energy.

IX. BUDGET COMMITTEE CONCURRENCE

In the submittal to the Senate Committee on the Budget in March the Committee estimated that the total authorization for the non-nuclear ERDA programs might need to be increased by as much as \$500 million above the Presidential budget request for fiscal year 1976 and \$150 million above the request for the transition quarter.

The Senate Budget Committee acknowledged the need for the additional funds for ERDA in the amount of up to \$500 million dollars and used that figure in their estimations of the total Federal budget for fiscal year 1976.

The Budget Committee stated, in approving the estimate made by the Interior Committee: "The Committee's recommendation for this function represents endorsement of both the authorizing committee's and the Administration's conviction that energy independence and diversification of energy sources are important national goals requiring significant commitment of new resources this year."

In the interim the individual programs within the total ERDA activity were carefully reviewed to establish the maximum level of effort which could be conducted without duplication or waste. In addition to hearing testimony, contacts with the technical community and with ERDA personnel were initiated to insure that every program could move forward with a sense of urgency.

The final Committee action resulted in an increase of \$448.7 million for the fiscal year 1976 and \$102.1 million for the transition year period above the Presidential budget request. The consensus of the Committee is that this is a necessary but sufficient funding level. The current reprogramming within ERDA in conjunction with the comprehensive energy plan to be reported to the Congress on June 30, 1975 should not require additional authorization funds.

In future fiscal years, the non-nuclear R&D budget must be expected to increase substantially. The policy statement of the Federal Non-nuclear Research and Development Act expressed the intent that the program would equal or exceed \$20 billion over ten years or an average of \$2 billion annually in future years. As each new energy technology is moved to the commercial-size demonstration plant phase, major increases (\$100-\$300 million) in the budgetary level for capital expenses will necessarily have to be authorized. Costs for construction and operation of demonstration plants will add up to several billion dollars more to the budget for the non-nuclear program within the next few years.

X. IMPACT ON INFLATION

The nonnuclear energy research, development, and demonstration programs, which would be funded by the authority provided by this measure, are consistent with the policies set forth by the Congress in enabling legislation for the Energy Research and Development Administration. The Congress, in the policy statement for the Nonnuclear Energy Research and Development Act of 1974 (P.L. 93-577), specifically recognized a substantial monetary commitment to a national program to develop domestic energy sources.

The costs involved in nonnuclear energy development, the Committee believes, are warranted despite the current inflation. Energy deficiencies and untoward dependence upon foreign energy sources are fundamental causes of recent years. Efficient and effective energy alternatives which do not depend upon foreign fuel sources are essential for long-term solutions to national economic problems. The investment in energy technologies, therefore, is warranted and incapable.

AUTHORIZING APPROPRIATIONS FOR THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION

DECEMBER 8, 1975.—Ordered to be printed

MR. JACKSON, from the committee of conference,
submitted the following

CONFERENCE REPORT

[To accompany H.R. 3474]

The committee of conference on the disagreeing votes of the two Houses on the amendment of the Senate to the bill (H.R. 3474) to authorize appropriations to the Energy Research and Development Administration in accordance with section 261 of the Atomic Energy Act of 1954, as amended, section 305 of the Energy Reorganization Act of 1974, and section 16 of the Federal Nonnuclear Energy Research and Development Act of 1974, and for other purposes, having met, after full and free conference, have agreed to recommend and do recommend to their respective Houses as follows:

That the House recede from its disagreement to the amendment of the Senate and agree to the same with an amendment as follows:

In lieu of the matter proposed to be inserted by the Senate amendment insert the following:

TITLE I—AUTHORIZATION OF APPROPRIATIONS FOR FISCAL YEAR 1976

Sec. 101. There is hereby authorized to be appropriated to the Energy Research and Development Administration in accordance with the provisions of section 261 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2017), section 305 of the Energy Reorganization Act of 1974 (42 U.S.C. 5875), and section 16 of the Federal Non-nuclear Energy Research and Development Act of 1974 (42 U.S.C. 5915):

(a) For "Operating expenses", for the following programs, a sum of dollars equal to the total of the following amounts:

(1) FOSSIL ENERGY DEVELOPMENT.—

(A) Coal liquefaction:

Costs, \$96,897,000.

Changes in selected resources, \$665,000.

(B) *High Btu gasification (coal)* :
 Costs, \$37,838,000.
 Changes in selected resources, \$20,526,000.

(C) *Low Btu gasification (coal)* :
 Costs, \$54,671,000.
 Changes in selected resources, (minus) \$4,282,000.

Provided, That not less than 20 per centum of the funds appropriated pursuant to this subparagraph (C) shall be used for in situ processes.

(D) *Advanced power systems (coal)* :
 Costs, \$8,261,000.
 Changes in selected resources, \$2,340,000.

(E) *Direct combustion (coal)* :
 Costs, \$32,645,000.
 Changes in selected resources, \$5,451,000.

(F) *Advanced research and supporting technology (coal)*, for the following:

- (i) *Advanced coal conversion process* :
 Costs, \$13,000,000.
 Changes in selected resources, \$1,000,000.
- (ii) *Advanced direct coal utilization process* :
 Costs, \$4,600,000.
 Changes in selected resources, \$400,000.
- (iii) *Advanced supporting research* :
 Costs, \$8,374,000.
 Changes in selected resources, \$119,000.
- (iv) *System studies* :
 Costs, \$9,087,000.
 Changes in selected resources, \$2,813,000.

(G) *Demonstration plants (coal)* :
 Costs, \$18,100,000.
 Changes in selected resources, \$18,900,000

(H) *Natural gas and oil extraction* :
 Costs, \$32,865,000.
 Changes in selected resources, \$8,564,000.

(I) *Natural gas and oil utilization* :
 Costs, \$1,582,000.
 Changes in selected resources, \$215,000

(J) *Oil shale in situ processing* :
 Costs, \$16,000,000.
 Changes in selected resources, \$3,000,000.

(K) *Oil shale composition and characterization* :
 Costs, \$1,113,000.
 Changes in selected resources, \$152,000.

(L) *Magnetohydrodynamics* :
 Costs, \$22,340,000.
 Changes in selected resources, \$12,160,000.

(2) *SOLAR ENERGY DEVELOPMENT* :
 Costs, \$97,100,000.
 Changes in selected resources, \$62,425,000.

(3) *GEOHERMAL ENERGY DEVELOPMENT* :
 Costs, \$34,750,000.
 Changes in selected resources, \$8,520,000.

(4) *CONSERVATION RESEARCH AND DEVELOPMENT*.—

(A) *Electric Power Transmission* :
 Costs, \$11,830,000.
 Changes in selected resources, \$300,000.

(B) *Advanced Transportation Power Systems* :
 Costs, \$19,000,000.
 Changes in selected resources, \$4,500,000.

(C) *Energy Storage Systems* :
 Costs, \$23,100,000.
 Changes in selected resources, \$5,700,000.

(D) *End-use Conservation* :
 Costs, \$31,000,000.
 Changes in selected resources, \$18,650,000.

(E) *Improved Conversion Efficiency* :
 Costs, \$12,625,000.
 Changes in selected resources, \$3,000,000.

(F) *Urban Waste Conversion* :
 Costs, \$10,000,000.
 Changes in selected resources, \$5,000,000.

(5) *NUCLEAR ENERGY AND OTHER PROGRAMS*.—\$3,158,970,000, of which a sum of dollars for the following programs equal to the total of the following amounts is included:

(A) *Scientific and technical education in support of Nonnuclear Energy Technologies* :
 Costs, \$4,500,000.

Changes in selected resources, \$1,350,000.

(B) *General new programs in Environmental and Safety Research in support of nonnuclear energy technology* :
 Costs, \$22,100,000.

Changes in selected resources, \$7,700,000.

(C) *For use as provided in section 316 of this Act* :
 Costs, \$4,000,000.

Changes in selected resources, \$1,000,000.

(D) *Nonpulmonary health studies on miners and people living in areas subjected to a high incidence of sulphur oxides and trace elements* :
 Costs, \$400,000.

Changes in selected resources, \$100,000.

(E) *New programs of physical research in molecular and materials sciences in support of nonnuclear technologies* :
 Costs, \$15,725,000.

Changes in selected resources, \$3,750,000.

(F) \$2,750,000 shall be available pursuant to sections 14 and 16 of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5913 and 5915) as follows:

(i) \$1,250,000 for the National Bureau of Standards;

(ii) \$500,000 for the Council on Environmental Quality;

and

(iii) \$1,000,000 for the Water Resources Council.

(b) For "Plant and capital equipment", including construction, acquisition, or modification of facilities, including land acquisition; and acquisition and fabrication of capital equipment not related to construction, a sum of dollars equal to the total of the following amounts:

Fossil Energy Development

(1) COAL.—

Project 76-1-a, clean boiler fuel demonstration plant (A-E and long-lead procurement), \$20,000,000.

Project 76-1-b, High Btu synthetic pipeline gas demonstration plant (A-E and long-lead procurement), \$20,000,000.

Project 76-1-c, Low Btu fuel gas demonstration plant, (A-E and long-lead procurement), \$15,000,000.

Project 76-1-d, Fluidized bed direct combustion demonstration plant, \$13,000,000.

Solar, Geothermal, and Advanced Energy Systems Development

(2) SOLAR ENERGY DEVELOPMENT.—

Project 76-2-a, Five megawatt solar thermal test facility, \$5,000,000.

Project 76-2-b, Ten megawatt central receiver solar thermal powerplant, (A-E and long-lead procurement), \$5,000,000.

(3) GEOTHERMAL ENERGY DEVELOPMENT.—

Project 76-3-a, Geothermal powerplant (steam) (A-E and long-lead procurement), \$5,000,000.

Project 76-3-b, Geothermal powerplant (A-E and long-lead procurement), \$5,000,000.

(4) PHYSICAL RESEARCH.—

Project 76-4-a, accelerator and reactor improvements and modifications, \$4,000,000.

Nuclear Energy Development

(5) FUSION POWER RESEARCH AND DEVELOPMENT.—

Project 76-5-a, Tokamak fusion test reactor, Princeton Plasma Physics Laboratory, Plainsboro, New Jersey, \$23,000,000.

Project 76-5-b, 14 Mev intense neutron source facility, Los Alamos Scientific Laboratory, New Mexico, \$22,100,000.

Project 76-5-c, 14 Mev high intensity neutron facility, Lawrence Livermore Laboratory, California, \$5,000,000.

(6) FISSION POWER REACTOR DEVELOPMENT.—

Project 76-6-a, modifications to reactors, \$4,000,000.

Project 76-6-b, sodium components test installation steam and feed-water system modification, Liquid Metal Engineering Center, Santa Susana, California, \$7,700,000.

(7) FISSION POWER REACTOR DEVELOPMENT.—

Project 76-7-a, test reactor area fire main replacement, Idaho National Engineering Laboratory, Idaho, \$2,200,000.

(8) NUCLEAR MATERIALS.—

Project 76-8-a, additional facilities, high level waste storage, Savannah River, South Carolina, \$68,000,000.

Project 76-8-b, additional high level waste storage facilities, Richland, Washington, \$35,000,000.

Project 76-8-c, supplemental N reactor irradiated fuel storage, Richland, Washington, \$2,500,000.

Project 76-8-d, uprate electrical switchyards for Roane substation, Oak Ridge, Tennessee, \$8,100,000.

Project 76-8-e, conversion of existing steam plants to coal capability, gaseous diffusion plants and Feed Materials Production Center, Fernald, Ohio, \$12,200,000.

Project 76-8-f, radioactive liquid waste system improvements, Idaho Chemical Processing Plant, Idaho National Engineering Laboratory, Idaho, \$5,800,000.

Project 76-8-g, additional facilities, enriched uranium production, locations undetermined, \$25,000,000.

National Security

(9) WEAPONS.—

Project 76-9-a, MK-12A MINUTEMAN III production facilities, various locations, \$3,000,000.

Project 76-9-b, plutonium metallurgy building modifications, Lawrence Livermore Laboratory, California, \$1,000,000.

Project 76-9-c, limited life component exchange facility, Charleston, South Carolina, \$13,900,000.

Project 76-9-d, water control and recycle project, Rocky Flats, Colorado, \$3,100,000.

(10) WEAPONS.—

Project 76-10-a, fire wall construction, Bendix Plant, Kansas City, Missouri, \$2,000,000.

Project 76-10-b, fire protection improvements, Los Alamos Scientific Laboratory, New Mexico, \$4,450,000.

Project 76-10-c, PHERMEX enhancement, Los Alamos Scientific Laboratory, New Mexico, \$6,150,000.

Environmental and Safety Research

(11) BIOMEDICAL AND ENVIRONMENTAL RESEARCH.—

Project 76-11-a, modifications and additions to biomedical and environmental research facilities, \$3,200,000.

Project 76-11-b, inhalation toxicology research facilities, \$6,800,000.

(12) GENERAL PLANT PROJECTS.—\$64,670,000.

(13) CONSTRUCTION PLANNING AND DESIGN.—\$6,000,000.

(14) SAFEGUARDS AND FACILITY UPGRADING.—

Project 76-14, safeguard and security upgrading, various locations, \$32,800,000.

Capital Equipment Not Related to Construction

(15) CAPITAL EQUIPMENT.—Acquisition and fabrication of capital equipment not related to construction, for the following programs, a sum of dollars equal to the total of the following amounts:

(A) Fossil energy development, \$425,000.

(B) Solar energy development, \$3,000,000.

(C) Geothermal energy development, \$3,120,000.

(D) Conservation research and development including improved conversion efficiency \$11,500,000.

(E) Physical research in molecular and materials sciences in support of nonnuclear energy technology, \$4,600,000.

(F) Environmental and safety research in support of non-nuclear energy technology, \$2,000,000.

(G) Nuclear energy and other programs, \$237,502,000.

SEC. 102. *IN SITU OIL SHALE DEMONSTRATION.*—(a) The Administrator shall, in consultation with the Secretary of the Interior, select an appropriate tract of public lands in accordance with section 21 of the Mineral Lands Leasing Act of 1920, as amended (30 U.S.C. 241) and other applicable provisions of such Act for the demonstration of production of oil from shale by in situ methods. The Administrator shall, by regulation, establish procedures for review of, and comment on, the proposed demonstration by States and local political subdivisions which may be impacted by such facility and the general public. As soon as the Administrator knows the geographic location of a proposed tract, he shall inform the Governor of the State and the officials of the political subdivision where the in situ demonstration facility would be located or which would be impacted by such facility. The Administrator shall not select such tract if the Governor of the State in which the proposed tract would be located recommends against such selection, unless the Administrator finds that there is an overriding national interest in selecting such tract. If the Administrator decides to select a tract despite a Governor's recommendation not to take such action, he shall communicate, in writing, to the Governor his reasons for not concurring with such recommendation. The Administrator's decision, pursuant to this subsection, shall be final unless determined upon judicial review to be arbitrary and capricious. Such review shall take place in the United States court of appeals for the circuit in which the State is located upon application made within ninety days from the date of such decision.

(b) Upon selection of such tract pursuant to subsection (a) of this section, the Administrator, pursuant to the authority of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901, et seq.), shall invite proposals from potential non-Federal participants to enter into a cooperative arrangement for the demonstration of in situ production of oil from shale wherein the Federal share of costs of such demonstration shall include the value of the right to lease the tract selected without payment of royalties or other consideration during the demonstration periods: Provided, That a portion of any amounts received by such participant in excess of costs from the sale of products produced during the demonstration shall be paid to the United States in proportion to the amounts contributed to the demonstration by the non-Federal participant and the United States, as determined by the Administrator, and such payments shall be covered into miscellaneous receipts of the Treasury: Provided further, That the United States' share shall include the value of use of the selected tract, as determined by the Administrator, during such demonstration.

(c) The demonstration shall be for, among other things, the purpose of performing necessary tests and pilot operations and ultimately for the in situ production of oil from shale upon the selected tract by the lessee with the objective of operating a facility sufficiently large to demonstrate the commercial viability of the process taking into account such considerations as water usage, profitability levels, environmental effects, waste disposal, labor conditions, and the socioeconomic impacts on local communities. The community impact financial assistance program authorized in section 17(k) of the Federal Nonnuclear Energy Research and Development Act of 1974, as added to said Act by this Act, shall be applicable to the program authorized by this section.

(d) After the cooperative agreement authorized by this section is executed, the Secretary shall issue a lease for such tract to such non-Federal entity pursuant to section 21 of the Mineral Lands Leasing Act of 1920, as amended (30 U.S.C. 241) and other applicable provisions of such Act, except that such lease shall not require payment of bonus, rent, or royalty during the demonstration period. The lease shall (1) require diligent development and production immediately after the demonstration period, (2) provide for the termination of the lease if the Secretary of the Interior determines that the lessee is not acting diligently, and (3) contain such adequate provisions for environmental protection as the Secretary shall determine to be necessary in the public interest. The lease shall also contain such terms and conditions applicable during the demonstration period as the Administrator determines are necessary to carry out the purposes of this section and the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901, et seq.). During the demonstration period, the Administrator shall have administrative jurisdiction over the lease. When the Administrator determines that the demonstration period has ended, the Administrator shall so notify the non-Federal entity and the Secretary of the Interior. Upon such notification, the Secretary shall assume administrative jurisdiction over the lease in accordance with the Mineral Lands Leasing Act of 1920, as amended (30 U.S.C. 181, et seq.): Provided, That such lease shall include consideration for the Administrator's share of financial, managerial, and material contribution to the demonstration: Provided further, That such consideration as required herein shall be based on financially sound, customary commercial formulas for the development and operation of a major extractive industry joint venture/project and may include equity, profit, or cash flow participation, a share of the facility's production, or any other generally accepted method of payment which fairly compensates the United States for the Administrator's contribution to the demonstration. Such consideration shall be treated as royalties and offset against any royalties required to be paid to the United States pursuant to said 1920 Act.

(e) Before such cooperative arrangement pursuant to this section is finalized, the Administrator shall transmit a detailed report to the Committee on Science and Technology of the House of Representatives and the Committee on Interior and Insular Affairs of the Senate describing the arrangement and setting forth the schedule for the demonstration and wait a period of sixty calendar days (not including any day in which either House of Congress is not in session because

of adjournment of more than three calendar days to a day certain) from the date on which the Administrator's report is received by such Committees, unless prior to the expiration of such period each such committee receiving the report has transmitted written notice to the effect that such committee has no objection to the proposed arrangement.

(f) Nothing in this section shall be construed as preventing the Secretary of the Interior or the Administrator from pursuing alternative means for encouraging demonstrations of in situ production of oil from shale.

SEC. 103. LOAN GUARANTEE PROGRAM FOR COMMERCIAL DEMONSTRATION FACILITIES.—(a) Section 7(a) of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5906) is amended—

(1) by striking out “and” after the semicolon at the end of paragraph (5);

(2) by striking out the period at the end of paragraph (6) and inserting in lieu thereof “; and”, and

(3) by adding at the end thereof the following new paragraph:

“(7) Federal loan guarantees and commitments thereof as provided in section 17.”

(b) The Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901, et seq.) is further amended by adding at the end thereof the following new section:

“LOAN GUARANTEES FOR COMMERCIAL DEMONSTRATION FACILITIES

“SEC. 17. (a) It is the purpose of this section—

“(1) to assure adequate Federal support to foster a commercial demonstration program to produce synthetic fuels from coal, oil shale, and other domestic resources, to employ biomass and renewable and geothermal energy sources to produce synthetic fuels and other desirable forms of energy on a commercial scale, and to assure the availability of energy-efficient industrial equipment and facilities;

“(2) to authorize loan guarantees for the construction and start-up and related costs of commercial demonstration facilities (A) for the conversion of domestic coal, oil shale, biomass, and other domestic resources into synthetic fuels; (B) for the commercial demonstration of synthetic fuels and other desirable forms of energy from renewable and geothermal sources; and (C) for the commercial demonstration of energy-efficient industrial equipment and facilities; and

“(3) to gather information about the technological, economic, environmental, and social costs, benefits, and impacts of such commercial demonstration facilities.

“(b) (1) The Administrator is authorized, in accordance with such rules and regulations as he shall prescribe after consultation with the Secretary of the Treasury, to guarantee and to make commitments to guarantee, in such manner and subject to such conditions (not inconsistent with the provisions of this Act) as he deems appropriate, the payment of interest on, and the principal balance of, bonds debentures, notes, and other obligations issued by or on behalf of any borrower for the purpose of (A) financing the construction and start-

up costs of commercial demonstration facilities for the conversion of domestic coal, oil shale, biomass, and other domestic resources into synthetic fuels, including, but not limited to, such synthetic fuels from coal as high-Btu gaseous fuels compatible for mixture and transportation with natural gas by pipeline; gaseous, liquid, and solid fuels suitable for boiler use in compliance with applicable environmental requirements; liquid fuels for transportation uses; and petrochemicals: Provided, That no oil shale commercial demonstration facility receiving a loan guarantee under this section shall be larger than is necessary, in the judgment of the Administrator, to demonstrate the commercial viability of the process, taking into account such considerations as water usage, profitability levels, environmental effects, waste disposal, labor conditions, health and safety, and the socio-economic impacts on local communities; (B) financing the construction and start-up costs of commercial demonstration facilities to generate desirable forms of energy (including synthetic fuels) in commercial quantities from direct solar, wind, ocean thermal gradient, bioconversion, or other renewable energy resources; (C) financing the purchase, construction, installation, and start-up costs of energy-efficient industrial equipment and facilities for commercial demonstration; and (D) further implementing the financing of geothermal resource development under the Geothermal Energy Research, Development, and Demonstration Act of 1974 (30 U.S.C. 1101, et seq.). The outstanding indebtedness guaranteed and committed to be guaranteed under clauses (A), (B), and (C) of this paragraph shall at no time exceed \$6,000,000,000: Provided, That up to \$2,500,000,000 of guarantees shall be available for commercial demonstration facilities to produce high-Btu gaseous fuel compatible for mixture and transportation with natural gas by pipeline. Loan guarantees for geothermal resource development under clause (D) of this paragraph shall be carried out pursuant to the authority and provisions of the Geothermal Energy Research, Development, and Demonstration Act of 1974: Provided, That paragraphs (2) and (4) of this subsection, and subsections (g) (2), (h), (j), (n), and (v), of this section, shall also apply to such guarantees: Provided further, That the limitations in section 201(e) of the Geothermal Energy Research, Development, and Demonstration Act of 1974 (30 U.S.C. 1141(e)) shall not apply to such guarantees.

“(2) An applicant for any guarantee under this section shall provide information to the Administrator in such form and with such content as the Administrator deems necessary.

“(3) Prior to issuing any guarantee under this section the Administrator shall obtain the concurrence of the Secretary of the Treasury with respect to the timing, interest rate, and substantial terms and conditions of such guarantee.

“(4) The full faith and credit of the United States is pledged to the payment of all guarantees issued under this section with respect to principal and interest.

“(c) The Administrator, with due regard for the need for competition, shall guarantee or make a commitment to guarantee any obligation under subsection (b) only if—

“(1) the Administrator is satisfied that the financial assistance applied for is necessary to encourage financial participation;

"(2) the amount guaranteed does not exceed 75 per centum of the total cost of the commercial demonstration facility, as determined by the Administrator: Provided, That the amount guaranteed may not exceed 90 per centum of the total cost of the commercial demonstration facility during the period of construction and startup;

"(3) the Administrator has determined that there will be a continued reasonable assurance of full repayment;

"(4) the obligation is subject to the condition that it not be subordinated to any other financing;

"(5) the Administrator has determined, taking into consideration all available forms of assistance under this section and other Federal statutes, that the impacts directly resulting from the proposed commercial demonstration facility have been fully evaluated by the borrower, the Administrator, and others, and that effective steps have been taken or are planned to be taken in a timely manner to finance community planning and development costs directly resulting from such facility under this section, under other provisions of law, or by other means; and

"(6) the maximum maturity of the obligation does not exceed thirty years, or 90 per centum of the projected useful economic life of the physical assets of the commercial demonstration facility covered by the guarantee, whichever is less, as determined by the Administrator.

"(d) At least sixty days prior to submitting a report to Congress pursuant to subsection (m) of this section on each guarantee, the Administrator shall request from the Attorney General and the Chairman of the Federal Trade Commission written views, comments, and recommendations concerning the impact of such guarantee or commitment on competition and concentration in the production of energy and give due consideration to views, comments, and recommendations received: Provided, That if either official recommends against making such guarantee or commitment, the Administrator shall not do so unless he determines in writing that such guarantee or commitment is in the national interest.

"(e) (1) As soon as the Administrator knows the geographic location of a proposed facility for which a guarantee or a commitment to guarantee is sought under this section, he shall inform the Governor of the State, and officials of each political subdivision and Indian tribe, as appropriate, in which the facility would be located or which would be impacted by such facility. The Administrator shall not guarantee or make a commitment to guarantee under subsection (b) of this section if the Governor of the State in which the proposed facility would be located recommends that such action not be taken unless the Administrator finds that there is an overriding national interest in taking such action in order to achieve the purpose of this section. If the Administrator decides to guarantee or make a commitment to guarantee despite a Governor's recommendation not to take such action, the Administrator shall communicate, in writing, to the Governor reasons for not concurring with such recommendation. The Administrator's decision, pursuant to this subsection, shall be final unless determined upon judicial review to be arbitrary and capricious. Such review shall take place in the United States court of appeals for the circuit in

which the State involved is located, upon application made within ninety days from the date of such decision. The Administrator shall, by regulation, establish procedures for review of, and comment on, the proposed facility by States, local political subdivisions, and Indian tribes which may be impacted by such facility, and the general public.

"(2) The Administrator shall review and approve the plans of the applicant for the construction and operation of any commercial demonstration and related facilities constructed or to be constructed with assistance under this section. Such plans and the actual construction shall include such monitoring and other data-gathering costs associated with such facility as are required by the comprehensive plan and program under this section. The Administrator shall determine the estimated total cost of such demonstration facility, including, but not limited to, construction costs, start-up costs, costs to political subdivisions and Indian tribes impacted by such facility, and costs of any water storage facilities needed in connection with such demonstration facility, and determine who shall pay such costs.

"(f) Except in accordance with reasonable terms and conditions contained in the written contract of guarantee, no guarantee issued or commitment to guarantee made under this section shall be terminated, canceled, or otherwise revoked. Such a guarantee or commitment shall be conclusive evidence that the underlying obligation is in compliance with the provisions of this section and that such obligation has been approved and is legal as to principal, interest, and other terms. Subject to the conditions of the guarantee or commitment to guarantee, such a guarantee shall be incontestable in the hands of the holder of the guaranteed obligation, except as to fraud or material misrepresentation on the part of the holder.

"(g) (1) If there is a default by the borrower, as defined in regulations promulgated by the Administrator and in the guarantee contract, the holder of the obligation shall have the right to demand payment of the unpaid amount from the Administrator. Within such period as may be specified in the guarantee or related agreements, the Administrator shall pay to the holder of the obligation the unpaid interest on and unpaid principal of the guaranteed obligation as to which the borrower has defaulted, unless the Administrator finds that there was no default by the borrower in the payment of interest or principal or that such default has been remedied. Nothing in this section shall be construed to preclude any forbearance by the holder of the obligation for the benefit of the borrower which may be agreed upon by the parties to the guaranteed obligation and approved by the Administrator.

"(2) If the Administrator makes a payment under paragraph (1) of this subsection or section 202(b) of the Geothermal Energy Research, Development, and Demonstration Act of 1974 (30 U.S.C. 1142 (b)) the Administrator shall be subrogated to the rights of the recipient of such payment as specified in the guarantee or related agreements including, where appropriate, the authority (notwithstanding any other provision of law) to complete, maintain, operate, lease, or otherwise dispose of any property acquired pursuant to such guarantee or related agreements, or to permit the borrower, pursuant to an agreement with the Administrator, to continue to pursue the purposes of the

commercial demonstration facility if the Administrator determines that this is in the public interest.

"(3) In the event of a default on any guarantee under this section, the Administrator shall notify the Attorney General, who shall take such action as may be appropriate to recover the amounts of any payments made under paragraph (1) (including any payment of principal and interest under subsection (h)) from such assets of the defaulting borrower as are associated with the commercial demonstration facility, or from any other security included in the terms of the guarantee.

"(4) For purposes of this section, patent and technology resulting from the commercial demonstration facility shall be treated as project assets of such facility in accordance with the terms and conditions of the guarantee agreement. Furthermore, the guarantee agreement shall contain a provision specifying that patents, technology, and other proprietary rights which are necessary for the completion or operation of the commercial demonstration facility shall be available to the Government and its designees on equitable terms, including due consideration to the amount of the Government's default payments.

"(h) With respect to any obligation guaranteed under this section, the Administrator is authorized to enter into a contract to pay, and to pay, the holders of the obligation, for and on behalf of the borrower, from the fund established by this section or from the Geothermal Resources Development Fund, as applicable, the principal and interest payments which become due and payable on the unpaid balance of such obligation if the Administrator finds that—

"(1) the borrower is unable to meet such payments and is not in default; it is in the public interest to permit the borrower to continue to pursue the purposes of such demonstration facility; and the probable net benefit to the Federal Government in paying such principal and interest will be greater than that which would result in the event of a default;

"(2) the amount of such payment which the Administrator is authorized to pay shall be no greater than the amount of principal and interest which the borrower is obligated to pay under the loan agreement; and

"(3) the borrower agrees to reimburse the Administrator for such payment on terms and conditions, including interest, which are satisfactory to the Administrator.

"(i) Regulations required by this section shall be issued within one hundred and eighty days after enactment of this section, except as provided in subsection (t) of this section. All regulations under this section and any amendments thereto shall be issued in accordance with section 553 of title 5, of the United States Code.

"(j) The Administrator shall charge and collect fees for guarantees of obligations authorized by clauses (A) (except with respect to community planning and development), (B), (C), and (D) of subsection (b) (1), in amounts sufficient in the judgment of the Administrator to cover the applicable administrative costs and probable losses on guaranteed obligations, but in any event not to exceed 1 per centum per annum of the outstanding indebtedness covered by the guarantee.

"(k) (1) In accordance with such rules and regulations as the Administrator in consultation with the Secretary of the Treasury

shall prescribe, and subject to such terms and conditions as he deems appropriate, the Administrator is authorized, for the purpose of financing essential community development and planning which directly result from, or are necessitated by, one or more commercial demonstration facilities assisted under this section to—

"(A) guarantee and make commitments to guarantee the payment of interest on, and the principal balance of, obligations for such financing issued by eligible States, political subdivisions, or Indian tribes,

"(B) guarantee and make commitments to guarantee the payment of taxes imposed on such commercial demonstration facilities by eligible non-Federal taxing authorities which taxes are earmarked by such authorities to support the payment of interest and principal on obligations for such financing, and

"(C) require that the applicant for assistance for a commercial demonstration facility under this section advance sums to eligible States, political subdivisions, and Indian tribes to pay for such financing of such development and planning: Provided, That the State, political subdivision, or Indian tribe agrees to provide tax abatement credits over the life of the facilities for such payments by such applicant.

"(2) Prior to issuing any guarantee under this subsection, the Administrator shall obtain the concurrence of the Secretary of the Treasury with respect to the timing, interest rate, and substantial terms and conditions of such guarantee.

"(3) The total amount guaranteed under paragraph (1) of this subsection shall not exceed \$350,000,000 which shall be included in the limitation on outstanding indebtedness set forth in subsection (b) (1) of this section.

"(4) In the event of any default by the borrower in the payment of taxes guaranteed by the Administrator under this subsection, the Administrator shall pay out of the fund established by this section such taxes at the time or times they may fall due, and shall be subrogated to the rights of such taxing authority.

"(5) If after consultation with the State, political subdivision, or Indian tribe, the Administrator finds that the financial assistance programs of paragraph (1) of this subsection will not result in sufficient funds to carry out the purposes of this subsection, then the Administrator may—

"(A) make direct loans to the eligible States, political subdivisions, or Indian tribes for such purposes: Provided, That such loans shall be made on such reasonable terms and conditions as the Administrator shall prescribe: Provided further, That the Administrator may waive repayment of all or part of a loan made under this paragraph, including interest, if the State or political subdivision or Indian tribe involved demonstrates to the satisfaction of the Administrator that due to a change in circumstances there will be net adverse impacts resulting from such demonstration facility that would probably cause such State, subdivision, or tribe to default on the loan; or

"(B) require that any community development and planning costs which are associated with, or result from, such commercial

demonstration facility and which are determined by the Administrator to be appropriate for such inclusion shall be included in the total costs of the commercial demonstration facility.

"(6) The Administrator is authorized to make grants to States, political subdivisions, or Indian tribes for studying and planning for the potential economic, environmental, and social consequences of such commercial demonstration facilities.

"(7) At any time the Administrator may, with the concurrence of the Secretary of the Treasury, redeem, in whole or in part, out of the fund established by this section, the debt obligations guaranteed or the debt obligations for which tax payments are guaranteed under this subsection.

"(8) When one or more States, political subdivisions, or Indian tribes would be eligible for assistance under this subsection but for the fact that construction and operation of the commercial demonstration facility occurs outside its jurisdiction, the Administrator is authorized to provide, to the greatest extent possible, arrangements for equitable sharing of such assistance.

"(9) Such amounts as may be necessary for direct loans and grants pursuant to this subsection shall be available as provided in annual authorization Acts and shall be requested in fiscal year 1977, and in subsequent fiscal years.

"(10) The Administrator, if appropriate, shall provide assistance in the financing of up to 100 per centum of the costs of the required community development and planning pursuant to this subsection.

"(1)(1) The Administrator is directed to submit a report to the Congress within one hundred and eighty days after the enactment of this section setting forth his recommendations on the best opportunities to implement a program of Federal financial assistance with the objective of demonstrating production and conservation of energy.

"(2) The report submitted under paragraph (1) of this subsection shall include a comprehensive plan and program to acquire information and evaluate the environmental, economic, social, and technological impacts of the demonstration program under this section. In preparing such a comprehensive plan and program, the Administrator shall consult with the Environmental Protection Agency, the Federal Energy Administration, the Department of Housing and Urban Development, the Department of the Interior, and the Department of Agriculture.

"(3) The comprehensive plan and program described in paragraph (2) shall include, but not be limited to—

"(A) information about potential commercial demonstration facilities proposed in the program under this section;

"(B) any significant adverse impacts which may result from any activity included in the program;

"(C) proposed regulations required to carry out the purposes of this section;

"(D) a list of Federal agencies, governmental entities, and other persons that will be consulted or utilized to implement the program; and

"(E) methods and procedures by which the information gathered under the program will be analyzed and disseminated.

"(4) The report required under paragraph (1) of this subsection shall be updated and submitted to the Congress at least annually for the duration of the program under this section.

"(m) Prior to issuing any guarantee or commitment to guarantee pursuant to subsection (b) of this section, the Administrator shall submit to the Committee on Science and Technology of the House of Representatives and the Committee on Interior and Insular Affairs of the Senate a full and complete report on the proposed commercial demonstration facility and such guarantee. Such guarantee or commitment to guarantee shall not be finalized under the authority granted by this section prior to the expiration of ninety calendar days (not including any day on which either House of Congress is not in session because of an adjournment of more than three calendar days to a day certain) from the date on which such report is received by such committees: Provided, That, where the cost of such commercial demonstration facility exceeds \$350,000,000, such guarantee or commitment to guarantee shall not be finalized if prior to the close of such ninety-day period either House passes a resolution stating in substance that such House does not favor the making of such guarantee or commitment.

"(n)(1) There is hereby created within the Treasury a separate fund (hereafter in this section called the 'fund') which shall be available to the Administrator without fiscal year limitation as a revolving fund for the purpose of carrying out the program authorized by clauses (A), (B), and (C) of subsection (b)(1) and subsections (g), (h), and (k) of this section. The Geothermal Resources Development Fund established by the Geothermal Energy Research, Development, and Demonstration Act of 1974 shall be available for the purpose of carrying out the geothermal loan guarantee program as established by that Act and as further implemented by this section.

"(2) There are authorized to be appropriated to the fund from time to time such amounts as may be necessary to carry out the purposes of the applicable provisions of this section, including, but not limited to, the payments of interest and principal and the payment of interest differentials and redemption of debt. All amounts received by the Administrator as interest payments or repayments of principal on loans which are guaranteed under this section, fees, and any other moneys, property, or assets derived by him from operations under this section shall be deposited in the fund or in the Geothermal Resources Development Fund, as applicable.

"(3) All payments on obligations, appropriate expenses (including reimbursements to other government accounts), and repayments pursuant to operations of the Administrator under this section shall be paid from the fund subject to appropriations or from the Geothermal Resources Development Fund, as applicable. If at any time the Administrator determines that moneys in the fund exceed the present and reasonably foreseeable future requirements of the fund, such excess shall be transferred to the general fund of the Treasury.

"(4) If at any time the moneys available in the fund or in the Geothermal Resources Development Fund are insufficient to enable the Administrator to discharge his responsibilities as authorized by subsections (b)(1), (g), (h), and (k) of this section, or the Geothermal

Energy Research, Development, and Demonstration Act of 1974 (30 U.S.C. 1101), as the case may be, the Administrator shall issue to the Secretary of the Treasury notes or other obligations in such forms and denominations, bearing such maturities, and subject to such terms and conditions as may be prescribed by the Secretary of the Treasury. Redemption of such notes or obligations shall be made by the Administrator from appropriations or other moneys available under paragraph (2) of this subsection for loan guarantees authorized by clauses (A), (B), and (C) of subsection (b) (1) and subsections (g), (h), and (k) of this section, and from appropriations or other moneys available under section 204 of the Geothermal Energy Research, Development, and Demonstration Act of 1974 for loan guarantees described in clause (D) of subsection (b) (1) of this section. Such notes or other obligations shall bear interest at a rate determined by the Secretary of the Treasury, which shall be not less than a rate determined by taking into consideration the average market yield on outstanding marketable obligations of the United States of comparable maturities during the month preceding the issuance of the notes or other obligations. The Secretary of the Treasury shall purchase any notes or other obligations issued hereunder and for that purpose he is authorized to use as a public debt transaction the proceeds from the sale of any securities issued under the Second Liberty Bond Act; and the purpose for which securities may be issued under that Act are extended to include any purchase of such notes or obligations. The Secretary of the Treasury may at any time sell any of the notes or other obligations acquired by him under this subsection. All redemptions, purchases, and sales by the Secretary of the Treasury of such notes or other obligations shall be treated as public debt transactions of the United States.

"(5) The provisions of this subsection do not apply to direct loans or planning grants made under subsection (k) of this section.

"(o) For the purposes of this section, the term—

"(1) 'State' means any State of the United States, the District of Columbia, the Commonwealth of Puerto Rico, Guam, the Virgin Islands, American Samoa, or any territory or possession of the United States,

"(2) 'United States' means the several States, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, and American Samoa, and

"(3) 'borrower' or 'applicant' shall include any individual, firm, corporation, company, partnership, association, society, trust, joint venture, joint stock company, or other non-Federal entity.

"(p) An applicant seeking a guarantee under subsection (b) of this section must be a citizen or national of the United States. A corporation, partnership, firm, or association shall not be deemed to be a citizen or national of the United States unless the Administrator determines that it satisfactorily meets all the requirements of section 802 of title 46, United States Code, for determining such citizenship, except that the provisions in subsection (a) of such section 802 concerning (1) the citizenship of officers or directors of a corporation, and (2) the interest required to be owned in the case of a corporation, association, or partnership operating a vessel in the coastwise trade, shall not be applicable.

"(q) No part of the program authorized by this section shall be transferred to any other agency or authority, except pursuant to Act of Congress enacted after the date of enacted of this section.

"(r) Inventions made or conceived in the course of or under a guarantee authorized by this section shall be subject to the title and waiver requirements and conditions of section 9 of this Act.

"(s) With respect to any obligation which is issued after the enactment of this section by, or in behalf of, any State, political subdivision, or Indian tribe and which is either guaranteed under, or supported by taxes levied by said issuer which are guaranteed under, this section, the interest paid on such obligation and received by the purchaser thereof (or the purchaser's successor in interest) shall be included in gross income for the purposes of chapter 1 of the Internal Revenue Code of 1954, as amended: Provided, That the Administrator shall pay to such issuer out of the fund established by this section such portion of the interest on such obligations, as determined by the Secretary of the Treasury to be appropriate after taking into account current market yields (1) on obligations of said issuer, if any, or (2) on other obligations with similar terms and conditions the interest on which is not so included in gross income for purposes of chapter 1 of said Code, and in accordance with such terms and conditions as the Secretary of the Treasury shall require.

"(t) (1) Each officer or employee of the Energy Research and Development Administration who—

"(A) performs any function or duty under this section; and

"(B) (i) has any known financial interest in any person who is applying for or receiving financial assistance for a commercial demonstration facility under this section; or

"(ii) has any known financial interest in property from which coal, natural gas, oil shale, crude oil, or other energy resources are commercially produced in connection with any commercial demonstration facility receiving financial assistance under this section,

shall, beginning on February 1, 1977, annually file with the Administrator a written statement concerning all such interests held by such officer or employee during the preceding calendar year. Such statement shall be available to the public.

"(2) The Administrator shall—

"(A) act within ninety days after the date of enactment of this Act—

"(i) to define the term 'known financial interest' for purposes of paragraph (1) of this subsection; and

"(ii) to establish the methods by which the requirement to file written statements specified in paragraph (1) will be monitored and enforced, including appropriate provisions for the filing by such officers and employees of such statements and the review by the Administrator of such statements; and

"(B) report to the Congress on June 1 of each calendar year with respect to such disclosures and the actions taken in regard thereto during the preceding calendar year.

"(3) In the rules prescribed in paragraph (2) of this subsection, the Administrator may identify specific positions within the Admin-

istration which are of a nonpolicymaking nature and provide that officers or employees occupying such positions shall be exempt from the requirements of this subsection.

"(4) Any officer or employee who is subject to, and knowingly violates, this subsection shall be fined not more than \$2,500 or imprisoned not more than one year, or both.

"(u) Nothing in this section shall be construed as affecting the obligations of any borrower receiving a guarantee pursuant to this section to comply with Federal and State environmental, land use, water, and health and safety laws and regulations or to obtain applicable Federal and State permits, licenses, and certificates.

"(v) The information maintained by the Administrator under this section shall be made available to the public, subject to the provisions of section 552 of title 5, United States Code, and section 1905 of title 18, United States Code, and to other Government agencies in a manner that will facilitate its dissemination: Provided, That upon a showing satisfactory to the Administrator by any person that any information, or portion thereof, obtained under this section by the Administrator directly or indirectly from such person would, if made public, divulge (1) trade secrets or (2) other proprietary information of such person, the Administrator shall not disclose such information and disclosure thereof shall be punishable under section 1905 of title 18, United States Code: Provided further, That the Administrator shall, upon request, provide such information (A) any delegate of the Administrator for the purpose of carrying out this Act, and (B) the Attorney General, the Secretary of Agriculture, the Secretary of the Interior, the Federal Trade Commission, the Federal Energy Administration, the Environmental Protection Agency, the Federal Power Commission, the General Accounting Office, other Federal agencies, or heads of other Federal agencies, when necessary to carry out their duties and responsibilities under this and other statutes, but such agencies and agency heads shall not release such information to the public. This section is not authority to withhold information from Congress, or from any committee of Congress upon request of the chairman. For the purposes of this subsection, the term 'person' shall include the borrower.

"(w) Notwithstanding any other provision of this section, the authority to make guarantees or commitments to guarantee under subsection (b) (1), the authority to make guarantees or commitments to guarantee, or to make loans or grants, under subsection (k), the authority to make contracts under subsection (h), the authority to charge and collect fees under subsection (j), and the authorities under subsection (n) of this section shall be effective only to the extent provided, without fiscal year limitation, in appropriation Acts enacted after the date of enactment of this section."

SEC. 104. LIMITATIONS.—(a) The Administration is authorized to start any project set forth in subsections 101(b) (4), (5), (6), (8), (9), (11), and (14) only if the currently estimated cost of that project does not exceed by more than 25 per centum the estimated cost set forth for that project.

(b) The Administration is authorized to start any project set forth in subsections 101(b) (7) and (10) only if the currently estimated

cost of that project does not exceed by more than 10 per centum the estimated cost set forth for that project.

(c) The Administration is authorized to start any project under subsection 101(b) (12) only if it is in accordance with the following:

(1) The maximum currently estimated cost of any project shall be \$750,000 and the maximum currently estimated cost of any building included in such project shall be \$300,000: Provided, That the building cost limitation may be exceeded if the Administration determines that it is necessary in the interest of efficiency and economy.

(2) The total cost of all projects undertaken under subsection 101(b) (12) shall not exceed the estimated cost set forth in that section by more than 10 per centum.

(d) The total cost of any project undertaken under subsections 101(b) (4), (5), (6), (8), (9), (11), and (14) shall not exceed the estimated cost set forth for that project by more than 25 per centum unless and until additional appropriations are authorized under section 261 of the Atomic Energy Act of 1954, as amended: Provided, That this subsection will not apply to any project with an estimated cost less than \$5,000,000.

(e) The total cost of any project undertaken under subsection 101(b) (7) and (10) shall not exceed the estimated cost set forth for that project by more than 10 per centum, unless and until additional appropriations are authorized under section 261 of the Atomic Energy Act of 1954, as amended: Provided, That this subsection will not apply to any project with an estimated cost less than \$5,000,000.

SEC. 105. AMENDMENT OF PRIOR YEAR ACTS.—(a) Section 101 of Public Law 91-273, as amended, is further amended by (1) striking from subsection (b) (1), project 71-1-f, process equipment modifications, gaseous diffusion plants, the figure "\$295,100,000" and substituting therefor the figure "\$478,100,000"; and (2) striking from subsection (b) (9), project 71-9, fire, safety, and adequacy of operating conditions projects, various locations, the figure "\$193,000,000" and substituting therefor the figure "\$240,000,000".

(b) Section 101 of Public Law 93-60, as amended, is further amended by (1) striking from subsection (b) (1), project 74-1-g, cascade uprating program, gaseous diffusion plants, the figure "\$183,100,000" and substituting therefor the figure "\$259,600,000"; and (2) striking from subsection (b) (2), project 74-2-c, high energy laser facility, Lawrence Livermore Laboratory, California, the figure "\$20,000,000" and substituting therefor the figure "\$25,000,000".

(c) Section 101 of Public Law 93-276 is amended by (1) striking from subsection (b) (1), project 75-1-a, additional facilities, high level waste handling and storage, Savannah River, South Carolina, the figure "\$30,000,000" and substituting therefor the figure "\$33,000,000"; (2) striking from subsection (b) (1), project 75-1-c, new waste calcining facility, Idaho Chemical Processing Plant, National Reactor Testing Station, Idaho, the figure "\$20,000,000" and substituting therefor the figure "\$27,500,000"; (3) striking from subsection (b) (3), project 75-3-e, addition to building 350 for safeguards analytical laboratory, Argonne National Laboratory, Illinois, the figure "\$3,500,000" and substituting therefor the figure "\$4,300,000"; (4) striking from sub-

section (b) (6), project 75-6-c, positron-electron joint project, Lawrence Berkeley Laboratory and Stanford Linear Accelerator Center, the figure "\$900,000" and substituting therefor the figure "\$11,900,000"; and (5) striking from subsection (b) (7), project 75-7-c, intermediate-level waste management facilities, Oak Ridge National Laboratory, Tennessee, the figure "\$9,500,000" and substituting therefor the figure "\$10,500,000".

(d) Section 106 of Public Law 91-273, as amended, is further amended by deleting the present text thereof and substituting therefor the following:

"SEC. 106. LIQUID METAL FAST BREEDER REACTOR DEMONSTRATION PROGRAM—FOURTH ROUND.—(a) The Energy Research and Development Administration (ERDA) is hereby authorized to enter into cooperative arrangements with reactor manufacturers and others for participation in the research and development, design, construction, and operation of a Liquid Metal Fast Breeder Reactor powerplant, in accordance with criteria approved by the Joint Committee on Atomic Energy, without regard to the provisions of section 169 of the Atomic Energy Act of 1954, as amended. Appropriations are hereby authorized for the period consisting of the fiscal year ending June 30, 1976, and the interim period following that fiscal year and ending September 30, 1976, for the aforementioned cooperative arrangements as shown in the basis for arrangements as submitted in accordance with subsection (b) hereof. In addition, ERDA may agree to provide assistance in the form of waiver of use charges during the term of the cooperative arrangements without regard to the provisions of section 53 of the Atomic Energy Act, as amended, by waiving use charges in an amount not to exceed \$10,000,000.

"(b) Before ERDA enters into any arrangement or amendment thereto under the authority of subsection (a) of this section, the basis for the arrangement or amendment thereto which ERDA proposes to execute (including the name of the proposed participating party or parties with which the arrangement is to be made, a general description of the proposed powerplant, the estimated amount of cost to be incurred by ERDA and by the participating parties, and the general features of the proposed arrangement or amendment) shall be submitted to the Joint Committee on Atomic Energy, and a period of forty-five days shall elapse while Congress is in session (in computing such forty-five days, there shall be excluded the days on which either House is not in session because of adjournment for more than three days): Provided, however, That the Joint Committee, after having received the basis for a proposed arrangement or amendment thereto, may by resolution in writing waive the conditions of all, or any portion of, such forty-five-day period: Provided, further, That such arrangement or amendment shall be entered into in accordance with the basis for the arrangement or amendment submitted as provided herein: And provided further, That no basis for arrangement need be resubmitted to the Joint Committee for the sole reason that the estimated amount of the cost to be incurred by ERDA exceeds the estimated cost previously submitted to the Joint Committee by not more than 15 per centum. Notwithstanding the foregoing, ERDA, in each of its annual budget submissions, shall submit for the information and review

of the Joint Committee in the exercise of its oversight responsibility, the anticipated obligations and costs for the ensuing fiscal year for the project authorized under subsection (a) of this section.

"(c) The ERDA is hereby authorized to agree, by modification to the definitive cooperative arrangement reflecting such changes therein as it deems appropriate for such purpose, to the following: (1) to execute and deliver to the other parties to the definitive contract, the special undertakings of indemnification specified in said contract, which undertakings shall be subject to availability of appropriations to ERDA and to the provisions of section 3679 of the Revised Statutes, as amended; and (2) to acquire ownership and custody of the property constituting the Liquid Metal Fast Breeder Reactor powerplant or parts thereof, and to use, decommission, and dispose of said property, as provided for in the definitive contract."

SEC. 106. RESCISSIONS.—(a) Public Law 92-314, as amended, is further amended by rescinding therefrom authorization for a project, except for funds heretofore obligated, as follows:

Project 73-5-d, modifications to TREAT facility, National Reactor Testing Station, Idaho, \$1,500,000.

(b) Public Law 93-60, as amended, is further amended by rescinding therefrom authorization for a project, except for funds heretofore obligated, as follows:

Project 74-3-e, modifications to TREAT facility, National Reactor Testing Station, Idaho, \$2,500,000.

(c) Public Law 93-276, as amended, is further amended by rescinding therefrom authorization for projects, except for funds heretofore obligated, as follows:

Project 75-13-a, hydrothermal pilot plant, \$1,000,000.

Project 75-5-e, high temperature gas reactor fuel reprocessing facility, National Reactor Testing Station, Idaho, \$10,100,000.

Project 75-5-f, high temperature gas reactor fuel refabrication pilot plant, Oak Ridge National Laboratory, Tennessee, \$3,000,000.

TITLE II—AUTHORIZATION OF APPROPRIATIONS FOR THE PERIOD JULY 1, 1976, THROUGH SEPTEMBER 30, 1976

SEC. 201. There is hereby authorized to be appropriated to the Energy Research and Development Administration in accordance with the provisions of section 261 of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2017), section 305 of the Energy Reorganization Act of 1974 (42 U.S.C. 5875), and section 16 of the Federal Non-nuclear Energy Research and Development Act of 1974 (42 U.S.C. 5915):

(a) For "Operating expenses", for the following programs, a sum of dollars equal to the total of the following amounts:

(1) FOSSIL ENERGY DEVELOPMENT.—

(A) Coal liquefaction:

Costs, \$16,000,000.

Changes in selected resources, \$12,750,000.

(B) High Btu gasification (coal):

Costs, \$7,450,000.

Changes in selected resources, \$1,800,000.

- (C) *Low Btu gasification (coal)* :
 Costs, \$7,300,000.
 Changes in selected resources, \$5,350,000.
 Provided, That not less than 20 per centum of the funds appropriated pursuant to this subparagraph (C) shall be used for in situ processes.
- (D) *Advanced power systems (coal)* :
 Costs, \$2,050,000.
 Changes in selected resources, \$1,450,000.
- (E) *Direct combustion (coal)* :
 Costs, \$5,100,000.
 Changes in selected resources, \$9,800,000.
- (F) *Advanced research and supporting technology (coal), for the following* :
- (i) *Advanced coal conversion process* :
 Costs, \$2,100,000.
 Changes in selected resources, \$1,900,000.
- (ii) *Advanced direct coal utilization process* :
 Costs, \$500,000.
 Changes in selected resources, \$500,000.
- (iii) *Advanced supporting research* :
 Costs, \$1,400,000.
 Changes in selected resources, \$450,000.
- (iv) *Systems studies* :
 Costs, \$1,400,000.
 Changes in selected resources, \$1,600,000.
- (G) *Demonstration plants (coal)* :
 Costs, \$4,100,000.
 Changes in selected resources, \$4,900,000.
- (H) *Natural gas and oil extraction* :
 Costs, \$9,930,000.
 Changes in selected resources, \$600,000.
- (I) *Natural gas and oil utilization* :
 Costs, \$500,000.
 Changes in selected resources (minus) \$50,000.
- (J) *Oil shale in situ processing* :
 Costs, \$4,241,000.
 Changes in selected resources, \$529,000.
- (K) *Oil shale composition and characterization* :
 Costs, \$300,000.
 Changes in selected resources, \$0.
- (L) *Magnetohydrodynamics*.
 Costs, \$6,700,000.
 Changes in selected resources, \$1,700,000.
- (2) *SOLAR ENERGY DEVELOPMENT.—*
 Costs, \$24,500,000.
 Changes in selected resources, \$19,203,000.
- (3) *GEOTHERMAL ENERGY DEVELOPMENT.—*
 Costs, \$10,100,000.
 Changes in selected resources, \$850,000.

- (4) *CONSERVATION RESEARCH AND DEVELOPMENT.—*
- (A) *Electric Power Transmission* :
 Costs, \$2,673,000.
 Changes in selected resources (minus) \$100,000.
- (B) *Advanced Transportation Power Systems* :
 Costs, \$4,750,000.
 Changes in selected resources, \$1,060,000.
- (C) *Energy Storage Systems* :
 Costs, \$5,400,000.
 Changes in selected resources, \$900,000.
- (D) *End-use Conservation* :
 Costs, \$8,000,000.
 Changes in selected resources, \$2,000,000.
- (E) *Improved Conversion Efficiency* :
 Costs, \$3,475,000.
 Changes in selected resources, \$1,100,000.
- (F) *Urban Waste Conversion* :
 Costs, \$2,500,000.
 Changes in selected resources, \$1,250,000.
- (5) *NUCLEAR ENERGY AND OTHER PROGRAMS.—\$914,849,000, of which a sum of dollars for the following programs equal to the total of the following amounts is included* :
- (A) *Scientific and technical education in support of Nonnuclear Energy Technologies* :
 Costs, \$1,125,000.
 Changes in selected resources, \$337,000.
- (B) *General new programs in Environmental and Safety Research in support of nonnuclear energy technology* :
 Costs, \$5,525,000.
 Changes in selected resources \$1,919,000.
- (C) *For use as provided in section 316 of this Act* :
 Costs, \$1,000,000.
 Changes in selected resources, \$250,000.
- (D) *Nonpulmonary health studies on miners and people living in areas subjected to a high incidence of sulphur oxides and trace elements* :
 Costs, \$100,000.
 Changes in selected resources, \$25,000.
- (E) *New programs of physical research in molecular and materials sciences in support of nonnuclear technologies* :
 Costs, \$3,931,000.
 Changes in selected resources, \$1,168,000.
- (F) \$687,000 shall be available pursuant to sections 14 and 16 of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5913 and 5915) as follows :
- (i) \$312,000 for the National Bureau of Standards;
- (ii) \$125,000 for the Council on Environmental Quality;
- and
- (iii) \$250,000 for the Water Resources Council.
- (b) For "Plant and capital equipment", including construction, acquisition, or modification of facilities, including land acquisition;

and acquisition and fabrication of capital equipment not related to construction, a sum of dollars equal to the total of the incremental amounts of the following:

FOSSIL ENERGY DEVELOPMENT

(1) COAL.—

Project 76-1-a, clean boiler fuel demonstration plant (A-E and long-lead procurement), \$8,000,000.

Project 76-1-b, High Btu synthetic pipeline gas demonstration plant (A-E and long-lead procurement), \$5,000,000.

Project 76-1-c, Low Btu fuel gas demonstration plant (A-E and long-end procurement), \$3,750,000.

Project 76-1-d, Fluidized bed direct combustion demonstration plant, \$3,250,000.

SOLAR, GEOTHERMAL, AND ADVANCED ENERGY SYSTEMS DEVELOPMENT

(2) SOLAR ENERGY DEVELOPMENT.—

Project 76-2-a, Five megawatt solar thermal test facility, \$1,250,000.

Project 76-2-b, Ten megawatt central receiver solar thermal powerplant (A-E and long-lead procurement), \$1,250,000.

(3) GEOTHERMAL ENERGY DEVELOPMENT.—

Project 76-3-a, Geothermal powerplant (steam) (A-E and long-lead procurement), \$1,250,000.

Project 76-3-b, Geothermal powerplant (A-E and long-lead procurement), \$1,250,000.

(4) PHYSICAL RESEARCH.—

Project 76-4-a, accelerator and reactor improvements and modifications, \$1,000,000.

NUCLEAR ENERGY DEVELOPMENT

(5) FUSION POWER RESEARCH AND DEVELOPMENT.—

Project 76-5-a, tokamak fusion test reactor, Princeton Plasma Physics Laboratory, Plainsboro, New Jersey, \$7,000,000.

(6) GENERAL PLANT PROJECTS.—\$15,900,000.

(7) CONSTRUCTION PLANNING AND DESIGN.—\$1,500,000.

CAPITAL EQUIPMENT NOT RELATED TO CONSTRUCTION

(8) CAPITAL EQUIPMENT.—

Acquisition and fabrication of capital equipment not related to construction, for the following programs, a sum of dollars equal to the total of the following amounts:

(A) Fossil energy development, \$200,000.

(B) Geothermal energy development, \$200,000.

(C) Conservation research and development including improved conversion efficiency, \$2,900,000.

(D) Physical research in molecular and materials sciences in support of nonnuclear energy technology, \$1,037,000.

(E) Environmental and safety research in support of nonnuclear energy technologies, \$500,000.

(F) Nuclear energy and other programs, \$58,086,000.

SEC. 202. LIMITATIONS.—(a) The Administration is authorized to start any project set forth in subsections 201(b) (4) and (5) only if the currently estimated cost of that project does not exceed by more than 25 per centum the estimated cost set forth for that project.

(b) The Administration is authorized to start any project under subsection 201(b) (6) only if it is in accordance with the following:

(1) The maximum currently estimated cost of any project shall be \$750,000 and the maximum currently estimated cost of any building included in such project shall be \$300,000: Provided, That the building cost limitation may be exceeded if the Administration determines that it is necessary in the interest of efficiency and economy.

(2) The total cost of all projects undertaken under subsection 201(b) (6) shall not exceed the estimated cost set forth in that subsection by more than 10 per centum.

(c) The total cost of any project undertaken under subsection 201(b) (4) and (5) shall not exceed the estimated cost set forth for that project by more than 25 per centum, unless and until additional appropriations are authorized under section 261 of the Atomic Energy Act of 1954, as amended: Provided, That this subsection will not apply to any project with an estimated cost less than \$5,000,000.

SEC. 203. AMENDMENT OF PRIOR YEAR ACTS.—(a) Section 101 of Public Law 91-273, as amended, is further amended by striking from subsection (b) (1), project 71-1-f, process equipment modifications, gaseous diffusion plants, the figure "\$478,100,000" and substituting therefor the figure "\$510,100,000".

(b) Section 101 of Public Law 93-60, as amended, is further amended by striking from subsection (b) (1), project 74-1-g, cascade uprating program, gaseous diffusion plants, the figure "\$259,600,000" and substituting therefor the figure "\$270,400,000".

TITLE III—GENERAL PROVISIONS

PART A—PROVISIONS RELATING TO PROGRAMS OTHER THAN FOSSIL ENERGY DEVELOPMENT

SEC. 301. The Administrator is authorized to perform construction design services for any Administration construction project whenever (1) such construction project has been included in a proposed authorization bill transmitted to the Congress by the Administrator, and (2) the Administrator determines that the project is of such urgency that construction of the project should be initiated promptly upon enactment of legislation appropriating funds for its construction.

SEC. 302. Any moneys received by the Administration may be retained and used for operating expenses (except sums received from disposal of property under the Atomic Energy Community Act of 1955 and the Strategic and Critical Materials Stockpiling Act, as amended, and fees received for tests or investigations under the Act of May 16, 1910, as amended (42 U.S.C. 2301; 50 U.S.C. 98h; 30 U.S.C. 7)), notwithstanding the provisions of section 3617 of the Revised Statutes (31 U.S.C. 484), and may remain available until expended.

SEC. 303. Transfers of sums from the "Operating expenses" appropriation may be made to other agencies of the Government for the performance of the work for which the appropriation is made, and in such cases the sums so transferred, may be merged with the appropriation to which transferred.

SEC. 304. Sections 301, 302, and 303 of this Act do not apply to fossil energy development programs of the Administration.

PART B—PROVISIONS RELATING TO NONNUCLEAR ENERGY DEVELOPMENT

SEC. 305. REPROGRAMING AUTHORITY.—Except as provided in part C of this title—

(1) no amount appropriated pursuant to this Act may be used for any nonnuclear program in excess of the amount actually authorized for that particular program by this Act,

(2) no amount appropriated pursuant to this Act may be used for any nonnuclear program which has not been presented to, or requested of, the Congress,

unless (A) a period of thirty calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three calendar days to a day certain) has passed after the receipt by the Committee on Science and Technology of the House of Representatives and the Committee on Interior and Insular Affairs of the Senate of notice given by the Administrator containing a full and complete statement of the action proposed to be taken and the facts and circumstances relied upon in support of such proposed action, or (B) each such committee before the expiration of such period has transmitted to the Administrator written notice to the effect that such committee has no objection to the proposed action: Provided, That the following categories may not, as a result of reprogramming, be decreased by more than 10 per centum of the sums appropriated pursuant to this Act for such categories: Coal, petroleum and natural gas, oil shale, solar, geothermal, and conservation.

SEC. 306. The Administrator shall submit to the Committee on Science and Technology of the House of Representatives and the Committee on Interior and Insular Affairs of the Senate a detailed explanation of the allocation of the funds appropriated pursuant to sections 101(a) and 201(a) of this Act for nonnuclear energy programs and subprograms, reflecting the relationships, consistencies, and dissimilarities between those allocations and (a) the comprehensive program definition transmitted pursuant to section 102 of the Geothermal Energy Research, Development, and Demonstration Act, (b) the comprehensive program definition transmitted pursuant to section 15 of the Solar Energy Research, Development, and Demonstration Act of 1974 (42 U.S.C. 5564), (c) the comprehensive nonnuclear energy research development, and (d) demonstrations transmitted pursuant to section 6 of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5905).

SEC. 307. When so specified in an appropriation Act, any amount appropriated pursuant to this Act for "Operating expenses" or for "Plant and capital equipment" for nonnuclear energy may remain available until expended.

SEC. 308. The Administrator shall, by June 30, 1976, and by the end of each fiscal year thereafter, submit a report to the Committee on Science and Technology of the House of Representatives and the Committee on Interior and Insular Affairs of the Senate detailing the extent to which small business and nonprofit organizations are being funded by the nonnuclear research, development, and demonstration programs of the Administrator, and the extent to which small business involvement pursuant to section 2(d) of the Energy Reorganization Act of 1974 (42 U.S.C. 5801(d)) is being encouraged by the Administrator.

SEC. 309. The Administrator shall coordinate nonnuclear programs of the Administration with the heads of relevant Federal agencies in order to minimize unnecessary duplication of programs, projects, and research facilities.

SEC. 310. The Administrator shall, as soon as practicable and consistent with design, economic, and feasibility studies, include in an annual authorization proposal a recommendation on construction of at least one demonstration offshore wind-electric generating facility.

SEC. 311. As a part of the annual report required by section 15(a)(1) of the Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5914(a)(1)), the Administrator shall:

(a) detail the Solar Energy Division personnel level recommended for the current fiscal year by the Administrator and submitted to the Office of Management and Budget, and the personnel level authorized upon review by that Office; and

(b) detail progress toward completion by January 1, 1980, of the objectives of the Solar Energy Research Development, and Demonstration Act of 1974 (42 U.S.C. 5551, et seq.).

SEC. 312. The Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901), as amended by section 103 of this Act, is amended by adding at the end thereof the following new section:

"CENTRAL SOURCE OF NONNUCLEAR ENERGY INFORMATION

"SEC. 18. The Administrator shall promptly establish, develop, acquire, and maintain a central source of information on all energy resources and technology in furtherance of the Administrator's research, development, and demonstration mission carried out directly or indirectly under this Act. When the Administrator determines that such information is needed to carry out the purposes of this Act, he may acquire proprietary and other information (a) by purchase through negotiation or by donation from any person, or (b) from another Federal agency. The information maintained by the Administrator shall be made available to the public, subject to the provisions of section 552 of title 5, United States Code, and section 1905 of title 18, United States Code, and to other Government agencies in a manner that will facilitate its dissemination: Provided, That upon a showing satisfactory to the Administrator by any person that any information, or portion thereof, obtained under this section by the Administrator directly or indirectly from such person, would, if made public, divulge (1) trade secrets or (2) other proprietary information of

such person, the Administrator shall not disclose such information and disclosure thereof shall be punishable under section 1905 of title 18, United States Code: Provided further, That the Administrator shall, upon request, provide such information to (A) any delegate of the Administrator for the purpose of carrying out this Act, and (B) the Attorney General, the Secretary of Agriculture, the Secretary of the Interior, the Federal Trade Commission, the Federal Energy Administration, the Environmental Protection Agency, the Federal Power Commission, the General Accounting Office, other Federal agencies, when necessary to carry out their duties and responsibilities under this and other statutes, but such agencies and agency heads shall not release such information to the public. This section is not authority to withhold information from Congress or any committee of Congress upon request of the chairman."

SEC. 313. The Federal Nonnuclear Energy Research and Development Act of 1974 (42 U.S.C. 5901) is amended by adding at the end thereof (after the new section added by section 312 of this Act) the following new section:

"ENERGY INFORMATION

"SEC. 19. The Administrator is, upon request, authorized to obtain energy information under section 11(d) of the Energy Supply and Environmental Coordination Act of 1974, as amended (15 U.S.C. 796(d))."

PART C—PROVISIONS RELATING TO FOSSIL ENERGY DEVELOPMENT

SEC. 314. Funds appropriated pursuant to this Act for "Operating expenses" for fossil energy purposes may be used for (1) any facilities which may be required at locations, other than installations of the Administration, for the performance of research and development contracts, and (2) grants to any organization for purchase or construction of research facilities. No such funds shall be used for the acquisition of land. Fee title to all such facilities shall be vested in the United States, unless the Administrator determines in writing that the programs of research and development authorized by this Act shall best be implemented by vesting fee title in an entity other than the United States: Provided, That, before approving the vesting of title in such entity, the Administrator shall (A) transmit such determination, together with all pertinent data, to the Committee on Science and Technology of the House of Representatives and the Committee on Interior and Insular Affairs of the Senate, and (B) wait a period of thirty calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three calendar days to a day certain), unless prior to the expiration of such period each such committee has transmitted to the Administrator written notice to the effect that such committee has no objection to the proposed action. Each grant shall be made under such conditions as the Administrator deems necessary to insure that the United States will receive therefrom benefits adequate to justify the making of the grant. No such funds shall be used

under clause (1) of the first sentence of this section for the construction of any major facility the estimated cost of which, including collateral equipment, exceeds \$250,000 unless the Administrator shall (i) transmit a report on such major facility showing the nature, purpose, location, and estimated cost of such facility to the Committee on Science and Technology of the House of Representatives and the Committee on Interior and Insular Affairs of the Senate, and (ii) wait a period of thirty calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three calendar days to a day certain), unless prior to the expiration of such period each such committee has transmitted to the Administrator written notice to the effect that such committee has no objection to the proposed action.

SEC. 315. Not to exceed three per centum of all funds appropriated pursuant to this Act for "Operating expenses" for fossil energy purposes may be used by the Administrator to construct, expand, or modify laboratories and other facilities, including the acquisition of land, at any location under the control of the Administrator, if the Administrator determines that (1) such action would be necessary because of changes in the national programs authorized to be funded by this Act or because of new scientific or engineering developments, and (2) deferral of such action until the enactment of the next authorization Act would be inconsistent with the policies established by Congress for the Administration. No portion of such sums may be obligated for expenditure or expended for such activities, unless (A) a period of thirty calendar days (not including any day in which either House of Congress is not in session because of adjournment of more than three calendar days to a day certain) has passed after the Administrator has transmitted to the Committee on Science and Technology, of the House of Representatives and the Committee on Interior and Insular Affairs of the Senate a written report containing a full and complete statement concerning (i) the nature of construction, expansion, or modification, (ii) the cost thereof, including the cost of any real estate action pertaining thereto, and (iii) the reason why such construction, expansion, or modification is necessary and in the national interest, or (B) each such committee before the expiration of such period has transmitted to the Administrator written notice to the effect that such committee has no objection to the proposed action.

SEC. 316. The Administrator shall conduct an environmental and safety research, development, and demonstration program related to fossil fuels.

**TITLE IV—OAK RIDGE HOLIFIELD NATIONAL
LABORATORY**

SEC. 401. The Holifield National Laboratory at Oak Ridge, Tennessee, shall hereafter be known and designated as the "Oak Ridge National Laboratory". Any reference in any law, map, regulation, document, record, or other paper of the United States to the Holifield National Laboratory or to the Oak Ridge National Laboratory shall be held to be a reference to the "Oak Ridge National Laboratory".

SEC. 102. The Heavy Ion Research Facility under construction at Oak Ridge, Tennessee, is hereby designated as the "Holifield Heavy Ion Research Facility". Any reference in any law, regulation, map, record, or other document of the United States to the Heavy Ion Research Facility shall be considered a reference to the "Holifield Heavy Ion Research Facility".

TITLE V—AIR TRANSPORTATION OF PLUTONIUM

SEC. 501. The Energy Research and Development Administration shall not ship plutonium in any form by aircraft whether exports, imports, or domestic shipment: Provided, That any exempt shipments of plutonium, as defined by section 502, are not subject to this restriction. This restriction shall be in force until the Energy Research and Development Administration has certified to the Joint Committee on Atomic Energy of the Congress that a safe container has been developed and tested which will not rupture under crash and blast testing equivalent to the crash and explosion of a high-flying aircraft.

SEC. 502. For the purposes of this title, the term "exempt shipments of plutonium" shall include the following:

(1) Plutonium shipments in any form designed for medical application.

(2) Plutonium shipments which pursuant to rules promulgated by the Administrator of the Energy Research and Development Administration are determined to be made for purposes of national security, public health and safety, or emergency maintenance operations.

(3) Shipments of small amounts of plutonium deemed by the Administrator of the Energy Research and Development Administration to require rapid shipment by air in order to preserve the chemical, physical, or isotopic properties of the transported item or material.

TITLE VI—ASSISTANCE PAYMENTS AMENDMENTS

SEC. 601. Chapter 9 of the Atomic Energy Community Act of 1955 (42 U.S.C. 2391 et seq.) is amended—

(1) by striking out "Commission" each time it appears in sections 91 and 94, the first time it appears in section 92, and where it appears in section 93, and inserting in each instance in lieu thereof the following: "Administrator";

(2) by striking out "atomic energy" in section 91a(2) and inserting "Energy Research and Development Administration" in lieu thereof;

(3) by striking out "its" in section 91d;

(4) by striking out "itself" in section 91e;

(5) by striking out the period at the end of the first sentence of section 91a, and inserting in lieu thereof the following: " : Provided further, That the Administrator is also authorized to make payments of just and reasonable sums to Anderson County and Roane County, Tennessee. ";

(6) by inserting immediately after "Richland School District" in section 91d, but before the closing of parentheses, the following:

" ; or not less than six months prior to June 30, 1986, in the case of Anderson County and Roane County, Tennessee ";

(7) by striking out "Commission" in the catchlines of sections 92 and 94;

(8) by striking out "Commission" the second time it appears in section 92, and inserting "Energy Research and Development Administration" in lieu thereof; and

(9) by striking out the final period in section 93 and inserting in lieu thereof the following: " ; and in the case of Anderson County and Roane County, Tennessee, shall not extend beyond June 30, 1986. ".

And the Senate agree to the same.

JOHN O. PASTORE,
HENRY M. JACKSON,
STUART SYMINGTON,
FRANK CHURCH,
JOSEPH M. MONTOYA,
J. BENNETT JOHNSTON, JR.,
FLOYD K. HASKELL,
JOHN GLENN,
CLIFFORD P. CASE,
PAUL J. FANNIN,
HOWARD BAKER, JR.,
MARK O. HATFIELD,
JIM A. MCCLURE,

Managers on the Part of the Senate.

OLIN E. TEAGUE,
MELVIN PRICE,
JOHN YOUNG,
THOMAS N. DOWNING,
KEN HECHLER,
DON FUQUA,
GEORGE BROWN, JR.,
WALTER FLOWERS,
JAMES W. SYMINGTON,
MIKE MCCORMACK,
JOHN B. ANDERSON,
CHARLES A. MOSHER,
ALPHONZO BELL,
BARRY M. GOLDWATER, JR.,
MANUEL LUJAN, JR.,

Managers on the Part of the House.

RESERVATION TO SECTIONS 102 AND 103 BY BARRY M. GOLDWATER, JR.

Representative Barry M. Goldwater, Jr., although he signed the Conference Report on the part of the House, emphasized that he did so with reservations about enacting at this time Sections 102 and 103, the two major new sections added by the Senate, and the additional reservation that the House should be allowed to have a separate vote on each section.

**JOINT EXPLANATORY STATEMENT OF THE
COMMITTEE OF CONFERENCE**

The managers on the part of the House and the Senate at the Conference on the disagreeing votes of the two Houses on the amendment of the Senate to the bill (H.R. 3474), Energy Research and Development Administration Authorization Act, 1976, and for other purposes, submit the following joint statement to the House and the Senate in explanation of the effect of the action agreed upon by the managers and recommended in the accompanying conference report:

NONNUCLEAR ENERGY

This authorization is the first for the new Energy Research and Development Administration which came into existence January 19, 1975. At the time the original budget request was submitted by the new agency it constituted a compilation of previous programs which had been placed in one agency for the first time. In succeeding months, much information and program direction has occurred on the part of the agency, and the Committees involved in the House and Senate have had an opportunity to evaluate and update their program desires and expectations.

The compromise worked out by the Committee of Conference and reflected in the accompanying amendment which is recommended take into account each of the above considerations.

A. SUMMARY OF NONNUCLEAR PROGRAMS

Titles I and II of the conference report on H.R. 3474 authorize non-nuclear programs, nuclear programs, and joint programs. Sections 101 and 201 authorize funds for those programs in fiscal year 1976 and the transition period.

CONFERENCE RECOMMENDATION OPERATING AND PLANT AND CAPITAL EQUIPMENT BUDGET AUTHORITY
[Dollars in thousands]

	Fiscal year 1976	Transition period
1. The nonnuclear programs are as follows:		
Fossil.....	\$497, 821	\$132, 550
Solar.....	175, 525	46, 203
Geothermal.....	56, 390	13, 650
Conservation.....	156, 205	35, 908
Advanced energy systems.....	9, 150	1, 780
2. The increases above the original ERDA request in the other programs are as follows:		
Physical research.....	24, 075	6, 136
Environment and safety.....	44, 100	9, 319
Scientific and technical education.....	5, 850	1, 462
CEQ, WRC, NBS.....	2, 750	687
Program support.....	9, 000	2, 250

Section 102 establishes in ERDA an in situ oil shale demonstration program and provides for the transfer to ERDA of the administrative jurisdiction of an oil shale lease, with the lease administration reverting to the Department of the Interior at the end of the demonstration phase. It also provides for consultation with the State and local officials and assistance for communities impacted by the demonstration.

Section 103 authorizes ERDA to provide up to \$6 billion in loan guarantees for the construction of commercial demonstration facilities for (1) synthetic fuels from coal, oil shale, biomass, and other domestic resources; (2) energy from solar and other renewable resources; and (3) energy-efficient industrial equipment. It also provides for the further implementation of the geothermal loan guarantee program established under Public Law 93-410.

The following paragraphs discuss the non-geothermal loan guarantees.

Each guarantee must be made in consultation with the Secretary of the Treasury. The Administrator must consult with the Governor and local officials in making his decision. If the Governor objects, the Administrator may override if he decides that it is in the national interest; a judicial review of the override decision is provided. Each guarantee is subject to a Congressional layover of 90 days, and if the project costs over \$350 million, either House may disapprove such project during this period.

The Administrator is given a portfolio of financial assistance programs to provide impact aid to affected communities. ERDA, as part of its program report to Congress, must also present a report on the socio-economic effects and their estimated costs.

The title and waiver requirements of the patent policy of the Federal Nonnuclear Energy Research and Development Act of 1974 apply to this program, but not the reporting provisions. All patents and technology resulting from the commercial demonstration facility are treated as part of project assets, in the event of default.

Any employee performing duties under this section and with any financial interest in energy resources associated with an applicant, must make an annual, public disclosure of all such interests.

All applicants or borrowers must be citizens or nationals of the United States.

Title 3 of the Conference Report contains general provisions.

Part A applies to all nuclear programs and to all nonnuclear programs, other than fossil programs. Authority is provided to begin construction design work without specific authorization from Congress for the project; funds may remain available until expended; and ERDA is given the authority to transfer funds to other agencies.

Part B relates to all nonnuclear energy development. It provides for general reprogramming of funds, with Congressional notification, as long as no major category is decreased by more than 10 percent; and a central source of information on all energy resources and technology for R. & D. purposes.

Part C relates to fossil energy development. It provides for reprogramming of operating expenses for construction purposes, and a program of environmental and safety research, development, and demonstration related to fossil fuels.

B. BUDGET ACTIONS

The compromise reflects numerous program decisions to accommodate the views on needed acceleration of nonnuclear programs by the two Houses. Fossil energy programs, for example, were reduced approximately \$52 million below the Senate recommendation and increased \$85 million over the House figure and solar energy programs were increased \$39 million above the Senate recommendation and reduced \$25 million below the House recommendation.

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
SUMMARY—FISCAL YEAR 1976 CONFERENCE COMMITTEE RECOMMENDATION

[In thousands of dollars]

	Costs	Changes in selected resources	Construction obligations	Capital equipment obligations	Total	Revised administration request
Fossil energy development:						
Senate authorization	398,733	77,274	73,000	425	549,432	
House authorization	337,040	54,620	20,000	425	412,085	434,485
Conference recommendation	357,373	72,023	68,000	425	497,821	
Original ERDA request	325,040	47,620	20,000	425	393,085	
Amount recommended exceeds original ERDA request	32,333	24,403	48,000	0	104,736	
Solar energy development:						
Senate authorization	97,109	26,248	10,000	0	133,348	
House authorization	96,223	98,577	0	3,000	197,800	89,200
Conference recommendation	97,109	62,425	10,000	3,000	172,525	
Original ERDA request	57,109	13,200	0	0	70,300	
Amount recommended exceeds original ERDA request	40,000	49,225	10,000	3,000	102,225	
Geothermal energy development:						
Senate authorization	33,870	-3,757	10,000	620	40,733	
House authorization	37,656	15,620	0	3,120	56,396	31,390
Conference recommendation	34,750	8,520	10,000	3,120	56,390	
Original ERDA request	28,370	-5,600	0	620	23,390	
Amount recommended exceeds original ERDA request	6,380	14,120	10,000	2,500	33,000	
Conservation research and development:						
Senate authorization	131,280	36,055	0	2,450	169,785	
House authorization	85,862	37,918	0	11,500	135,280	71,820
Conference recommendation	107,553	37,150	0	11,500	156,203	
Original ERDA request	35,020	4,000	0	2,450	41,470	
Amount recommended exceeds original ERDA request	72,533	33,150	0	9,050	114,735	
Physical research (increment only):						
Senate authorization	18,000	6,000	0	5,000	29,000	
House authorization	13,450	2,450	0	4,100	20,000	
Conference recommendation	15,725	3,750	0	4,600	24,075	
Environment and safety (increment only):						
Senate authorization	26,500	8,800	6,800	0	42,100	
House authorization	10,800	2,700	0	2,000	15,500	
Conference recommendation	26,500	8,800	6,800	2,000	44,100	
Advanced energy systems supporting activities:						
Senate authorization	6,550	2,600	0	0	9,150	
House authorization	6,550	2,600	0	0	9,150	11,350
Conference recommendation	6,550	2,600	0	0	9,150	
Scientific and technical education:						
Senate authorization	5,000	1,700	0	0	6,700	
House authorization	4,000	1,000	0	0	5,000	0
Conference recommendation	4,500	1,350	0	0	5,850	
CEQ, WRC, NBS:						
Senate authorization	3,200	0	0	0	3,200	
House authorization	1,500	0	0	0	1,500	2,750
Conference recommendation	2,750	0	0	0	2,750	
Program support (increment only):						
Senate authorization	10,300	0	0	0	10,300	
House authorization	6,600	0	0	0	6,600	
Conference recommendation	9,000	0	0	0	9,000	
Totals:						
Total Senate authorization	730,533	154,920	99,800	8,495	993,748	
Total House authorization	599,675	215,485	20,000	24,145	859,305	
Total conference recommendation	661,803	196,618	94,800	24,645	977,866	
Total original ERDA request	452,080	61,820	20,000	3,495	537,395	
Total amount recommended exceeds original ERDA request	209,723	134,798	74,800	21,150	440,471	

DETAILED FISCAL YEAR 1976 CONFERENCE COMMITTEE RECOMMENDATION
[In thousands of dollars]

	Costs	Changes in selected resources	Construction obligations	Capital equipment obligations	Total	Revised administration request
FOSSIL ENERGY						
Coal liquefaction:						
Senate authorization.....	96,897	665	20,000	0	117,562	117,562
House authorization.....	96,897	665	20,000	0	117,562	
Conference recommendation.....	96,897	665	20,000	0	117,562	
High-Btu gasification:						
Senate authorization.....	37,838	20,526	20,000	0	78,364	63,364
House authorization.....	42,838	20,526	0	0	63,364	
Conference recommendation.....	37,838	20,526	20,000	0	78,364	
Low-Btu gasification:						
Senate authorization.....	49,171	-3,782	20,000	0	65,389	45,389
House authorization.....	54,671	-4,282	0	0	50,389	
Conference recommendation.....	54,671	-4,282	15,000	0	65,389	
Advanced power systems:						
Senate authorization.....	8,261	2,340	0	0	10,601	10,001
House authorization.....	5,261	1,340	0	0	6,601	
Conference recommendation.....	8,261	2,340	0	0	10,601	
Direct combustion:						
Senate authorization.....	32,645	5,451	13,000	0	51,096	45,096
House authorization.....	32,645	5,451	0	0	38,096	
Conference recommendation.....	32,645	5,451	13,000	0	51,096	
Advanced research and supporting technology:						
Coal conversion:						
Senate authorization.....	13,000	1,000	0	0	14,000	14,000
House authorization.....	13,000	1,000	0	0	14,000	
Conference recommendation.....	13,000	1,000	0	0	14,000	
Direct coal utilization:						
Senate authorization.....	4,600	400	0	0	5,000	5,000
House authorization.....	4,600	400	0	0	5,000	
Conference recommendation.....	4,600	400	0	0	5,000	
Supporting research:						
Senate authorization.....	8,374	119	0	0	8,493	8,493
House authorization.....	8,374	119	0	0	8,493	
Conference recommendation.....	8,374	119	0	0	8,493	
Systems studies:						
Senate authorization.....	6,087	1,813	0	0	7,900	7,900
House authorization.....	9,087	2,813	0	0	11,900	
Conference recommendation.....	9,087	2,813	0	0	11,900	
Demonstration plants:						
Senate authorization.....	18,100	18,900	0	0	37,000	37,000
House authorization.....	18,100	18,900	0	0	37,000	
Conference recommendation.....	18,100	18,900	0	0	37,000	
Natural gas and oil extraction:						
Senate authorization.....	47,065	11,264	0	100	58,429	35,029
House authorization.....	28,065	6,864	0	100	35,029	
Conference recommendation.....	32,865	8,564	0	100	41,529	
Natural gas and oil utilization:						
Senate authorization.....	1,582	215	0	0	1,797	1,797
House authorization.....	1,582	215	0	0	1,797	
Conference recommendation.....	1,582	215	0	0	1,797	
Oil shale in-situ processing:						
Senate authorization.....	24,000	6,318	0	325	30,643	14,045
House authorization.....	7,034	686	0	325	8,045	
Conference recommendation.....	16,000	3,000	0	325	19,325	
Oil shale composition and characterization:						
Senate authorization.....	1,113	152	0	0	1,265	1,265
House authorization.....	1,113	152	0	0	1,265	
Conference recommendation.....	1,113	152	0	0	1,265	
Magnetohydrodynamics:						
Senate authorization.....	50,000	11,893	0	0	61,893	28,544
House authorization.....	13,773	-229	0	0	13,544	
Conference recommendation.....	22,340	12,160	0	0	34,500	
Total fossil energy:						
Senate authorization.....	398,733	77,274	73,000	425	549,432	434,485
House authorization.....	337,040	54,620	20,000	425	412,085	
Conference recommendation.....	357,373	72,023	68,000	425	497,821	

DETAILED FISCAL YEAR 1976 CONFERENCE COMMITTEE RECOMMENDATION—Continued
[In thousands of dollars]

	Costs	Changes in selected resources	Construction obligations	Capital equipment obligations	Total	Revised administration request
SOLAR ENERGY DEVELOPMENT						
Solar energy buildings and facilities:						
Senate authorization.....	31,600	7,780	0	0	39,380	28,500
House authorization.....	30,885	24,357	0	500	55,742	
Conference recommendation.....	31,600	16,070	0	500	48,170	
Solar thermal:						
Senate authorization.....	11,000	2,200	10,000	0	23,200	17,000
House authorization.....	19,392	19,028	0	750	39,170	
Conference recommendation.....	11,000	10,610	10,000	750	32,360	
Photovoltaic:						
Senate authorization.....	21,000	6,460	0	0	27,460	19,000
House authorization.....	17,239	22,219	0	1,000	40,458	
Conference recommendation.....	21,000	14,340	0	1,000	36,340	
Wind energy conversion:						
Senate authorization.....	15,000	4,500	0	0	19,500	11,500
House authorization.....	12,442	11,925	0	500	24,867	
Conference recommendation.....	13,720	8,210	0	500	22,430	
Bioconversion to fuels:						
Senate authorization.....	6,000	1,600	0	0	7,600	6,000
House authorization.....	4,825	4,174	0	0	8,999	
Conference recommendation.....	5,780	2,890	0	0	8,670	
Ocean thermal energy conversion:						
Senate authorization.....	6,000	1,558	0	0	7,558	3,200
House authorization.....	5,977	9,529	0	0	15,506	
Conference recommendation.....	6,000	5,545	0	0	11,545	
Resource analysis:						
Senate authorization.....	1,500	500	0	0	2,000	3,800
House authorization.....	1,788	2,366	0	0	4,154	
Conference recommendation.....	1,500	1,660	0	0	3,160	
Solar storage:						
Senate authorization.....	0	0	0	0	0	0
House authorization.....	1,788	2,366	0	0	4,154	0
Conference recommendation.....	1,500	1,600	0	0	3,100	
Solar institute:						
Senate authorization.....	5,000	1,650	0	0	6,650	200
House authorization.....	1,887	2,613	0	250	4,750	
Conference recommendation.....	5,000	1,500	0	250	6,750	
Capital equipment not identified to program.....						
Total solar energy:						
Senate authorization.....	97,100	26,248	10,000	0	133,348	89,200
House authorization.....	96,223	98,577	0	3,000	197,800	
Conference recommendation.....	97,100	62,425	10,000	3,000	172,525	
GEOHERMAL ENERGY DEVELOPMENT						
Geothermal energy demonstration:						
Senate authorization.....	0	0	10,000	0	10,000	0
House authorization.....	7,200	15,800	0	0	23,000	
Conference recommendation.....	0	0	10,000	0	10,000	
Resource utilization:						
Senate authorization.....	17,870	-3,070	0	0	14,800	12,600
House authorization.....	18,750	-1,450	0	500	17,800	
Conference recommendation.....	18,750	5,200	0	500	24,450	
Supporting research and development:						
Senate authorization.....	16,000	-687	0	620	15,933	18,790
House authorization.....	11,700	1,270	0	2,620	15,590	
Conference recommendation.....	16,000	3,320	0	2,620	21,940	
Total geothermal energy:						
Senate authorization.....	33,870	-3,757	10,000	620	40,733	31,390
House authorization.....	37,650	15,620	0	3,120	56,390	
Conference recommendation.....	34,750	8,520	10,000	3,120	56,390	
CONSERVATION RESEARCH AND DEVELOPMENT						
Electric power transmission:						
Senate authorization.....	11,830	300	0	1,700	13,830	21,130
House authorization.....	11,830	300	0	1,700	13,830	
Conference recommendation.....	11,830	300	0	1,700	13,830	

DETAILED FISCAL YEAR 1976 CONFERENCE COMMITTEE RECOMMENDATION—Continued

[In thousands of dollars]

	Changes in Costs	Changes in selected resources	Construc- tion obligations	Capital equip- ment obligations	Total	Revised adminis- tration request
CONSERVATION RESEARCH AND DEVELOPMENT—Continued						
Energy storage systems:						
Senate authorization	23,100	5,700	0	750	29,550	
House authorization	22,932	5,318	0	2,600	30,850	14,850
Conference recommendation	23,100	5,700	0	2,600	31,400	
Advanced transportation power systems:						
Senate authorization	18,000	4,420	0	0	22,420	
House authorization	19,000	4,500	0	1,500	25,000	12,940
Conference recommendation	19,000	4,500	0	1,500	25,000	
End-use conservation:						
Senate authorization	31,000	11,300	0	0	42,300	
House authorization	27,000	26,000	0	5,000	58,000	18,100
Conference recommendation	31,000	18,650	0	5,000	54,650	
Improved conversion efficiency: ¹						
Senate authorization	17,350	4,335	0	0	21,685	
House authorization	5,100	1,800	0	700	7,600	4,800
Conference recommendation	12,625	3,000		700	16,325	
Fuel cells:						
Senate authorization	(10,000)	(3,235)			(13,235)	
House authorization	(?)	(?)			(?)	(600)
Conference recommendation	(9,000)	(1,000)			(10,000)	
Urban Waste conversion:						
Senate authorization	30,000	10,000	0	0	40,000	
House authorization	0	0	0	0	0	0
Conference recommendation	10,000	5,000	0	0	15,000	
Total conservation:						
Senate authorization	131,280	36,055	0	2,450	169,785	
House authorization	85,862	37,918	0	11,500	135,280	71,820
Conference recommendation	107,555	37,150	0	11,500	156,205	
PHYSICAL RESEARCH (INCREMENT ONLY)						
Materials sciences:						
Senate authorization	8,500	2,850	0	2,500	13,850	
House authorization	8,500	1,900	0	2,600	13,000	
Conference recommendation	8,500	1,900	0	2,600	13,000	
Molecular sciences:						
Senate authorization	9,500	3,150	0	2,500	15,150	
House authorization	4,950	550	0	1,500	7,000	
Conference recommendation	7,225	1,850	0	2,000	11,075	
Total physical research:						
Senate authorization	18,000	6,000	0	5,000	29,000	
House authorization	13,450	2,450	0	4,100	20,000	
Conference recommendation	15,725	3,750	0	4,600	24,075	
ENVIRONMENT & SAFETY (INCREMENT ONLY)						
Health studies:						
Senate authorization	4,660	1,540	6,800		13,000	
House authorization	1,120	280	0		1,400	
Conference recommendation	4,660	1,540	6,800		13,000	
Environmental studies:						
Senate authorization	12,672	4,203	0		16,875	
House authorization	5,520	1,380	0		6,900	
Conference recommendation	12,672	4,203	0		16,875	
Biological studies:						
Senate authorization	2,240	760	0		3,000	
House authorization	1,140	285	0		1,425	
Conference recommendation	2,240	760	0		3,000	
Physical and analytical:						
Senate authorization	6,928	2,297	0		9,225	
House authorization	3,020	755	0		3,775	
Conference recommendation	6,928	2,297	0		9,225	
General program capital equipment:						
Senate authorization				0	0	
House authorization				2,000	2,000	
Conference recommendation				2,000	2,000	
Total environment and safety:						
Senate authorization	26,500	8,800	6,800	0	42,100	
House authorization	10,800	2,700	0	2,000	15,500	
Conference recommendation	26,500	8,800	6,800	2,000	44,100	

Footnotes at end of table.

DETAILED FISCAL YEAR 1976 CONFERENCE COMMITTEE RECOMMENDATION—Continued

[In thousands of dollars]

	Changes in Costs	Changes in selected resources	Construc- tion obligations	Capital equip- ment obligations	Total	Revised adminis- tration request
ENVIRONMENT & SAFETY (INCREMENT ONLY)—Continued						
Advanced energy systems research supporting activities:						
Senate authorization	6,550	2,600	0	0	9,150	
House authorization	6,550	2,600	0	0	9,150	11,350
Conference recommendation	6,550	2,600	0	0	9,150	
Scientific and technical education:						
Senate authorization	5,000	1,700	0	0	6,700	
House authorization	4,000	1,000	0	0	5,000	0
Conference recommendation	4,500	1,350	0	0	5,850	
CEO, WRC, NBS:						
Senate authorization	3,200	0	0	0	3,200	
House authorization	1,500	0	0	0	1,500	2,750
Conference recommendation	2,750	0	0	0	2,750	
Program support (increment only):						
Senate authorization	10,300	0	0	0	10,300	
House authorization	6,600	0	0	0	6,600	
Conference recommendation	9,000	0	0	0	9,000	

¹ Includes fuel cells.² House authorization for fuel cells included in improved conversion efficiency total.

SUMMARY—TRANSITION PERIOD CONFERENCE COMMITTEE RECOMMENDATION

[In thousands of dollars]

	Changes in Costs	Changes in selected resources	Construc- tion obligations	Capital equip- ment obligations	Total	Revised adminis- tration request
Fossil energy development:						
Senate authorization	76,425	46,625	21,250	200	144,500	
House authorization	61,230	40,850	8,000	200	110,280	113,130
Conference recommendation	69,071	43,279	20,000	200	132,550	
Original ERDA request	58,030	39,300	8,000	200	105,530	
Amount recommended exceeds original ERDA request	11,041	3,979	12,000	0	27,020	
Solar energy development:						
Senate authorization	24,550	9,170	2,500	0	36,220	
House authorization	34,075	14,625	0	0	48,700	26,100
Conference recommendation	24,500	19,203	2,500	0	46,203	
Original ERDA request	14,500	5,900	0	0	20,400	
Amount recommended exceeds original ERDA request	10,000	13,303	2,500	0	25,803	
Geothermal energy development:						
Senate authorization	4,425	2,460	2,500	200	9,585	
House authorization	10,100	3,350	0	200	13,650	7,650
Conference recommendation	10,100	850	2,500	200	13,650	
Original ERDA request	3,050	2,000	0	200	5,250	
Amount recommended exceeds original ERDA request	7,050	-1,150	2,500	0	8,400	
Conservation research and development:						
Senate authorization	32,148	7,795	0	500	40,443	
House authorization	20,873	8,160	0	2,900	31,933	17,740
Conference recommendation	26,798	6,210	0	2,900	35,908	
Original ERDA request	8,083	-250	0	500	8,333	
Amount recommended exceeds original ERDA request	18,715	6,460	0	2,400	27,575	
Physical research (increment only):						
Senate authorization	4,500	1,500	0	1,250	7,250	
House authorization	3,500	900	0	600	5,000	
Conference recommendation	3,931	1,168	0	1,037	6,136	
Environment and safety (increment only):						
Senate authorization	6,625	2,200	0	0	8,825	
House authorization	2,700	675	0	500	3,875	
Conference recommendation	6,625	2,194	0	500	9,319	

SUMMARY—TRANSITION PERIOD CONFERENCE COMMITTEE RECOMMENDATION—Continued

[In thousands of dollars]

	Costs	Changes in selected resources	Construction obligations	Capital equipment obligations	Total	Revised administration request
Advanced energy systems supporting activities:						
Senate authorization.....	1,480	300	0	0	1,780	
House authorization.....	1,480	300	0	0	1,780	2,780
Conference recommendation.....	1,480	300	0	0	1,780	
Scientific and technical education:						
Senate authorization.....	1,250	425	0	0	1,675	
House authorization.....	1,000	250	0	0	1,250	0
Conference recommendation.....	1,125	337	0	0	1,462	
CEQ, NRC, NBS:						
Senate authorization.....	800	0	0	0	800	
House authorization.....	375	0	0	0	375	450
Conference recommendation.....	687	0	0	0	687	
Program support (increment only):						
Senate authorization.....	2,600	0	0	0	2,600	
House authorization.....	1,700	0	0	0	1,700	
Conference recommendation.....	2,250	0	0	0	2,250	
Totals:						
Total Senate authorization.....	154,803	70,475	26,250	2,150	253,678	
Total House authorization.....	137,033	69,110	8,000	4,400	218,543	
Total conference recommendation.....	146,567	73,541	25,000	4,837	249,945	
Total original ERDA request.....	85,143	47,250	8,000	900	141,293	
Total amount recommended exceeds original ERDA request.....	61,424	26,291	17,000	3,937	108,652	

DETAILED TRANSITION PERIOD CONFERENCE COMMITTEE RECOMMENDATION

[In thousands of dollars]

	Costs	Changes in selected resources	Construction obligations	Capital equipment obligations	Total	Revised administration request
FOSSIL ENERGY DEVELOPMENT						
Coal liquefaction:						
Senate action.....	16,000	12,750	8,000	0	36,750	
House action.....	16,000	12,750	8,000	0	36,750	36,750
Conference recommendation.....	16,000	12,750	8,000	0	36,750	
High-Btu gasification:						
Senate action.....	7,450	1,800	5,000	0	14,250	
House action.....	8,700	1,800	0	0	10,500	10,500
Conference recommendation.....	7,450	1,800	5,000	0	14,250	
Low-Btu gasification:						
Senate action.....	5,900	5,500	5,000	0	16,400	
House action.....	7,300	5,350	0	0	12,650	11,400
Conference recommendation.....	7,300	5,350	3,750	0	16,400	
Advanced power systems:						
Senate action.....	2,050	1,450	0	0	3,500	
House action.....	1,300	1,200	0	0	2,500	3,500
Conference recommendation.....	2,050	1,450	0	0	3,500	
Direct combustion:						
Senate action.....	5,100	9,800	3,250	0	18,150	
House action.....	5,100	9,800	0	0	14,900	17,000
Conference recommendation.....	5,100	9,800	3,250	0	18,150	
Advanced research and supporting technology:						
Coal conversion:						
Senate action.....	2,100	1,900	0	0	4,000	
House action.....	2,100	1,900	0	0	4,000	4,000
Conference recommendation.....	2,100	1,900	0	0	4,000	
Direct coal utilization:						
Senate action.....	500	500	0	0	1,000	
House action.....	500	500	0	0	1,000	1,000
Conference recommendation.....	500	500	0	0	1,000	

DETAILED TRANSITION PERIOD CONFERENCE COMMITTEE RECOMMENDATION—Continued

[in thousands of dollars]

	Costs	Changes in selected resources	Construction obligations	Capital equipment obligations	Total	Revised administration request
FOSSIL ENERGY DEVELOPMENT—Continued						
Supporting research:						
Senate action.....	1,400	450	0	0	1,850	
House action.....	1,400	450	0	0	1,850	1,850
Conference recommendation.....	1,400	450	0	0	1,850	
Systems studies:						
Senate action.....	600	1,400	0	0	2,000	
House action.....	1,400	1,600	0	0	3,000	2,000
Conference recommendation.....	1,400	1,600	0	0	3,000	
Demonstration plants:						
Senate action.....	4,100	4,900	0	0	9,000	
House action.....	4,100	4,900	0	0	9,000	9,000
Conference recommendation.....	4,100	4,900	0	0	9,000	
Natural gas and oil extraction:						
Senate action.....	12,930	1,800	0	100	14,830	
House action.....	8,330	600	0	100	9,030	6,530
Conference recommendation.....	9,930	600	0	100	10,630	
Natural gas and oil utilization:						
Senate action.....	500	—50	0	0	450	
House action.....	500	—50	0	0	450	450
Conference recommendation.....	500	—50	0	0	450	
Oil shale in-situ processing:						
Senate action.....	6,240	1,330	0	100	7,670	
House action.....	2,000	—50	0	100	2,050	2,050
Conference recommendation.....	4,241	529	0	100	4,870	
Oil shale composition and characterization:						
Senate action.....	300	0	0	0	300	
House action.....	300	0	0	0	300	300
Conference recommendation.....	300	0	0	0	300	
Magnetohydrodynamics:						
Senate action.....	11,255	3,095	0	0	14,350	
House action.....	2,200	100	0	0	2,300	6,800
Conference recommendation.....	6,700	1,700	0	0	8,400	
Fossil energy totals:						
Senate action.....	76,425	46,625	21,250	200	144,500	
House action.....	61,230	40,850	8,000	200	110,280	113,130
Conference recommendation.....	69,071	43,279	20,000	200	132,550	
SOLAR ENERGY DEVELOPMENT						
Solar energy buildings and facilities:						
Senate authorization.....	7,400	3,535	0	0	10,935	
House authorization.....	9,102	4,905	0	0	14,007	8,400
Conference recommendation.....	7,400	6,617	0	0	14,017	
Solar thermal:						
Senate authorization.....	3,200	600	2,500	0	6,300	5,300
House authorization.....	6,888	2,664	0	0	9,552	
Conference recommendation.....	3,200	2,702	2,500	0	8,402	
Photovoltaic:						
Senate authorization.....	5,650	1,710	0	0	7,360	5,200
House authorization.....	6,901	3,004	0	0	9,905	
Conference recommendation.....	5,650	3,685	0	0	9,335	
Wind energy:						
Senate authorization.....	4,000	1,400	0	0	5,400	3,400
House authorization.....	4,509	1,729	0	0	6,238	
Conference recommendation.....	3,680	2,327	0	0	6,007	
Bioconversion to fuels:						
Senate authorization.....	1,150	850	0	0	2,000	1,700
House authorization.....	1,915	244	0	0	2,159	
Conference recommendation.....	1,095	1,172	0	0	2,267	
Ocean thermal:						
Senate authorization.....	1,500	520	0	0	2,020	900
House authorization.....	2,797	891	0	0	3,688	
Conference recommendation.....	1,475	1,511	0	0	2,986	
Resource analysis:						
Senate authorization.....	400	135	0	0	535	1,000
House authorization.....	553	458	0	0	1,011	
Conference recommendation.....	375	432	0	0	807	
Solar storage:						
Senate authorization.....	0	0	0	0	0	0
House authorization.....	653	358	0	0	1,011	
Conference recommendation.....	375	425	0	0	800	

DETAILED TRANSITION PERIOD CONFERENCE COMMITTEE RECOMMENDATION—Continued

[In thousands of dollars]

	Changes in selected Costs	Construc- tion obligations resources	Capital equip- ment obligations	Total	Revised adminis- tration request
SOLAR ENERGY DEVELOPMENT—					
Continued					
Solar institute:					
Senate authorization.....	1,250	420	0	1,670	200
House authorization.....	757	372	0	1,129	
Conference recommendation.....	1,250	332	0	1,582	
Total solar energy:					
Senate authorization.....	24,550	9,170	2,500	36,220	26,100
House authorization.....	34,075	14,625	0	48,700	
Conference recommendation.....	24,500	19,203	2,500	46,203	
GEOHERMAL ENERGY DEVELOPMENT					
Geothermal energy demonstration:					
Senate authorization.....	0	0	2,500	2,500	
House authorization.....	5,500	300	0	5,800	0
Conference recommendation.....	0	0	2,500	2,500	
Resource utilization:					
Senate authorization.....	1,500	1,800	0	3,300	
House authorization.....	2,100	2,000	0	4,100	3,300
Conference recommendation.....	4,500	400	0	4,900	
Supporting research and development:					
Senate authorization.....	2,925	660	0	3,785	
House authorization.....	2,500	1,050	0	3,750	4,350
Conference recommendation.....	5,600	450	0	6,250	
Total geothermal energy:					
Senate authorization.....	4,425	2,460	2,500	9,585	7,650
House authorization.....	10,100	3,350	0	13,650	
Conference recommendation.....	10,100	850	2,500	13,650	
CONSERVATION RESEARCH AND DEVELOPMENT					
Electric power transmission:					
Senate authorization.....	2,673	-100	0	2,773	
House authorization.....	2,673	-100	0	2,773	5,180
Conference recommendation.....	2,673	-100	0	2,773	
Energy storage systems:					
Senate authorization.....	5,500	980	0	6,780	
House authorization.....	5,400	900	0	7,100	3,220
Conference recommendation.....	5,400	900	0	7,100	
Advanced transportation power systems:					
Senate authorization.....	4,500	1,060	0	5,560	
House authorization.....	4,800	1,010	0	6,210	3,240
Conference recommendation.....	4,750	1,060	0	6,210	
End-use conservation:					
Senate authorization.....	8,000	2,320	0	10,320	
House authorization.....	7,100	6,000	0	14,400	4,900
Conference recommendation.....	8,000	2,000	0	11,300	
Improved conversion efficiency: ¹					
Senate authorization.....	3,975	1,035	0	5,010	
House authorization.....	900	350	0	1,450	1,200
Conference recommendation.....	3,475	1,100	0	4,775	
Fuels cells:					
Senate authorization.....	(2,575)	(615)	(0)	(3,190)	
House authorization.....	(?)	(?)	(0)	(?)	0
Conference recommendation.....	(2,575)	(615)		(3,190)	
Urban waste conversion:					
Senate authorization.....	7,500	2,500	0	10,000	
House authorization.....	0	0	0	0	0
Conference recommendation.....	2,500	1,250	0	3,750	
Total conservation:					
Senate authorization.....	32,148	7,795	0	40,443	
House authorization.....	20,873	8,160	0	29,000	17,740
Conference recommendation.....	26,798	6,210	0	35,908	

DETAILED TRANSITION PERIOD CONFERENCE COMMITTEE RECOMMENDATION—Continued

[In thousands of dollars]

	Changes in selected Costs	Construc- tion obligations resources	Capital equip- ment obligations	Total	Revised adminis- tration request
PHYSICAL RESEARCH (INCREMENT ONLY)					
Materials sciences:					
Senate authorization.....	2,125	705	0	625	3,455
House authorization.....	2,200	600	0	400	3,200
Conference recommendation.....	2,125	705	0	625	3,455
Molecular sciences:					
Senate authorization.....	2,375	795	0	625	3,795
House authorization.....	1,300	300	0	200	1,800
Conference recommendation.....	1,806	463	0	412	2,681
Total physical research:					
Senate authorization.....	4,500	1,500	0	1,250	7,250
House authorization.....	3,500	900	0	600	5,000
Conference recommendation.....	3,931	1,168	0	1,037	6,136
ENVIRONMENT AND SAFETY (INCREMENT ONLY)					
Health studies:					
Senate authorization.....	1,165	385	0		1,550
House authorization.....	280	70	0		350
Conference recommendation.....	1,165	385	0		1,550
Environmental studies:					
Senate authorization.....	3,168	1,057	0		4,225
House authorization.....	1,380	345	0		1,725
Conference recommendation.....	3,168	1,051	0		4,219
Biological studies:					
Senate authorization.....	560	185	0		745
House authorization.....	285	71	0		356
Conference recommendation.....	560	185	0		745
Physical and analytical:					
Senate authorization.....	1,732	573	0		2,305
House authorization.....	755	189	0		944
Conference recommendation.....	1,732	573	0		2,305
General program capital equipment:					
Senate authorization.....			0		0
House authorization.....			500		500
Conference recommendation.....			500		500
Total environment and safety:					
Senate authorization.....	6,625	2,200	0	0	8,825
House authorization.....	2,700	675	0	500	3,875
Conference recommendation.....	6,625	2,194	0	500	9,319
Advanced energy systems research supporting activities:					
Senate authorization.....	1,480	300	0	0	1,780
House authorization.....	1,480	300	0	0	1,780
Conference recommendation.....	1,480	300	0	0	1,780
Scientific and technical education:					
Senate authorization.....	1,250	425	0	0	1,675
House authorization.....	1,000	250	0	0	1,250
Conference recommendation.....	1,125	337	0	0	1,462
CEQ, WRC, NBS:					
Senate authorization.....	800	0	0	0	800
House authorization.....	375	0	0	0	375
Conference recommendation.....	687	0	0	0	687
Program support (increment only):					
Senate authorization.....	2,600	0	0	0	2,600
House authorization.....	1,700	0	0	0	1,700
Conference recommendation.....	2,250	0	0	0	2,250

¹ Includes fuel cells.² House authorization for fuel cells included in improved conversion efficiency total.

C. DISCUSSION OF SELECTED PROVISIONS

Section 101(a)(1)(H)—Natural Gas and Oil Extraction

The Conference Committee authorization for natural gas and oil extraction represents an increase in the House bill of \$6.5 million and a decrease in the Senate amendment of \$16.8 million for fiscal year 1976. The \$6.5 million for fiscal year 1976 and \$1.6 million for the transition period is added to fund additional projects in gas stimulation in Devonian shale. The increase will provide funding for additional resource appraisal work and one additional massive hydraulic fracturing test in Devonian shale, and represents an addition to the \$7 million already available for natural gas stimulation in both Devonian shale and Rocky Mountain formations.

Section 101(a)(1)(L)—MHD

The original ERDA request of \$15,844,000 for work in magneto-hydrodynamics was subsequently revised by ERDA and a request for \$35,344,000 was submitted. The House authorized \$15,844,000 and the Senate amendment authorized \$76,243,000. The Committee of Conference agreed to recommend a fiscal year 1976 authorization of \$34,500,000 and a transition period authorization of \$8,400,000, for a total of \$42,900,000. This amount represents a total increase of \$7,556,000 over the amended ERDA request.

These increased funds for the MHD program will be used to increase work in the program categories of Preliminary Testing and Component Development. For the Preliminary Testing category \$3.8 million will be used to (1) inaugurate design and construction of two superconducting magnets to be used to study basic high-field generator phenomena and (2) conduct basic engineering rig tests on arc mode current transport to electrodes and how to optimize electrode design to prevent damage to the electrodes by electric arc action.

For the Component Development category \$3.8 million will be used to accelerate the effort on the Component Development and Integration Facility. The funds will be expended on both the basic facility and on additional effort on test equipment to be utilized in that facility.

Section 101(a)(2)—Solar Programs

The Conferees recognize that the large increases above the Administration request approved for the solar energy programs introduce uncertainties in the program plans. They have, at the same time, provided significant management flexibility, subject to the "fully and currently informed" requirements under which ERDA keeps Congressional committees informed. The Conferees note, for example, that concepts alternative to the central receiver plan for solar thermal electric power generation—such as fixed mirror distributed focus systems—may be more attractive for small and rural communities. Similarly, solar heating and cooling systems utilizing air as a heat transfer medium may be more attractive than alternative liquid systems in many cases.

Section 101(a)(2)—Ocean Thermal Energy Conversion

The Senate amendment required that \$6 million of the total authorized for the solar program would be available for ocean thermal

energy conversion. No comparable provision was included in the House bill, but it included \$15,506,000 for such research. The conference recommendation provides a total of \$11,545,000 for ocean thermal energy conversion. This authorization includes \$6 million in costs and \$5,545,000 changes in selected resources. The continued high level of funding for ocean thermal energy conversion is intended to indicate the strong support of the conferees for this program.

Section 101(a)(4)—Fuel Cells

The fuel cell program will be managed entirely within the ERDA program called "Improved Conversion Efficiency" under the Assistant Administrator for Conservation. Of the total amount authorized in this program, the conference recommendation provides that \$10 million shall be available for an expanded Federal effort in fuel cell technology. The conferees are informed that \$8.9 million would be utilized for the initiation of a fuel cell demonstration powerplant, utilizing as a fuel source natural gas or naphtha. In addition, \$1 million would be used for general research and development in the use of clean fuels and \$100,000 for work with coal-derived fuels.

Section 101(a)(4)(f), (Sec. 103), Sec. 17(a)(b), and Section 201(a)(4)(f)—Urban Waste Conversion

The Senate amendment included a separate line item for research, development and demonstration in Urban Waste Conversion under the Assistant Administrator for Conservation. The House bill had no specific amount for this purpose, although Urban Waste Conversion has been a part of the bioconversion activity of the Solar Energy Program in the past. The Fiscal Year 1976 Senate figure of \$40 million was reduced to \$15 million in the Conference recommendation.

The Conferees recognize the potential for overlap with the programs of other agencies not only for the Urban Waste Conversion program subject to direct funding, but also for the loan guaranties which may be implemented through Section 103.

It is the intent of the Conferees that this ERDA Urban Waste Conversion program be carefully coordinated with other Federal agencies, the EPA in particular. At the present time EPA has the major responsibility in this area. EPA provides significant budget assistance to states and local governments for construction in current state-of-the-art urban waste conversion facilities. The ERDA program is not intended to needlessly duplicate this EPA function but rather to emphasize the need for developing urban waste conversion technology in the context of the nation's energy needs. At the present time solid waste represents not only a costly disposal problem and an environmental insult, but also is an important under-utilized source of energy. ERDA's research and development programs must be coordinated through agreements between ERDA and EPA consistent with Congressional policies contained in the Solid Waste Disposal Act and ERDA's legislative authorities.

It is not the intent of the Conferees to impinge on the current EPA program. Rather, we expect that the relative roles of ERDA and EPA will be decided within the Executive Branch through inter-agency agreements and coordination. The Conferees expect that unnecessary duplication and overlap in this extremely important pro-

gram will be minimized through close cooperation between the two agencies during the period such an interagency agreement is pending. It is hoped that such an agreement will be reached as soon as feasible. The Conferees feel that ERDA should work closely with EPA in those areas where EPA has special expertise, including, if desirable, the assigning of program management responsibility to EPA by interagency agreement, in order to take advantage of the EPA experience.

Section 101(a)(5)(F)—Authorization for NBS, WRC and CEQ

The Senate bill authorized \$1.7 million for the Energy-Related Inventions Evaluation Program conducted by the National Bureau of Standards and \$500,000 for the Council of Environmental Quality (CEQ) and \$1 million for transfer to the Water Resources Council (WRC). The House bill contained no comparable provision. The conference report provides \$1,250,000 for the National Bureau of Standards' program, \$500,000 for CEQ, and \$1 million for the WRC. Funds transferred to the CEQ and WRC are authorized on a continuing basis by Section 16 of the Federal Nonnuclear Energy Research and Development Act. The conference agreement does not change that provision in any way.

Section 101(b)(1)—Demonstration Plants for Fossil Fuels

The House bill did not contain funding in the plant and capital equipment subsection for the demonstrations included separately in the Senate bill. The conferees accepted the Senate language for the demonstration of high-Btu gasification, \$20,000,000; of low-Btu gasification, \$15,000,000; and for fluidized bed of \$13,000,000.

Section 101(b)(1)—Low-Btu Combined Cycle Demonstration Plant

The Senate bill provided \$5 million for plant and capital expenditures for a low-Btu combined cycle plant and an expenditure of \$1.250 million for the transition period. The Conference Committee deleted this item from the bill based on advice from ERDA that design work has not yet been undertaken and that a plant and capital equipment authorization at this time would be premature.

It is hoped that by the time of the next budget cycle that ERDA will be in a better position to request funds for such a project.

Section 101(b)(3)—Geothermal

The Senate amendment contained provisions authorizing two geothermal powerplant demonstration projects; one to be located at Raft River, Idaho, and a second to be located at Buffalo Valley, Nevada. The House bill, while authorizing funds for demonstration projects, did not designate specific locations. Specific locations were included in the Senate amendment because the geothermal division of the Atomic Energy Commission, later incorporated into ERDA, requested capital funds for geothermal powerplants for on-going programs in Idaho and Nevada prior to the budgetary review process. In addition, the Senate Interior Committee has conducted public hearings on the Raft River Project on two separate occasions, the most recent hearing conducted in Idaho on October 17, 1975.

While expressing strong support for a demonstration scale project such as that proposed for Raft River, the conference agreed to authorize two geothermal powerplant demonstrations without designating specific sites.

The Conferees feel that ERDA should choose the best sites for these and all other demonstration projects. However, the Raft River Project is one of the leading candidates, and is particularly attractive because both private and public entities have already actively participated with ERDA in developing this geothermal resource. In addition, the local electric cooperative as well as other public power entities will require additional power needs in the future and which a successful demonstration powerplant facility could provide much needed information to help meet those demands.

The Conferees agree that at least one of the geothermal powerplants authorized should utilize a geothermal resource with characteristics including medium temperature (below 300 degrees F.) and low salinity, typical of that found in areas of recent volcanic geologic activities such as those associated with observed geothermal phenomena in the northwestern United States. Such a resource is not now proven technologically and is a primary reason why the conference emphasizes the need to demonstrate its practical utilization.

Section 101(b)(11)—Inhalation Toxicology

The Senate authorized \$6,800,000 for construction of research facilities for inhalation toxicology at the Lovelace Foundation. The Conferees were subsequently advised that the Administrator has proposed new work at several ERDA facilities to improve the agency's capability to conduct work on inhalation toxicology. The Conferees feel that ERDA should have the flexibility to decide the particular location for use of this increase in funding.

Section 102—In Situ Oil Shale Demonstration on Public Lands

The purpose of section 102 is to expedite the demonstration of technologies for the *in-situ* production of oil from shale in commercial amounts and with sufficient Federal participation in design and monitoring of the demonstration to assure credible evaluation of the results.

The environmental impacts of extensive oil shale development using mining and above-ground retort processes appear to present formidable problems. The disposal of voluminous solid waste products and the collection and disposal of waste water used for material handling are major considerations.

The *in-situ* process offers the possibility of greatly reducing the volumes of material mined and disposed of and virtually eliminating waste water disposal problems. It would also reduce to negligible amounts the water resource demands for oil shale production. But it has not been demonstrated on a large scale and it may also present some unknown serious problems.

In view of the profound public policy questions raised by the potential development of oil shale, an evaluation of the potential for *in situ* development is urgently required. Thus far, private experiments and the incentives of the Federal leasing program have not resulted in activities adequate to evaluate the viability of commercial-scale *in situ* processing.

One requirement for any such undertaking will be a suitable resource base. A second requirement would be sufficient involvement by the Administrator of ERDA in the design of experiments and the monitoring of results to insure credible evaluation of the viability of the *in situ* process as a basis for public policy decisions.

Over three-fourths of the oil shale resource is located on the Federal lands. The opportunity exists, therefore, to propose a cooperative venture in which the Federal participation would include making available for lease a tract of shale suitable for *in situ* development.

Section 102, recommended by the Conferees, authorizes the Administrator of ERDA in consultation with the Secretary of the Interior to select an appropriate tract of public land for an *in situ* oil shale demonstration. The Administrator shall then invite proposals from non-Federal participants to enter into a cooperative arrangement for the demonstration. As a part of the agreement, the Federal government shall lease the oil shale tract to the non-Federal participant without payment of any bonus and without payment of any rents or royalties during the demonstration period. However, any profits accruing from the sale of oil produced during the demonstration phase shall be divided between the Federal Government and the participant in proportion to the value of the contribution of each to the demonstration. The Federal Government's share will be deposited into miscellaneous receipts of the Treasury. During the demonstration, ERDA will administer the lease.

At the conclusion of the demonstration, as determined by ERDA, should the non-Federal participant choose to continue commercial production on the tract, a lease would be issued by the Secretary of the Interior under the Mineral Leasing Law, except that the lease shall provide for profit sharing to the extent that the value of the Federal contribution to the demonstration, including bonus payments and royalties forgone, warrants such payments in excess of usual royalties. Such payments are to be treated as royalties for the purposes of 30 U.S.C. 191.

Provisions are included in Section 102 for State and local governmental consultation, approval of the Governor, and social impact aid assistance similar to those of Section 103.

The Conferees want to emphasize the need for diligent development during and after the demonstration period. Section 102 requires that the lease contain effective provisions toward that end, including provisions for termination of the lease whenever the Secretary of the Interior determines that the lessee is not acting diligently. Frequent criticisms heard by the Conferees during consideration of this section were that Interior's present lease provisions requiring diligence through the use of credits and development plans were not adequate to avoid speculation and encourage early production. Under Interior's prototype oil shale leasing program, the lessee can delay submission of an acceptable development plan for over five years after the lease is issued and even then delay is only "ground" for termination if Interior "so elects."

The Conferees expect that the lease, in the case of Section 102, will require an effective development plan as part of the cooperative agreement with ERDA for the demonstration period and another one for commercial development at the end of the demonstration. If the plans are not acceptable, the lessee should be given a brief period to try to meet objections, but not a year or more as is the case in the prototype program. If a plan is still unacceptable to Interior and ERDA, then the lease should be terminated consistent with existing administrative review procedures.

The lease terms and the cooperative agreement will be the subject of Congressional review under subsection (e) of Section 102.

Section 103—Loan Guarantee Program for Commercial Demonstration Facilities

The Senate amendment included a new section authorizing loan guarantees for up to 75% of the cost of construction and operation of commercial-sized demonstration plants to convert coal and oil shale into synthetic fuels and to generate power or heat in commercial quantities utilizing as their energy source, direct solar, wind, ocean thermal gradient, bioconversion, or geothermal resources. The amendment authorized loan guarantees aggregating \$6 billion for this new program. The House bill had no similar provision.

The Conferees recommend a revision of the Senate amendment to add a new Section 17 to the Federal Nonnuclear Energy Research and Development Act of 1974. The new Section 17 limits the guarantees to construction and start-up costs.

The Conferees agree that such a loan guarantee program is needed to initiate a meaningful commercial scale demonstration of promising energy conversion technologies and to generate essential information. A primary objective is to gather data about the technological, economic, environmental, and social costs, benefits, and impacts of these plants.

The Conferees observe that many profound public policy decisions turn upon the viability of replacing imported energy with synthetic fuels created from domestic resources. In the absence of the experience and information which would be provided by the demonstrations assisted by these programs, these decisions will have to be made with inadequate information about their economic viability, their effect on our environment, and their impact on communities and States. This proposal gives the public, through ERDA, the States, local political subdivisions, and Indian Tribes, a say in how, when, and where the first of these plants will be built. With the information gained from these first plants, industry and government at all levels can better plan how, when, and where others will be built.

Section 17(b)(1)(A)—Size of Oil Shale Demonstration Plants

The new section 17(b)(1)(A) includes a proviso that directs ERDA to review carefully applications for loan guarantees to build oil shale commercial demonstration facilities to insure that such demonstration facilities are no larger than actually necessary to demonstrate commercial viability of the technology. Recent hearings by the House Science and Technology Committee have indicated that a full-scale commercial size facility may not be necessary initially to prove the viability of the technology and other factors. It has been suggested that a modular facility may be adequate. The Conferees do not adopt or reject that suggestion, but expect ERDA to examine the matter. The language gives ERDA adequate flexibility to approve whatever facility is reasonable.

The Conferees note that the Administrator's judgment as to the size of the facility would be subject to judicial review under existing law.

Section 17(b)(1)—Geothermal Energy

Loan guarantees for the commercial development of geothermal energy resources will be carried out pursuant to Title II of Public

Law 93-410, the Geothermal Energy Research and Demonstration Act of 1974. Unlike Section 103, which applies only to commercial demonstration facilities, Public Law 93-410 provides for loan guarantees for the purposes of:

- (1) The determination and evaluation of the resource base;
- (2) Research and development with respect to extraction and utilization technologies;
- (3) Acquiring rights in geothermal resources; or
- (4) Development, construction, and operation of facilities for the demonstration or commercial production of energy from geothermal resources.

The following paragraphs and subsections of Section 103 do apply to geothermal loan guarantees. These paragraphs and subsections bring the geothermal loan guarantee program and the loan guarantee program of Section 103 into conformity in a number of important aspects:

- (b) (1) Removes the limits of \$25 million per project and \$50 million per borrower.
- (b) (2) Relates to information supplied to the Administrator by an applicant for a loan guarantee.
- (b) (4) Explicitly pledges the full faith and credit of the United States to the guarantees.
- (g) (2) Provides the Administrator with flexibility to provide for the completion and operation of projects in default, if such continuation is in the public interest.
- (h) Authorizes the Administrator to pay the lender principle and interest payments if it is in the public interest to prevent default.
- (j) Provides authority for the Administrator to collect fees for loan guarantees to cover the applicable administrative costs and probable losses, but not to exceed 1% in any one year of the outstanding indebtedness.
- (n) Provides that the geothermal resources fund may have funds made available to it by notes issued by the Administrator to the Secretary of the Treasury.
- (v) Provides that information obtained shall be available to public, except where ERDA determines it to be confidential.

Proposed regulations implementing the geothermal loan guarantee program under Public Law 93-410 have been published on October 28, 1975 (40 F.R. 50100). The Conferees intend and expect that the modifications required by Section 103 will not delay promulgation of regulations. This will permit the Geothermal Loan Guarantee Program to be implemented expeditiously.

Section 17(b) (1)—Utilization of Loan Guarantee Authority

Section 103 authorizes a loan guarantee program to assist in the financing of commercial demonstrations of a variety of energy technologies. The total commitment of outstanding guarantees authorized in this measure is limited to \$6 billion. The division of this amount among the various technologies has not been included in the bill or arrived at by the Conferees with two exceptions. The total amount included within the \$6 billion for loan guarantees in support of social impact assistance to local communities is limited to \$350 million.

Additionally, the Conferees agreed to retain a provision of the Senate version of the measure stating "that up to \$2,500,000,000 of guarantees shall be available for projects to produce high-Btu gaseous fuel compatible for mixture and transportation with natural gas by pipeline."

The Conferees note that the amount of \$2,500,000,000 is a ceiling on the amount to be devoted to high-Btu gas demonstrations, and not a minimum. It was, however, the sense of the conference, as it had been of the Senate committee, to assign a priority to demonstrations of the synthetic production of pipeline quality gas. The advanced state of technology for coal gasification coupled with the critical shortages of natural gas facing many portions of the nation makes the demonstration of viable synthetic gas production technologies an important objective of the Federal research, development and demonstration program.

The Conferees also point out that the scope of the loan guarantee program is not coincident with the scope of the synthetic fuels program which has been outlined by the President's synthetic fuels task force. While the measure provides latitude for the Administrator to apportion the loan guarantees among technologies and to respond to available proposals, the conferees expect the Administrator aggressively to seek and entertain proposals for demonstrations of a full range of technologies. The Administrator will have to make a particular effort to obtain proposals in the less conventional technologies where well established industries do not exist and where the types of potential demonstrations are not widely known.

The Administrator should make a special effort to explore the potential for demonstrations using lignite, peat, and lesser known fossil fuels as an energy source, to demonstrate commercial solar energy applications, and to demonstrate the use of waste products for energy production. This high priority should also extend to significant demonstrations of industrial energy conservation equipment and facilities, since economic energy conservation measures are perhaps the most environmentally attractive technological frontier today. Further implementation of the geothermal loan guarantee program established by Public Law 93-410 is expedited by incorporation of certain parts of this section.

Section 17(b) (1)—Limitation on Indebtedness

The limitation on outstanding indebtedness guaranteed refers to the total liability or fiscal exposure which may be assumed by ERDA under this section in the event that all the outstanding obligations are defaulted.

Section 17(b) (1) (B)—Renewable Resources

Subsection 17(b) (1) (B) authorizes the Administrator to provide loan guarantee assistance in financing the construction and start-up costs of commercial demonstration facilities that will produce, from various renewable energy resources, commercial quantities of desirable forms of energy. Renewable energy resources are generally considered to be all direct and indirect forms of solar energy, as well as tidal energy. These have the characteristic that they are usually replaced

by natural means within a time span on the order of one or two generations. Such resources include but are not limited to direct solar, wind, ocean thermal gradients, biomass grown purposefully for recovery of energy values, and wastes of all types, such as urban, industrial, agricultural, and forestry wastes. Desirable forms of energy include but are not limited to synthetic fuels, direct heat, electricity, low-grade heat, ammonia, and recycled materials originally produced by methods which consume significant amounts of energy.

Section 17(b)(3) and (k)(2)—Treasury to Act Promptly

This subsection was adopted to assure that the loan guarantees are administered with the concurrence of the Secretary of the Treasury so as to minimize the impact on the money market and coordinate these efforts with other Administration programs which affect fiscal policy. It is expected that the Secretary of the Treasury will act promptly so that the concurrence will not delay the implementation of this program and that the Secretary will exercise special care that smaller projects will not be delayed.

Section 17(c)—Competition

Subsection (c) requires that the Administrator have due regard for competition in carrying out loan guarantees. The Conferees are concerned that concentration in the energy business not be further aggravated through Federal loan guarantees. The Administrator is expected to be sensitive to this concern. The Conferees note as well that by-products from a commercial demonstration may have value comparable to the primary product. It is expected that the Administrator will consider these significant by-products when giving due consideration to the maintenance of competition.

Section 17(c)(1)—Financial Participation

The Senate amendment referred to financial participation by private lenders or investors and referenced approval of application for a guarantee by the Secretary of the Treasury. In order to permit the utilization of the Federal Finance Bank, where appropriate, as authorized by the Federal Finance Bank Act of 1973 (Public Law 93-224, 12 U.S.C. 1281), the reference to "private lenders or investors" has been deleted.

Section 17(c)(2)—Project Costs

The Senate amendment authorized ERDA to make guarantees for up to 75% of the total project cost of each facility. It added that during the period of construction this guaranteed amount could exceed this percentage limit until construction is completed as determined by ERDA. Thus, the guarantee could be as high as 100% during construction.

The Conference recommendation is to retain the 75% limitation and to authorize a higher percentage during construction and the start up period but limit this to a maximum of 90%. The conferees emphasize that ERDA must require in the regulations or each guarantee agreement that the total guarantee of the facility when construction and start up ends and commercial operation begins as determined by ERDA does not exceed 75%. The Conferees want to make it clear that at all times the borrower will have a substantial and meaningful

equity in the facility so that the risk will be shared. ERDA will have to examine the form of equity to insure compliance with this intention of the conferees.

The Conferees considered and rejected a provision to exclude from project costs for the purposes of loan guarantees the value of certain payments made to the United States such as bonuses, royalties, and rents. It is the intent of the Conferees, however, that the value of any Federal facilities, property, or other consideration which in certain situations might be made available for use in any demonstration project be excluded from project costs unless the Federal Government has, in fact, been paid the value of such facilities, property, or considerations by the parties financing the project.

Section 17(d)—Competitive Impact

Noting concern about the competitive impact of each commercial demonstration facility, the Conferees included in the new section 17 of the Federal Nonnuclear Energy Research and Development Act of 1974 provisions for consideration of this problem.

In subsection (c) ERDA must consider the need for competition in making loan guarantees.

In subsection (d), ERDA is required to solicit from the Attorney General and the Chairman of the Federal Trade Commission written views, comments, and recommendations concerning the impact of each proposed loan guarantee on competition and concentration in the energy supply industry. ERDA must do this in a timely fashion, but at least 60 days before ERDA sends its report on the proposed guarantee to Congress under subsection (m).

The Conferees expect that Justice and the FTC will act in timely fashion and provide their comments, etc., to ERDA so that ERDA can act upon them and the two Congressional committees can consider them also. In this regard, the Conferees intend that the FTC act expeditiously using its Bureau of Competition in reviewing each guarantee. It is expected, however, that each agency will give serious and meaningful attention and provide a comprehensive and adequate response, including, where appropriate, recommendations. The Conferees note that such recommendations could possibly include suggestions for improving a guarantee contract to overcome any anti-competitive or other problem that may exist.

The Conference Committee in its deliberation on this section emphasized that the Administrator carefully review the effect of approving a loan guarantee on the continued concentration of ownership in existing energy companies, particularly the integrated companies. The Administrator in carrying out the purpose of this section is urged to give appropriate priorities to those applicants for guarantees whose ownership is held by independent users of oil, coal or natural gas.

Section 17(e)(1)—State Review

The new Section 17(e)(1) of the 1974 Act provides that once ERDA has ascertained, after reviewing applications for loan guarantees and determining which are capable of being approved, where a proposed demonstration facility is likely to be located, ERDA must promptly notify the appropriate State and local governmental officials. Before ERDA can approve any such application, however, ERDA must give

the Governor of the State where the facility will be located an opportunity to make a recommendation thereon. For the Governor to act effectively and in a timely manner, ERDA and the applicant will have to provide to the State sufficient data on which the Governor can make an informed judgment.

If the Governor recommends against making the guarantee for the facility, the ERDA must refrain from doing so unless the Administrator finds that there is an overriding national interest and sets forth his reasons for this finding in writing to the Governor. Clearly, if ERDA seeks to override the Governor, the burden is on ERDA to show that this particular facility is indeed in the national interest.

The ERDA decision is subject to judicial review filed within 90 days after the decision.

Provision is also made for ERDA regulations concerning review by States and communities which may be impacted by the facility in any way and by the general public. These regulations must be published within 180 days after enactment.

Section 17(g)(2)—Disposal of Property in Case of Default

In the event of default, the Administrator is provided with the authority to complete the project, maintain the facility, operate the facility, including purchase of necessary feedstock and other material, and the authority to sell the products or energy produced by the facility. Such operation may be by the Federal Government or by other parties or by the defaulting borrower, where the Administrator determines that permitting the borrower to continue pursuing the purposes of the facility is in the public interest.

Section 17(g)(4)—Disposition of Patents on Default

Section 17(g)(4) provides that "patents and technology resulting from the commercial demonstration facility shall be treated as project assets of such facility in accordance with terms and conditions of the guarantee agreement." The purpose of this provision is to make clear that in the event of default intangible assets such as patents and technology are subject to claim by the United States in the same manner as tangible, physical assets. The term technology is intended to be all-inclusive and embrace such items as know-how and trade secrets. Patents and technology may well be extremely valuable assets of a defaulted project, and should be available to the United States upon default.

The phrase "in accordance with the terms and conditions of the guarantee agreement" is not intended to eviscerate this provision. Rather, it is a direction that ERDA should include in the guarantee agreement detailed provisions protecting the rights of the United States and other interested parties. At the same time the conferees appreciate that ERDA must have some flexibility to sort out the rights of all interested parties. This is merely a recognition of the complexities and subtleties attendant to patent and technology rights.

The typical project participant may well own some patents and technology outright while being the licensee of other such rights. One of the government's objectives upon default is to have available, for itself and its designees, the patents and technology necessary to complete and operate the defaulting project. The mixture of owned and

licensed patents and technology complicates the simple achievement of this goal.

Another complexity of the disposition of patents and technology upon default is the problem of severing the borrower's background patents and technology from subsequent improvements thereon because of the project. If the improvements are severable, then they can be treated as project assets in a straightforward manner. However, where this is not possible, ERDA must have the flexibility to tailor its guarantee agreement to meet its needs for the continued operation of the project.

Section 17(g)(4) also provides that "the guarantee agreement shall contain a provision specifying that patents, technology, and other proprietary rights which are necessary for the completion or operation of the commercial demonstration facility shall be available to the Government and its designees on equitable terms, including due consideration to the amount of the Government's default payments." The purpose of this authority is to insure that the full complement of patents and technology required for the limited purpose of completing and operating the defaulting project will be available to the government and its designees. Without this provision, it is conceivable that blocking patents and technology of the project participant or patents and technology licensed to the project participant by others might frustrate the ability of the United States or its designee to expeditiously and economically complete the project.

Waivers under Section 17(r) of this Act are not intended to override the applicability of section 17(g)(4) and should be made subject to its provisions.

Section 17(k)—Community Impact Assistance

The Conferees were concerned, based on extensive testimony before the House Science and Technology Committee in September and October of this year, that the construction of commercial demonstration facilities would result in a sudden influx of construction workers, operating personnel, support personnel, and secondary (service) workers and their families. In unanticipated and unplanned circumstances, rapid increases in population can have adverse socioeconomic impacts on a community. In many cases, such adverse effects can be avoided with adequate planning and early construction of public service systems (schools, roads, health care facilities, etc.) and housing.

Under normal circumstances, however, many communities and local governments, even those in more populated areas, probably cannot build the public service system until after the housing has been built and people move in, creating an additional tax base to pay the cost of public services and facilities. The avoidance of these potential adverse effects requires either a slow growth rate—which is not possible, once work on the demonstration facility begins—or some means of financing the construction of needed public service systems in advance of population increase and tax-base growth.

As was made clear in the report of the Senate Committee on Interior and Insular Affairs (page 87), the Senate intended that energy facilities which are assisted by loan guarantees by this measure should provide for the early financing and construction of public service facilities as a part of the cost of demonstrating the energy technology. The

Conferees agreed that existing Federal programs are not adequate in some potential instances to provide for the impacts to local communities which would arise from implementation of the loan guarantee program. The Conferees have provided in subsection (c) of the new section 17 which is added to the Federal Nonnuclear Energy Research and Development Act of 1974 by this conference report that the borrower and the Administrator of ERDA, as well as State and local governmental officials, consider and evaluate these potential impacts before approving a guarantee, and that the Administrator determine that adequate financing of the costs of needed public facilities will be provided for.

The provisions of the conference report amplify and make explicit the intent of the Senate version that the Administrator of ERDA shall assure adequate financial support for local communities to provide essential public facilities required as a direct result of the construction and operation of energy demonstration facilities assisted by loan guarantees. Subsection (b) of the new Section 17 sets forth several alternative forms of assistance to cover essential capital expenditures directly resulting from the proposed commercial demonstration facility for facilities including, but not limited to, public safety, health, education, roads, sewer and water.

First, the subsection authorizes ERDA to extend up to a maximum of 100% guarantees of a local community's obligations for financing such essential public facilities or of the tax revenue stream which is expected from the new commercial demonstration facility. In the former case, the Administrator would guarantee the obligations issued by State, local jurisdictions or Indian Tribes to finance essential public facilities. In the second situation, the Administrator would guarantee to the community the amounts of anticipated tax revenues from the energy demonstration facility. Such revenues could then become a reliable basis for municipal borrowing.

A provision has been included in subsection (s) to make clear that interest paid to a holder of a community's obligations which are guaranteed under the provisions of this measure not be exempt from income taxes. This provision is also designed to make it clear that the conferees are not changing or requiring a community to change the status or type of obligation it issues, but that the holder of the obligation must include the interest arising from the obligation as taxable income.

Because such a provision may result in a higher interest rate upon municipal securities issued by a community, the conferees have provided that ERDA shall pay an interest differential to the community. The amount of the differential will be determined by Treasury. The conferees intend that Treasury have discretion respecting the amount of the differential, the terms and timing of payments, and as to such other conditions as Treasury deems appropriate. An estimate of any such differential payments should be included in the report to Congress required under subsection (m) concerning each guarantee.

The conferees have established a ceiling of \$350 million as the maximum outstanding obligation due to guarantees by the Administrator of financing for community development. This amount would be included within the total authorization of \$6 billion established for

outstanding obligations to guarantee financing of energy demonstration facilities under this measure. The limitation on the amount of impact assistance which, in the form of guaranteed obligations or the guarantee of the payment of taxes, refers to the principal amount of the obligations involved and not the interest charges on such obligations.

As a further alternative form of community assistance, the entity financing an energy demonstration facility with assistance under this measure could be required by the Administrator to include capital costs for essential public community facilities within the project costs. The funds would then be made available to appropriate public entities under terms and agreements prescribed by the Administrator. payments would be treated as advances on taxes and tax credits would be provided by the public entities to the project to return the amounts over the life of the project.

Additionally, and only if circumstances make the previous approaches impractical or inadequate, the Administrator would be authorized to make direct loans to communities to cover the costs of essential public facilities and to forgive all or part of the repayment of such loans if changes in circumstances, such as failure or partial failure of the demonstration, make repayment by the community from revenues impossible.

A least favored approach is also provided to be used only where the lack of community or other public capability to administer the initial provision of community facilities would necessitate direct construction of community facilities as ancillary facilities of the demonstration itself. The costs of the community facilities would be included within the costs of the demonstration facility and the entity proposing the demonstration would arrange for construction of community facilities under the Administrator's direction and with the greatest possible local public participation.

The Administrator is authorized to provide planning grants to impacted communities to finance up to 100% of the planning of essential public facilities.

Funds for planning grants and loans will be authorized in future annual authorization Acts as required in the way funding for all other ERDA programs is provided.

The community assistance program is also extended to any commercial demonstration of in situ shale oil production which may be undertaken pursuant to the authority granted in Section 102 of this measure.

The conferees noted that the determination by the Administrator of the need for community assistance is to be predicated upon the projected net adverse impacts of the facility on the community, the actual anticipated requirement for essential public facilities made necessary directly as a result of the energy demonstration facility, and the lack of capability for financing such facilities in the absence of assistance taking into account other State and Federal programs. Population increase alone is not to be the measure of need.

The Administrator is expected to work closely in consultation with the impacted States, local governments and public groups in developing an appropriate community assistance program for each situation.

The Administrator, furthermore, is expected to coordinate other applicable Federal assistance programs to avoid duplication and to assist in bringing the full benefits of the programs into effect in each situation.

Section 17(m)—Congressional Oversight

The new section 17(m) provides that before ERDA finally makes a binding commitment to guarantee, or a guarantee of, obligations to any borrower to build a commercial demonstration facility, ERDA must transmit to the House Science and Technology Committee and the Senate Interior and Insular Affairs Committee a complete report on the proposed guarantee and facility.

Each report should be quite detailed. For example, it should include a description of the proposed facility, the expected total costs and benefits, the expected impact, a finding that effective actions have been taken or will be taken to deal with these impacts, the views of the appropriate non-Federal governmental officials and others, a detailed discussion of the extent of Federal financial commitment to the borrower for the facility and to local governmental entities, the terms and conditions of the agreement, a copy of the final environmental impact statement, and other pertinent data. Where the action is taken over the objection of the Governor, the ERDA findings and reasons shall be included. Similarly, the report of the Justice Department and the Federal Trade Commission concerning the impact of such guarantee or commitment on competition and concentration in the production of energy shall be included, together with ERDA's written determination, if any, that despite any objection by such agency the demonstration should proceed from the standpoint of the national interest.

Such report on each proposed guarantee or commitment will lay before the Committees for 90 calendar days, exclusive of days either House adjourns for more than 3 days.

If the estimated cost of proposed commercial demonstration facility will exceed \$350 million, ERDA shall not finalize the guarantee or commitment for that facility if either House passes a resolution of disapproval within the 90 day period. These commercial demonstration facilities will often be quite large, have significant environmental and social impacts, and may be controversial. Such projects should require some degree of Congressional scrutiny, short of actual authorization. Those exceeding \$350 million in costs require an opportunity for either House to express its disapproval. On these sizeable projects, the Conferees are concerned that they not be built without this opportunity for careful scrutiny by Congress.

Section 17(q)—Transfer of Loan Guarantee Program

It is the expressed intent of the Conferees that the primary responsibility for the entire loan guarantee program remain with the ERDA until otherwise directed by the Congress. The Conferees do not intend to prevent the participation and cooperation of other Federal agencies with the ERDA through normal fund transfers provided that the ERDA maintain the final authority to control the program.

Section 17(r)—Patent Policy

Section 17(r) provides that "inventions made or conceived in the course of or under a guarantee authorized by this section shall be

subject to the title and waiver requirements and conditions of Section 9 of this Act." This compromise provision reflects the intention of the Conference Committee that all of the patent policy provisions, except subsection (b), of Section 9 of the Federal Nonnuclear Energy Research and Development Act of 1974 shall be applicable to the loan guarantee program contained in section 17.

In lieu of the broad reporting requirements of subsection (b), therefore, the Committee determined to provide ERDA with sufficient flexibility to promulgate such rules and regulations pertaining to the filing of reports and information as it believes necessary or appropriate to effectively carry out its mission and to protect the interests of the United States and the public. Exclusion of subsection (b) should not be read as precluding ERDA from promulgating such rules and regulations.

The conferees were concerned about the possible impact of subsection 9(b) on trade secrets and other proprietary rights because of the reports required by the subsection. The concern existed that subsection 9(b) might adversely affect a project participant's background trade secrets and other proprietary rights if such information was made public. Rather than risk discouraging potential project participants from cooperating in the synthetic fuel program because of possible uncertainty with respect to their background rights, the conferees believe that the limited application of Section 9 together with the positive protection contained in Sections 17(v) and 18, will adequately protect the holders of trade secrets and other proprietary rights.

The Conference Committee recognizes that Federal involvement and exposure in research and development programs through loan guarantees is more remote than the immediacy of its involvement and exposure in the case of direct Federal expenditures through grants or loans. The applicable provisions of Section 9 provide sufficient flexibility and safeguards to balance the equities between federal ownership and waiver of title in particular situations. The remote nature of the federal involvement in loan guarantee situations justifies a corresponding adjustment in the balance of equities applied in judging requests for waivers of title. For this reason, the Committee determined that as to section 17 guarantees ERDA be permitted to exercise greater flexibility than previously specified in the Conference Report on the Federal Nonnuclear Energy Research and Development Act of 1974 with respect to the application of the waiver provisions of Section 9 of that Act.

Although the patent policy to be applied by a federal agency is properly the jurisdiction of those committees having legislative jurisdiction over the particular agency, the conferees appreciate the comments and suggestions of other committees having an interest in the general subject area. The conferees believe they have acted to incorporate the major suggestions offered by other committees in such a way as to effectuate the satisfactory resolution of their concerns.

Section 9 (with the exception of subsection (b)) of the Nonnuclear Act is made specifically applicable to the guarantee program under Section 17 of this Act because of the competing interpretations given to whether Section 9 applies generally to loan guarantees under that Act. Some of the House and Senate conferees believe that it does not apply.

Their position is supported by the General Counsel of ERDA, whose letter and memorandum on this issue are reprinted below.

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION,
Washington, D.C., October 29, 1975.

HON. MIKE McCORMACK,
Chairman, Subcommittee on Energy Research, Development and
Demonstration, Committee on Science and Technology, House of
Representatives, Washington, D.C.

DEAR CHAIRMAN McCORMACK: During testimony on the Geothermal Loan Guaranty Program on October 1 before your Subcommittee, Congressman Philip Hayes requested my legal opinion on the applicability of the patent provisions of the Federal Nonnuclear Research and Development Act of 1974 to Federal loan guarantees administered by ERDA. The attached Memorandum for the Record contains my analysis that section 9, the patent provisions of that Act, does not apply to loans, price support or loan guarantees.

Inasmuch as this request arose in the context of the Geothermal Loan Guarantee Program, I would add an additional thought to the attached memorandum. The Geothermal Energy Research, Development, and Demonstration Act of 1974 (Public Law 93-410), of which Geothermal Loan Guaranty Program is a part, contains no specific requirements as to patents. Therefore, the patent provisions utilized in carrying out the research, development and demonstration authorized by the Geothermal Act would depend on the patent policy of the particular Federal agencies conducting the program. Subsequent to ERDA's establishment, the research development and demonstration functions including the Geothermal Loan Guarantee Program as authorized by Public Law 93-410 have been transferred to ERDA.

The Conference Report (No. 93-1563) on the Federal Nonnuclear Research and Development Act specified that all of ERDA's non-nuclear contracts shall be governed by the patent policy of section 9 of that Act. Therefore, ERDA awarded research, development and demonstration contracts under the geothermal program will contain our standard patent provisions which implement the policy required by section 9. However, based on the attached legal opinion, these standard patent provisions will not be included in geothermal loan guarantee agreements but instead special patent provisions will be utilized as appropriate.

Sincerely,

LEONARD RAWICZ,
Deputy General Counsel.

Enclosure.

WASHINGTON, D.C., October 29, 1975.

Memorandum for the Record.

Application of Section 9 of the Federal Nonnuclear Research and Development Act of 1974 to Section 7, Forms of Federal Assistance.

Section 7(a) of the Federal Nonnuclear Research and Development Act of 1974 (hereinafter the Act) identifies the following Forms of Federal Assistance which the Administrator may utilize in carrying out the objectives of the Act.

(1) Joint Federal-industry experimental, demonstration, or commercial corporations consistent with the provisions of subsection (b) of this section;

(2) Contractual arrangements with non-Federal participants including corporations, consortia, universities, governmental entities and nonprofit institutions;

(3) Contracts for the construction and operation of federally owned facilities;

(4) Federal purchases or guaranteed price of the products of demonstration plants or activities consistent with the provisions of subsection (c) of the section;

(5) Federal loans to non-Federal entities conducting demonstrations of new technologies; and

(6) Incentives, including financial awards, to individual inventors, such incentives to be designed to encourage the participation of a large number of such inventors.

Section 7(b) of the Act specifically notes that the joint-Federal-industry corporation of (1) above are "subject to the provision of section 9 of this Act."

Subsection 9(a), the Act's patent policy, specifies that "Whenever any invention is made or conceived in the course of or under any contract of the Administration, other than nuclear energy research, development, and demonstration pursuant to the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.)" and the Administrator makes certain findings which relate the inventor's activities to the ERDA contract, title to the invention vests in the United States unless the Administrator waives all or any part of the rights of the United States to such invention. Where a waiver is granted, subsection 9(h) requires certain minimum rights to be retained by the Government. These minimum rights include a royalty-free license in the Government, which generally also includes State and municipal governments, and the right to terminate the waiver or to require the licensing of the invention involved in specified circumstances.

The question addressed herein is whether all the Forms of Federal Assistance of section 7 of the Act are subject to its patent policy. Specifically of interest is whether section 9 would apply to inventions made by a party constructing a demonstration facility which receives Government assistance in the form of a loan, price support or a loan guarantee.

The Conference Report (No. 93-1563) accompanying S. 1283, the bill which resulted in the Act, in reference to Forms of Federal Assistance states: Also, the provision in subsection 7(b) was modified by the conference committee to make clear the intention that any joint Federal-industry corporations which may be proposed for Congressional authorization would be subject to the patent policy set forth in section 9 of the compromise version.

This statement refers to a question which arose during the drafting of the patent policy for S. 1283 of whether the Government should own, in the first instance, all inventions made by the joint Federal-industry corporations contemplated by subsections 7(a)(1) and (b). Significantly, the reference to section 9 in section 7 is limited to only one of the Forms of Federal Assistance noted in section 7, the joint

Federal-industry corporation. While this fact in itself suggests a Congressional intent that section 9 is inapplicable to the other Forms of Federal Assistance in section 7, it may nevertheless be argued that section 9 by its own terms is applicable.

As noted above, section 9 specifies that unless waived by the Administrator the Government owns any inventions "... made or conceived in the course of or under any contract of the Administration. . . ." Subsection 9(m)(2) defines contract as follows: the term "contract" means any contract, grant agreement, understanding, or other arrangement, which includes research, development or demonstration work, and includes any assignment, substitution of parties, or subcontract executed or entered into thereunder.

The Conference Report emphasizes the breadth of the term "other arrangement" with the following statement: Subsection (m) is the definitional section. Subsection (m)(2), which defines contract as including "other arrangements," is intended to encompass any and all other arrangements. The reference to section 9 in section 7 is intended to make this clear.

While the Report refers to the reference of section 9 in section 7, the correct reference is subsection 7(b), and as noted above this deals only with Federal-industry corporations.

With this background, the relationship of Federal assistance under section 7 to the patent provisions of section 9 will be discussed. The most important legal consideration in determining the applicability of section 9 to section 7 is whether the Federal assistance forms concerned herein, i.e., loans, price support, or loan guarantees, are within the term "contract" as it is defined by subsection 9(m)(2). There are two elements to this definition of "contract." First, ERDA must have an agreement or other arrangement with a party and secondly, the agreement or arrangement must include "research, development, or demonstration work." Ostensibly, Federal assistance in the form of a loan, price support or a loan guarantee may be said to be an "arrangement" and most probably the assistance will be to a party for the purpose of aiding that party conduct a "demonstration" or "commercial demonstration" of an energy related process, system or facility. Therefore the issue is whether these forms of Federal assistance are within the meaning of the term "which include research, development or demonstration work" of subsection (m)(2).

As noted in the Conference Report, section 305 of the National Aeronautic and Space Act of 1958 (NAS Act) and the implementing NASA regulations were used as a model for section 9. The related provisions of section 305 which establishes its applicability is the first phrase of subsection (a) which provides "Whenever any invention is made in the performance of any work under any contract of the Administration * * *" (emphasis added) and the definition of the term "contract" in subsection 305(j)(2). This subsection states: The term "contract" means any actual or proposed contract, agreement, understanding or other arrangement, and includes any assignment, substitution of parties, or subcontract executed or entered into thereunder.

In drafting subsection 9(a) changes were made to subsection 305(a) of NAS Act to accommodate the language of section 152 of the Atomic Energy Act of 1954 which refers to "inventions * * * made or conceived in the course of or under any contract, subcontract or arrange-

ment entered into with or for the benefit of the Commission. * * *

This change would permit a greater harmonization of ERDA's patent policy for both its nuclear and nonnuclear work, a goal specified in the Conference Report. However, it was recognized that the resulting subsection 9(a) dropped the words "performance of any work" from subsection 305(a) and these words have been relied upon by NASA in interpreting the applicability of its patent provisions. For example, NASA has defined the word "work" in the NAS Act to limit section 305 to specific types of contracts, i.e., contracts which call for the performance of research and development work, *O'Brien and Parker*, Property Rights in Inventions Under the National Aeronautics and Space Act of 1958, Fed. B.J. Vol. 19, No. 3, July 1959. The NASA procurement regulations applies section 305 to NASA contracts "where research, experimental, design, engineering, or development work is contemplated", 41 C.F.R. 18-9.101-2 and not to fixed price supply contracts; construction contracts, or employment contracts. Further, a contractor's independent research and development program, even though agreed to in an advance agreement and supported by an overhead allowance (an arrangement), has not been interpreted by NASA to be encompassed by its statutory patent policy, see 41 C.F.R. 18-9.101-7. AEC has similarly interpreted the Atomic Energy Act patent provisions, 41 C.F.R. 9-9.5019. The removal of the term "performance of any work" of subsection 305(a) of the NAS Act from subsection 9(a) and a concern that the NASA regulatory provisions as to "design" or "engineering" work were overly broad led to the incorporation into the definition of "contract" in subsection 9(m)(2) the words "which includes research, development or demonstration work." Whether this was necessary is questionable in view of a recent court decision, which equates the term "in the course of or under any contract" with the term in the performance of work under a contract. In *Fitch & Braun v. AEC*, 181 USPQ 41 (CCPA 1974), the Court of Customs and Patent Appeals interpreted the phrase "in course of or under" an AEC contract, pursuant to section 152 of the Atomic Energy Act as follows:

The rule of statutory interpretation requires that the phrase "in the course of" and the word "under" mean different things. In our view, an invention made or conceived in performing, or as a result of performing, the work required by a contract is made or conceived "in the course of" that contract. That would be true even though the invention was not specifically sought in the terms of the contract. An invention is made or conceived "under" a contract when it is made or conceived during the life of the contract and the invention is, in whole or in part, specifically provided for by that contract. Neither of these fact situations applies here.

There is nothing in the legislative history which would establish that Congress in selecting the patent provisions of the NAS Act and the Atomic Energy Act as a model for section 9 intended to disregard the interpretation given to these provisions by NASA and AEC. As noted above, these interpretations include the concept that the type of work called for as well as the nature of the "arrangement" control whether these statutory patent provisions apply. Where only fiscal assistance is provided for the purpose of encouraging the conduct of independent research, development or demonstration which is not for the Government's account, i.e., independent research and development noted above,

these agencies, as well as other Federal agencies, have determined that their statutory patent provisions do not apply.

Loans, price support and price guarantees are "arrangements" or "agreements" for fiscal assistance. In a loan situation the lender usually agrees to provide money to the borrower upon the condition that the money only be used for a specified purpose. Generally, a pledge of security is involved along with other terms and conditions to protect the lender. Consideration for the lender's money is usually the payment of an interest charge by the borrower. The purpose of a loan is of great concern to the lender albeit for the purchase of land, the construction of a facility, the purchase of equipment, the payment of salaries, etc. The property acquired with the money loaned or other value obtained normally accrues only to the borrower just as any liability which flows from the use of the money loaned is on the borrower's and not the lender's behalf. While the lender may monitor the borrower's efforts to assure the adherence to the purpose of the loan and the nature of the security involved, the work in question is done solely by and on behalf of the borrower. This is not at all related to the situation where work is performed by or on the Government's behalf under contract or otherwise.

Government loan guarantees are even further removed than a loan arrangement since in a loan guarantee the loan "agreement" is between the borrower and the lender. The Government's guarantee is in the form of default insurance to protect the lender. The Government's agreement to guarantee the loan is a fiscal arrangement similar to insurance and does not encompass, in itself, the performance of research, development or demonstration work even though that is the purpose for which the loan was made.

Similarly, in my opinion an agreement to guarantee the price of a product which contains the understanding that a new plant is to be built to make the product, is not an "arrangement" which includes research, development, or demonstration work. The party receiving the guarantee does all the demonstration type work on his own behalf. If the plant doesn't work, he takes all the losses. It is only after the standard products are available on market that the Government's fiscal obligation arises. Again the arrangement is fiscal, the purpose of which is to encourage independent demonstration work.

It is a rather unique requirement that a party loaning money, guaranteeing the repayment of a loan, or establish a price support level would end up owning a part of the assets of the party obtaining the loan or the benefit of the price support. If this would be the intent of Congress, it should be stated so explicitly since it has not been a usual consequence of any other similar government or private program.

In summary, it is my opinion that except for joint-Federal industry corporations the applicability of section 9 of the Federal Nonnuclear Research and Development Act to the Forms of Federal Assistance under section 7 of this Act is dependent upon the terminology of section 9. This section is applicable to contracts (i.e., contracts, agreements or other arrangements) which include the conduct of research, development or demonstration work. Section 9 of the Act is not applicable to Federal loans, price support or loan guarantees made for the purpose of encouraging other parties to construct demonstra-

tion facilities or the like on their own account since work is performed independently and not on the Government's behalf.

LEONARD RAWICZ,
Deputy General Counsel.

Other House and Senate conferees believe that section 9 of the 1974 Act does apply to all loan guarantees. Their position is supported in the following communication:

U.S. SENATE,
COMMITTEE ON THE JUDICIARY,
SUBCOMMITTEE ON ANTITRUST AND MONOPOLY,
November 14, 1975.

HON. HENRY M. JACKSON,
*Chairman, Committee on Interior and Insular Affairs,
U.S. Senate, Washington, D.C.*

DEAR SCOOP: We understand that the Conference Committee considering ERDA's fiscal 1976 authorization (S. 598 and H.R. 3474) has been advised by the Energy Research and Development Administration that the patent provisions of the Federal Nonnuclear Research and Development Act of 1974 (P.L. 93-577), Section 9, do not apply to loans, price supports, or loan guarantees.

We respectfully disagree with ERDA's conclusion, and, as principal sponsors of the patent policy provisions contained in that Act, invite the Committee's attention to Section 9(m) which defines the term contract as meaning "any contract, grant, agreement, understanding, or other arrangement, which includes research, development, or demonstration work, and includes any assignment, substitution of parties, or subcontract executed or entered into thereunder." As further evidence of our intention, and that of the Congress, that the patent provisions of Section 9 are all encompassing and apply to all forms of Federal assistance, the Conference Report elaborated that "Subsection (m) (2), which defines contract as including 'other arrangement' is intended to encompass any and all other arrangements." It further stated that "Section 9 (patent policy) is intended to apply to all non-nuclear contracts of the Energy Research and Development Administration."

The Conference Committee on the Energy Policy and Conservation Act (S. 622) has already acted to disapprove ERDA's interpretation by amending the patent policy provisions of that Act (which are essentially identical to those in P.L. 93-577) to specifically include "obligation guarantees."

Considering the importance of carrying out the intent of the Congress in enacting the patent provisions of P.L. 93-577, we respectfully suggest that the Conference Committee specifically refer to and reject ERDA's interpretation that Section 9 of P.L. 93-577 does not apply to loans, loan guarantees, or price supports. Alternatively, it may be useful to specifically amend Section 9(m) to include the phrase "loan, obligation guarantee, or price support."

Best personal regards.

Sincerely,

RUSSELL LONG.
PHILIP A. HART.

The Conference Committee does not believe it necessary to resolve this issue in this conference, particularly because of anticipated receipt from ERDA early next year of its report and recommendations on the patent provisions of Section 9.

Section 17 (u)—Disclaimer—State Laws, Etc.

Subsection (u) of the amendment contained in subsection (b) of Section 17 makes clear that the granting of a loan guarantee under the authority of that Section would convey no immunity from Federal or State laws to the demonstration projects constructed with the assistance of such guarantees.

The Conferees note that the undertakings which would be assisted will be private or, in some instances, possibly non-Federal, public ventures. Depending upon circumstances of siting, proprietorship, nature of the technology, or type of industry and product involved they will be subject to various laws and regulations of Federal, State, and local government which are now in effect or which may be enacted or imposed in the future. It is the intent of this section that the granting of a guarantee would neither exempt a borrower or a project from such legal obligations which would otherwise apply or to extend any obligation which otherwise would not apply.

The Conferees particularly note that nothing in Section 17 is intended to effect the rights of various parties to water resources which are established under State and Federal law and interstate compact.

In response to the concerns expressed by Western governors, the Conferees considered those situations in which demonstration facilities which are assisted by loan guarantees were located upon Federal lands. As would be the case elsewhere, it is the intent of this measure that a loan guarantee would not in any way change or extend the applicability of any and all Federal, State, and local laws and regulations which would otherwise apply to the demonstration facility absent such loan guarantee.

The management of activities on the public lands is primarily a Federal responsibility, and State jurisdiction has been extended selectively by the Congress. The policy procedure which has ordinarily been adopted is exemplified by the Clean Air Act. This Federal law establishes administrative procedures by which regulations are promulgated by a State and are approved by the Environmental Protection Agency as consistent with Federal minimum requirements, such as Federal new source performance standards. The joint Federal-State implementation plans then become generally applicable to all facilities within the State, including facilities on the public lands. Similar approaches have been taken in the areas of water quality control and occupational and mine health and safety statutes.

Two major areas which are particularly applicable to major demonstration facilities, however, are not yet covered by a Federal-State regulatory regimen. They are surface mining reclamation and energy facilities siting. Some States have adopted rigorous laws and regulations in these areas or may do so in the near future.

The Federal government, thus far, has exercised its management of surface mine reclamation and energy facilities siting on the public

lands primarily through the responsibilities of the Secretary of the Interior to use his discretion in the granting of leases, permits and rights-of-ways and to incorporate into such instruments provisions for the management of the undertaking.

The Conferees recognize the valid concern of the Western governors that major energy demonstration facilities which may be encouraged to come into being on the public lands by loan guarantees under this Act will conform to the standards established by the State for similar facilities elsewhere provided the State standards are more stringent than Federal standards, as provided for in such Federal statutes as the Clean Air Act and Federal Water Pollution Control Act. The conferees have incorporated into the Act provisions for early notice to the Governor of consideration of any loan guarantee within the State, and for close coordination with the Governor during development of the proposal. Prior to approval of any guarantee, by the Administrator, the Governor is also provided a right to express disapproval of the project.

The conferees expect that during the consideration of any proposal which contemplates siting upon the public lands, the Governor will make known to the Administrator any provisions of State law regarding energy facilities siting or surface mine reclamation which he believes should be applicable to the demonstration facility.

The Administrator, in consultation with the Secretary of the Interior and the Administrator of the Environmental Protection Agency and such other Federal officials as the Administrator may deem to have relevant expertise or authority, will determine if such provisions are superior to the provisions of Federal law or regulation which would otherwise apply. If they are, the conferees expect that to the extent possible, ERDA and Interior will incorporate similar provisions into the Federal permits, leases, rights-of-way, guarantees, or other appropriate documents governing the demonstration facility.

In any case, prior to the time when the Governor is requested to make recommendations on a proposed facility, the Administrator shall advise the Governor of the measures which will be taken concerning the provisions recommended by the Governor the conferees expect that the reports submitted to the Congress concerning any proposed assistance for a demonstration facility will include a discussion of such recommendations by the Governor, if any, and the disposition to be made.

If during the life of the demonstration facility, the terms of such documents are revised, the responsible Federal official should obtain the Governor's views concerning the continued applicability of State-sponsored provisions.

Section 17 (w)—Appropriations

Subsection 17 (w) makes it clear that the appropriations and budget process actions to establish the funding mechanism for the guarantee program must be complete before ERDA makes any commitment or obligation under this Section. Subsection (w) is intended to reflect due regard for the appropriation and budget processes, as well as the obvious lateness at this time of the authorization, appropriation and budget cycles for Fiscal Year 1976.

Additionally, the Conference Committee expects the implementation of the program to begin promptly, utilizing existing funds to initiate the administrative and regulatory steps necessary to carry out the loan guarantee program. In addition, it is important that the Administrator move swiftly in order to prepare a complete, carefully conceived report within 180 days as required by this section, and to request the needed appropriations.

Once the appropriate appropriation action has been taken to establish the mechanism of the fund authorized under Section 17, the Administrator will have fully authority to carry out the directions of Section 17 and to make obligations subject only to the limitations of this Act and the available capabilities of the fund to support such obligations.

Section 17—No Endorsement of Further Programs

The conferees note that the initial action of the Senate to incorporate the authority to guarantee the financing of energy demonstrations was taken prior to any recommendations for similar programs on the part of the Administration. After the Senate acted on this legislation the Administration completed and made public its draft Task Force report on a "Synthetic Fuels Commercialization Program" and the President transmitted to the Congress a legislative proposal for the Energy Independence Authority.

The conferees note that the provisions of Section 103 are not based upon any Administration proposal. The House Committee on Science and Technology has drawn upon the information in the draft Task Force Report and has received testimony from participants in the Task Force study. Some of this information has been of value to the conferees in perfecting Section 103. The section, however, is not modeled after the Task Force recommendations and it differs in many important respects from both the scope and approach of the effort postulated by the Task Force.

The Conferees especially emphasize that the approval of Section 103 in no way constitutes an expression of approval of approaches for assistance beyond loan guarantees. Nothing in Section 103 authorizes construction grants, price supports or price guarantees for the products from demonstration projects nor does the approval of Section 103 constitute any expression of Congressional commitment to other proposals which are pending or may be advanced in the future.

The conferees, furthermore, do not view Section 103 as the initial part of a more ambitious program. The program authorized by this measure is viewed as an independent and complete program as it now stands. Any further energy facility financing arrangements will be considered by the Congress on their merits.

Section 17—Applicability of NEPA

The conferees considered the question of the applicability of the requirements of the National Environmental Policy Act of 1969, including section 102(2)(C) thereof concerning the preparation of environmental impact statements, to the loan guarantee program established by Section 103 of this Act. The conference Committee determined that no statutory language concerning the NEPA was necessary. The conferees intend that the National Environmental

Policy Act of 1969 applies to any loan guarantee made pursuant to this section.

Section 304—Limitations on Reprogramming

With the exception of the proviso of subsection 304(2)(b) which sets forth explicit categories, it is the expectation of the conferees that all restrictions upon programming or the utilization of funds in nonnuclear portions of the Act will apply to the lowest levels of funding set forth in the language of the Act. It should be noted that the Environment and Safety program includes both nuclear and nonnuclear activities. While the conferees would expect the Administrator to apply the spirit of the nonnuclear reprogramming restrictions to the nonnuclear activities within Section 101(a)(5)(A)-(F) Environment and Safety, they recognize the impracticality of applying statutory restrictions to a portion of a mixed account and do not intend to do so.

The conferees retained in modified form the Senate proviso limiting the reduction of certain budget categories by reprogramming to ten percent of the amount appropriated by the Congress. The categories set forth in the proviso are "coal, petroleum and natural gas, oil shale, solar, geothermal, and conservation."

It is the intention of this proviso to protect the priorities among programs which were assigned by the Congress. The limitation of this proviso was applied to the categories stated in the Act in order to provide greater management flexibility while applying a general restriction upon redefinitions of priorities by the Administrator. Although reprogramming of funds within the categories would not be limited by the proviso, it is the intent of the conferees that the Administrator shall make every effort to carry out each activity to the level of funding which was approved by the Congress. Reductions in the funding of any activity should be made only where circumstances preclude the effective utilization of the funds provided.

The conferees explicitly intend the amounts added to the Environment and Safety program activities to be expended to advance additional research in support of nonnuclear programs. That category was not included in the proviso solely because of the fact that environment and safety programs support both nuclear and nonnuclear programs, making specific identification of all nonnuclear programs impossible.

Section 305—Explanation of Nonnuclear Appropriation Allocations

The House version of H.R. 3474 included Sections 101(c) and 201(c) which require ERDA to submit an explanation of the allocation of appropriated funds which details the relationship of that allocation to the various comprehensive program definitions required under earlier nonnuclear energy R&D acts. The Senate substitute had not comparable provision.

The conferees adopted the House provisions. This report should be made promptly, but not later than 45 days after the appropriation is enacted as indicated in the House report on H.R. 3474. Standard fiscal year budget documents will not satisfy this requirement, but, with necessary expansion, may be used to submit the explanation.

Section 311—Central Source of Information

Section 311 of the Conference Report adds a new section 18 to the Federal Nonnuclear Energy Research and Development Act of 1974.

A similar provision was included in the House-passed version, but not in the Senate bill. The new provision has been modified by the Conferees.

The new provision directs ERDA to promptly establish and maintain a central source of information on energy resources and technology in furtherance of ERDA's R&D mission under the 1974 Act, other than data on proved and other energy reserves. The primary objective of the provision is to give ERDA a better and more accurate energy data base on which to make decisions concerning its R&D mission. Where necessary, ERDA is authorized to acquire proprietary and other data by negotiated purchase or by donation, but not by condemnation.

Section 309—Coordination

Provision has been made in the amendment directing the Administrator to be aware of other federal programs and to thereby minimize unnecessary duplication. The conferees recognize that different agencies look at given areas of research from diverse points-of-view, and that therefore, no single agency should have exclusive jurisdiction. At the same time, it is certainly important that the Administrator recognize the expertise built up in certain agencies, and not attempt to duplicate unnecessarily this expertise.

Section 316—Environment and Safety

In establishing ERDA, it was the intent of Congress that the agency should have the authority to carry out whatever research is necessary to a comprehensive approach to energy research, development and demonstrations. Where relevant research programs of other agencies were not transferred to ERDA, it was the intent of the Congress that ERDA have the authority to undertake work which was not being accomplished under the ongoing activities of other agencies. ERDA, however, was cautioned not unnecessarily to undertake work which could be accommodated by utilizing the expertise and resources of other agencies.

There are many areas where work of this nature is not being done at all or not being done in a manner adequate to support ERDA's overall mission. ERDA has authority to do this work. This section directs that ERDA do it.

Specifically, we find it extremely important that ERDA be involved in a program of environment and safety research related to the potential impacts of all nonnuclear fuels, and while we recognize that the Nonnuclear Act provided that program authority, the importance has been further emphasized by authorization of \$5 million specifically for fossil fuels for this purpose.

D. OPPOSITION TO SECTIONS 102 AND 103 BY REPRESENTATIVE
KEN HECHLER

Representative Ken Hechler, although he signed the conference report on the part of the House, emphasized that he is strongly opposed to two sections of the conference recommendation which were not in the bill passed by the House on June 20, 1975—Sections 102 and 103. He opposes Section 102 which establishes a new program, using the public lands free of any bonus, rent, or royalty, for the demonstration

of production of oil from shale by in situ methods. He also opposes Section 103 which establishes a new \$6 billion loan guarantee program to provide financial assistance to private industry to build synthetic fuels and other commercial demonstration plants.

E. RESERVATION TO SECTION 102 AND 103 BY GEORGE E. BROWN, JR.

Representative George E. Brown, Jr., although he signed the Conference Report on the part of the House, emphasized that he did so with the reservation that the House should have the opportunity to work its will by separate vote on Sections 102 and 103.

F. RESERVATION TO SECTIONS 102 AND 103 BY BARRY M. GOLDWATER, JR.

Representative Barry M. Goldwater, Jr., although he signed the Conference Report on the part of the House, emphasized that he did so with reservations about enacting at this time Sections 102 and 103, the two major new sections added by the Senate, and the additional reservation that the House should be allowed to have a separate vote on each section.

MANAGERS FOR THE NONNUCLEAR PORTION OF THE JOINT STATEMENT

HENRY M. JACKSON,
FRANK CHURCH,
J. BENNETT JOHNSTON, JR.,
FLOYD K. HASKELL,
JOHN GLENN,
PAUL J. FANNIN,
CLIFFORD P. HANSEN,
JIM A. MCCLURE,

Managers on the Part of the Senate.

OLIN E. TEAGUE,
KEN HECHLER,
THOMAS N. DOWNING,
DON FUQUA,
JAMES W. SYMINGTON,
WALTER FLOWERS,
MIKE McCORMACK,
GEORGE E. BROWN, JR.,
CHARLES A. MOSHER,
ALPHONZO BELL,
BARRY M. GOLDWATER, JR.,

Managers on the Part of the House.

NUCLEAR

The managers on the part of the House and Senate at the conference on the disagreeing votes of the two Houses on the amendments of the Senate to the bill (H.R. 3474) to authorize appropriations to the Energy Research and Development Administration in accordance with Section 261 of the Atomic Energy Act of 1954, as amended, Section 305 of the Energy Reorganization Act of 1974 and Section 16 of the Federal Nonnuclear Energy Research and Development Act of 1974 and for other purposes, submit the following joint statement to the House and the Senate in explanation of the effect of the action agreed upon by the managers and recommended in the accompanying conference report:

The Senate amended the House bill to increase the operating expenses portion of the ERDA budget for fiscal year 1976 by \$114,616,000 and by \$13,106,000 for the transition quarter. The increases for the most part are as set forth in a formal amendment to the ERDA budget which was submitted to the Congress on July 25, 1975. The ERDA amendment was anticipated by the House in its action accepting an amendment offered by Mr. McCormack which had the effect of reprogramming \$71.2 million which in the original ERDA budget submission would have been used for the Liquid Metal Fast Breeder Reactor program. The substance of that amendment was preserved in the Senate amendment. Although the Senate amendments do not include language in the bill limiting the Liquid Metal Fast Breeder Reactor and Clinch River Breeder Reactor programs to specific authorization levels, they do reflect the reduction of \$71.2 million in these programs. This reduction is identical to that included in the formal budget amendment submitted to the Congress on July 25, 1975. Hence, the funding restrictions apply to those programs and there is no need for the limiting language in the bill as passed by the House.

Most of the increases in the ERDA budget amendment relate to programs which were considered and in some instances were emphasized by the Joint Committee during the authorization hearings. The increases are primarily in the areas of (1) \$99.5 million for increased electric power cost for the operation of the gaseous diffusion plants, (2) \$1.9 million for upgrading the safeguards for the protection of special nuclear materials, and (3) \$91.9 million for an expanded research and development program, particularly as related to the nuclear fuel cycle and light water reactor technology.

An item deleted by the Senate from the July 25, 1975, budget amendment is \$4 million for fiscal year 1976 and \$1.3 million in the transition quarter for conceptual design efforts related to a proposal for a private enrichment facility. This subject is being considered in a separate legislative proposal submitted by the Administration (S. 2035 and

H.R. 8401) which is receiving careful and comprehensive consideration. The Senate amendment would not allow any funds to be used for conceptual design work with one of the prospective private participants. The funds remain available to be used in research and development efforts, independent of those related to private entry into the uranium enrichment business, such as in the area of reprocessing of used nuclear fuel from commercial power reactors, as well as preparing for the contingency in the event the initial additional enrichment capacity would have to be provided by the Government.

The Senate amendment includes an increase of \$1.4 million for the Molten Salt Breeder Reactor program and \$8 million for the Light Water Breeder Reactor program which are deemed by the Joint Committee to be important backup breeder programs. ERDA sought to include these amounts in the July 25 budget amendment, but was overruled by the Office of Management and Budget.

The House recesses.

The Senate amended Section 101(b)(15) of the bill to increase the authorization for capital equipment by \$650,000 for fiscal year 1976 and Section 201(b)(8) to increase that authorization by \$60,000 in the transition quarter. The increased amount results from the July 25 budget amendment and would be used for the procurement of administrative equipment such as typewriters, calculators, etc., needed to meet the requirements of ERDA offices.

The House recesses.

The Senate included an amendment which would authorize \$25 million for a line item construction project for a new Government-owned uranium enrichment production facility at an undetermined location, Section 101(b)(8), Project 76-8-g.

The purpose of this amendment is simply to provide for the contingency in the event the Government has to build the next increment of uranium enrichment capacity. The authorization does not in any way mean that such a contingency will in fact become a reality. The Administration's proposal for private enterprise to build the next increment of capacity is a matter which is yet to be decided by the Congress. The authorization simply means that ERDA would be prepared to proceed if ultimately it is decided that the Government should provide the next increment of uranium enrichment capacity.

The House recesses.

The Senate added \$3.1 million for a water control and recycle project at Rocky Flats, Colorado, Project 76-9-d in Section 101(b)(9), and \$32.8 million for construction project to upgrade the safeguards and security at several ERDA installations, Project 76-14 in Section 101(b)(14). These increases were proposed in the July 25 budget amendment.

These programs are in the interest of assuring that the Government's programs in the nuclear area are carried out in a manner which is compatible with appropriate environmental and safety considerations. Among other things, there must be assurance that nuclear material will not be stolen or otherwise diverted for any unauthorized use.

The bill reported by the Joint Committee and passed by each House includes funds for new radioactive waste storage tanks at the Gov-

ernment's Savannah River and Richland sites. The Joint Committee has recently received correspondence on these new tanks and on a calcined solids storage addition at the Idaho National Engineering Laboratory (AEC Construction Project 74-1-c). The Joint Committee agrees that these facilities for short-term shortage of radioactive waste are not required to be licensed by the Nuclear Regulatory Commission. This does not, of course, reduce in any way the responsibility of ERDA to assure that all storage of radioactive waste must be completely acceptable from the standpoint of the public health and safety and the protection of the environment. The Joint Committee expects the Administration to make timely plans for the permanent storage of the wastes which will be contained in these tanks.

[The letters on the subject follow:]

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION,
Washington, D.C., November 26, 1975.

HON. JOHN O. PASTORE,
Chairman, Joint Committee on Atomic Energy, Congress of the
United States.

DEAR MR. CHAIRMAN: Our November 20, 1975 letter on waste storage facilities provided the Committee with ERDA's response to a November 12, 1975, letter from Senators Jackson and Ribicoff. The paragraph in our letter which discusses the calcined solids storage addition at the Idaho National Engineering Laboratory should be changed as follows: "The above discussion also applies to the calcined solids storage addition at the Idaho National Engineering Laboratory (AEC Construction Project 74-1-c) which was not referred to in the November 12 letter."

The changed paragraph more clearly reflects the project history in that, as JCAE and Congressional Appropriations Committees were notified by letters dated May 16, 1975, additional funds for 74-1-c were required and ERDA was reviewing alternatives to provide the necessary funding. Since that time, additional funds have been provided from within ERDA availability.

Sincerely,

F. P. BARANOWSKI,
Director, Division of Nuclear Fuel Cycle and Production.

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION,
Washington, D.C., November 20, 1975.

Re: Additional High-Level Waste Storage Tanks, Richland, Washington, (ERDA Construction Project 76-6-b); Additional High-Level Waste Storage Tanks, Savannah River Plant (ERDA Construction Project 76-6-a)

HON. JOHN O. PASTORE,
Chairman, Joint Committee on Atomic Energy, Congress of the
United States, Washington, D.C.

DEAR MR. CHAIRMAN: By letter dated November 12, 1975, copy attached, Senators Jackson and Ribicoff advised me of their concern that the above referenced facilities be licensed by the Nuclear Regulatory Commission in accordance with section 202 of the Energy Reorganization Act if they were intended to be utilized for long-term storage of high-level radioactive wastes.

I am enclosing our response which attempts to make clear that ERDA does not plan to rely on these facilities for long-term storage, i.e., 20 years or more and therefore does not consider that these facilities are required to be licensed by NRC.

The above discussion also applies to the calcined solids storage addition at the Idaho Nuclear Engineering Laboratory (AEC Construction Project 74-1-c), additional funds for which were requested in ERDA's fiscal year 1976 authorization request but which was not referred to in the November 12 letter.

If you would like any further information on this matter, please let us know.

Sincerely,

ALFRED D. STARBIRD,
(For Robert C. Seamans, Jr.,
Administrator).

Enclosure.

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION,
Washington, D.C., November 20, 1975.

HON. HENRY M. JACKSON,
*Committee on Government Operations,
U.S. Senate, Washington, D.C.*

DEAR SENATOR JACKSON: We are pleased to respond to the November 12, 1975 letter from Senator Ribicoff and you regarding the proposed new waste tanks at our Savannah River and Richland sites. An identical reply is being sent to Senator Ribicoff. These tanks are required to continue our existing programs for the safest containment of existing and future high level radioactive waste from the chemical processing plants at Savannah River and Richland.

The ERDA waste management program, as discussed with Congress on many occasions, provides for the interim (i.e., short-term) storage of waste in a retrievable form until a suitable long-term disposal process or processes for the very large quantities of waste at the Savannah River and Richland sites have been developed and adopted. Several alternatives are under active consideration at this time. Upon selection of the optimum long-term storage method or methods, the waste would be processed as necessary and transferred to a long-term storage site or stored at a site analogous to a Retrievable Surface Storage Facility proposed for commercial wastes until a long-term site has been made ready.

We would expect to use the planned tanks only until ERDA can implement an approved plan for the long-term storage of the wastes. It is presently anticipated that facilities for long-term storage will be available between 15 and 20 years after construction of the tanks in question has been completed. This period of between 15 and 20 years after construction is complete will allow time to develop the disposal processes, budget for new long-term storage facilities, undergo the licensing procedures which would be required under section 202 of the Energy Reorganization Act and construct and startup such long-term storage facilities.

Thus, we plan to utilize the new waste tanks at Savannah River and Richland for less than 20 years. Accordingly, we would consider that such tanks would not be for "long-term storage" within the meaning of subsection 202(4) of the Energy Reorganization Act of 1974, and would not be subject to licensing.

The above discussion also applies to the calcined solids storage addition at the Idaho National Engineering Laboratory (AEC Construction Project 74-1-c), additional funds for which were requested in ERDA's fiscal year 1976 authorization request.

In summary, our planning on waste management reflects the need to store wastes in tanks (Savannah River or Richland) or stainless steel storage bins (Idaho National Engineering Laboratory) for an interim period to provide the necessary lead time to develop and implement a long-term disposal solution. Implementation of the long-term disposal method will follow the licensing procedures.

Sincerely,

ROBERT C. SEAMANS, JR.,
Administrator.

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION,
Washington, D.C., November 20, 1975.

HON. ABRAHAM A. RIBICOFF,
*Chairman, Committee on Government Operations,
U.S. Senate, Washington, D.C.*

DEAR MR. CHAIRMAN: We are pleased to respond to the November 12, 1975 letter from Senator Jackson and you regarding the proposed new waste tanks at our Savannah River and Richland sites. An identical reply is being sent to Senator Jackson. These tanks are required to continue our existing programs for the safest containment of existing and future high level radioactive waste from the chemical processing plants at Savannah River and Richland.

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licensing procedures which would be required under section 202 of the Energy Reorganization Act and construct and startup such long-term storage facilities.

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In summary, our planning on waste management reflects the need to store wastes in tanks (Savannah River or Richland) or stainless steel storage bins (Idaho National Engineering Laboratory) for an interim period to provide the necessary lead time to develop and implement a long-term disposal solution. Implementation of the long-term disposal method will follow the licensing procedures.

Sincerely,

ALFRED D. STARBIRD,
(For Robert S. Seamans, Jr.,
Administrator).

U.S. SENATE,
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D.C., November 12, 1975.

DR. ROBERT C. SEAMANS, JR.,
Administrator, Energy Research and Development Administration,
Washington, D.C.

DEAR DR. SEAMANS: Recently, the staff of the Government Operations Committee received inquiries with respect to the legislative intent of Section 202(4) of the Energy Reorganization Act of 1974, as it was reported by the Subcommittee on Reorganization, Research and International Organizations and sustained unchanged through final passage and enactment.

According to Mr. Stephen Greenleigh of the ERDA General Counsel's Office, these inquiries were intended to help determine whether NRC should have licensing authority over six new double-walled tanks for storage of high-level radioactive wastes to be built by ERDA at Hanford, Washington, and four such new tanks at Savannah River, Georgia.

Mr. Greenleigh was provided with a transcript of the Subcommittee's mark-up of Sec. 202, and was shown the only direct reference to paragraphs (3) and (4) pertaining to the licensing of waste storage facilities, in which Mr. Dan Dreyfus, explaining Senator Jackson's amendment to the other Senators, said:

"And in the waste storage facilities, the intent here would be that new waste storage facilities would be licensed whether their wastes come from licensed reactors or whether they come from ERDA operations, all high level waste facilities which are new facilities which require licensing. Again, that goes slightly beyond the material in the draft bill."

We wish to make clear that it was our intent that any new construction of waste-storage facilities by ERDA, including those built according to an existing design, should be licensed by the NRC.

As stated in the Committee report:

Paragraphs (3) and (4) provide . . . the authority and responsibility for licensing and related regulation of retrievable surface storage facilities and for other facilities for high-level radioactive wastes which are or may be authorized by the Congress to be built by ERDA or with ERDA financial assistance for long-term (tens to hundreds of years) storage for such radioactive wastes generated by the Administration or to which present high-level radioactive wastes may be transferred by the Administration in the future. It is not the intent of the committee to require licensing of such storage facilities which are already in existence or of storage facilities which are necessary for the short-term storage of radioactive materials incidental to ERDA's R&D activities.

The Senate-House Conference Report noted that the Senate language had been retained for Sec. 202 (3) and (4).

Inasmuch as the facilities to be built are "new" facilities, will have a projected useful life of about 30 years and will be used for the transfer from deteriorating tanks of present high-level radioactive wastes from ERDA non-R&D programs, we believe that these new facilities should be licensed as intended under Sec. 202(4).

We know that you share our deep concern that the strictest design standards be applied to ensure the safe, long-term storage of these extremely toxic nuclear waste products.

We are sending an identical letter to Chairman Anders.

Sincerely,

ABE RIBICOFF.
HENRY M. JACKSON.

The House recesses.

Section 106 "Recession" as passed by the Senate includes two additional projects (75-5-e and 75-5-f) in the area of high temperature gas reactors. These rescissions were requested by ERDA in its July 25 ERDA budget amendment.

The Joint Committee strongly endorsed the Government's involvement in the high temperature gas reactor program when it originally authorized these two projects. The funds authorized were limited, however, only to those required for architect-engineering services and the procurement of long lead-time components and equipment. ERDA has now informed the Joint Committee that the total estimated cost for these projects has substantially increased and that a significantly different research and development program may be required which, among other things, may include the possible elimination of one or both of these projects.

The House recesses.

The Senate added a Title V to the bill which imposed restrictions on the air transportation of plutonium until ERDA has certified to the Joint Committee on Atomic Energy that a safe container has been developed and tested which will not rupture under crash and blast testing equal to the crash and explosion of high-flying aircraft.

Exemptions for shipment of plutonium involving the national security, medical applications, and the need for rapid transport are included in the title.

The House recesses.

The Senate included a new Title VI to the bill which would include Roane and Anderson Counties, Tennessee, in the Atomic Energy Community Act of 1955, as amended. This amendment is the product of extensive hearings which the Joint Committee on Atomic Energy held in Oak Ridge in May of this year. Under this amendment, Anderson and Roane County, Tennessee would be eligible to receive assistance, as authorized by the Administrator of ERDA, until June 30, 1986.

The House recesses.

RESERVATION TO SECTIONS 102 AND 103 BY
BARRY M. GOLDWATER, JR.

Representative Barry M. Goldwater, Jr., although he signed the Conference Report on the part of the House, emphasized that he did so with reservations about enacting at this time Sections 102 and 103, the two major new sections added by the Senate, and the additional reservation that the House should be allowed to have a separate vote on each section.

MANAGERS FOR THE NUCLEAR PORTION OF THE JOINT STATEMENT

JOHN O. PASTORE,
STUART SYMINGTON,
JOSEPH MONTOYA,
HOWARD BAKER, JR.,
CLIFFORD P. CASE,

Managers on the Part of the Senate.

MELVIN PRICE,
JOHN YOUNG,
MIKE McCORMACK,
JOHN ANDERSON,
MANUEL LUJAN, JR.,

Managers on the Part of the House.

MANAGERS FOR THE JOINT STATEMENT

JOHN O. PASTORE,
HENRY M. JACKSON,
STUART SYMINGTON,
FRANK CHURCH,
JOSEPH M. MONTOYA,
J. BENNETT JOHNSTON, JR.,
FLOYD K. HASKELL,
JOHN GLENN,
CLIFFORD P. CASE,
PAUL J. FANNIN,
HOWARD BAKER, JR.,
MARK O. HATFIELD,
JIM A. MCCLURE,

Managers on the Part of the Senate.

OLIN E. TEAGUE,
MELVIN PRICE,
JOHN YOUNG,
THOMAS N. DOWNING,
KEN HECHLER,
DON FUQUA,
GEORGE E. BROWN, JR.,
WALTER FLOWERS,
JAMES W. SYMINGTON,
MIKE McCORMACK,
JOHN B. ANDERSON,
CHARLES A. MOSHER,
ALPHONZO BELL,
BARRY M. GOLDWATER, JR.,
MANUEL LUJAN, JR.,

Managers on the Part of the House.

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