PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ENERGY RESEARCH APPROPRIATION BILL, 1977

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS HOUSE OF REPRESENTATIVES

NINETY-FOURTH CONGRESS

SECOND SESSION

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PART 5

TENNESSEE VALLEY AUTHORITY

Printed for the use of the Committee on Appropriations

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PUBLIC WORKS FOR WATER AND POWER DEVELOPMENT AND ENERGY RESEARCH APPROPRIATIONS BILL, 1977

MONDAY, MARCH 8, 1976.

TENNESSEE VALLEY AUTHORITY

WITNESSES

AUBREY J. WAGNER, CHAIRMAN
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LYNN SEEBER, GENERAL MANAGER
JOHN S. BARRON, ASSISTANT TO THE GENERAL MANAGER, PLANNING BUDGET, AND SYSTEMS
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LEWIS B. NELSON, MANAGER OF AGRICULTURAL AND CHEMICAL DEVELOPMENT
JOHN N. REBORI, CHIEF, BUDGET STAFF
THOMAS H. RIPLEY, DIRECTOR OF FORESTRY, FISHERIES, AND WILDLIFE DEVELOPMENT
HERBERT S. SANGER, JR., GENERAL COUNSEL
GODWIN WILLIAMS, JR., MANAGER OF POWER
JAMES L. WILLIAMS, DIRECTOR OF PURCHASING

Mr. EVINS. The committee will come to order.

We are pleased to have with us this morning our friends from the TVA, Chairman Aubrey Wagner, Director William Jenkins, Mr. Lynn Seeber. Mr. Chairman, as you know, I recently announced that I would not seek reelection for a 16th term of the Congress after serving 30 years in the House. I am planning to go to Tennessee where I can enjoy the good environment of the TVA area. We are delighted to have our friends with us. I commend you all for the good work you have done over the years, great work in flood control, navigation, reforestation, attraction of industry, recreation, and the general growth and progress that has marked the TVA's growth over the years in the valley.

Last Thursday I placed in the record an insertion pointing out that on that day, 40 years ago, work was completed on the first major TVA project—Norris Dam—the largest of all the TVA dams and reservoirs. I believe my credentials as a friend and supporter of TVA is

well-established. I am proud of TVA, have supported TVA. I wish you continued success in the years ahead.

The only disagreement I have had, I believe, with TVA over the years is the recent policy of power rate increases. I want to express the hope, as I leave, that in the next 40 years TVA will hold its rates down.

Only in the area of TVA's current policy of power rate escalation have I been critical or disagreeable with your policies. This is because the people of the area have protested and they continue to protest. The first TVA Act was passed on May 18, 1933, less than 6 weeks after President Roosevelt in a message to the 73d Congress called for "A corporation clothed with the power of government but possessed of the flexibility and initiative of private enterprise."

The President also said on this occasion, "This in a true sense is a return to the spirit and vision of the pioneer."

TVA has indeed pioneered in the valley and opened the way to new dimensions in growth and progress.

Since 1933, the average income in the 201-county region has increased 23 times. The economy has shifted from 62-percent agricultural employment to more than 60-percent manufacturing.

From TVA dams like ripples on a smooth lake the economic benefits flow out through the region and we can see the result in our modern, progressive communities with productive industry on the thriving economy.

The accomplishments of TVA have indeed been numerous.

During 1973, private industry in the valley announced plans for new plants and expansions involving more than $1 billion. Flood control benefits from the TVA system now total $1.5 billion—five times the cost of the flood control system.

TVA's enormous power generation comes from 29 TVA dams, 12 Alcoa dams, 8 Cumberland dams, 12 coal-fired plants, and 5 nuclear plants.

Nine TVA dams on the Tennessee River and one on the Clinch River have navigation locks and in 1973 waterway traffic exceeded 4 billion ton-miles.

TVA and its distributors now have more than 2,400,000 customers. The TVA program of fertilizer science and education is the only TVA project carried out across the Nation. Tributary area development, recreation, forestry, fisheries and wildlife, air and water quality control—all of these are important elements of the TVA pattern of progress in the Tennessee Valley.

TVA is also participating in the liquid metal fast breeder reactor project in Oak Ridge—pioneering in this country in the development of a technology that will provide fuel for nuclear powerplants—the wave of the future.

TVA has now paid more than $1 billion in repayments to the Treasury. I am sure all of you know our position on holding down power rates. My concern has been that TVA will lose its image as the low-cost power "yardstick" for the Nation. I have done all I can do in the last 3 years, holding lengthy, oversight hearings before this Appropriations subcommittee and also on the Special Subcommittee on Oversight of the Small Business Committee in which special counsel was employed and extensive hearings held at that time.

I continue to be concerned about the impact of these rates on the people of the area because they continue to protest. We cannot make TVA change its current policy. We can only plead with you and urge you and try to persuade you to desist.

We have received hundreds of complaints concerning these rate increases. I exhibited them to the committee. I have another pile since then. I know the TVA Board has recently held meetings for ratepayers in Knoxville and Chattanooga.

You have heard from the people and representatives of the people.

Recently one lady wrote me her social security check was $130, and her electric light bill for the month from TVA was $105.

Some answers must be found to the problem. I expect, hope, and believe that TVA will find the solution.

In any event, we commend you, Chairman Wagner, and your associates, for your good work over the years. We enjoyed working with you for the growth and progress of the Tennessee Valley, and wish you the very best and good luck for success in the future.

We will place the justifications in the record at this point.

[The information follows:]

HIGHLIGHTS FOR THE PAST YEAR

NAVIGATION

–Cumulative benefits attributable to TVA's program for navigation improvement of the Tennessee River and its tributaries totaled $828.5 million through 1974. Freight traffic on the Tennessee River totaled 27.1 million tons. Shippers using the waterway saved an estimated $72.1 million in transportation costs. Traffic moved 3.6 billion ton-miles.

–Private industry has invested more than $2.6 billion in waterfront plants, terminals, and distribution facilities.

FLOOD CONTROL

–Through fiscal year 1975 cumulative flood control benefits attributable to the TVA flood control system totaled over $1.5 billion. This is approximately six times the combined cost of the flood control system plus operation and maintenance costs since Norris Dam was completed. Damages averted at Chattanooga, Tennessee, total approximately $1.2 billion. Along the lower Ohio and Mississippi rivers damages averted now total approximately $80.0 million. In addition, the ability of the reservoir system to reduce flood heights along the Mississippi River levees that guard 6.0 million acres of productive land is estimated to increase the value of that land by over $150.0 million.

RECREATION

–Almost $45.3 million was invested by TVA and others in recreation facilities and improvements on and around TVA lakes during calendar year 1974, bringing the total recreation investment to $482.5 million. Some 61.9 million recreation visits were recorded at TVA lakes. An estimated 2.0 million visitors participated in the outdoor activities in Land Between The Lakes which included hiking, boating, birdwatching, field archery, and trail riding.

–Eighty-three cities, communities, counties, and other agencies requested and were given TVA assistance during 1975 in planning a variety of recreation programs and facilities.

FORESTRY

–The woods products industry in the Valley announced plans for investing some $186.0 million in new or expanded facilities, bringing an estimated 1,500 additional jobs to the region. About 850 wood-using plants now provide jobs for 46,000 Valley workers with a combined annual payroll of $250.0 million.

FERTILIZER DEVELOPMENT

–TVA education and research programs were conducted in 46 states and in Puerto Rico. New fertilizers were used in the developmental and educational programs of 255 fertilizer companies across the Nation. In total, over 289,000 tons of TVA materials were distributed. TVA patented discoveries are licensed for use by fertilizer companies on a nonexclusive basis.

Seventeen licenses were granted for use of TVA processes, 16 of them for a new process for making high-grade liquid fertilizers. This brought to 588 the total number of licenses issued for this and other developments. They have gone to 357 companies for use in 533 plants in 39 states.

–Farm demonstrations of TVA fertilizers and new fertilizer practices were conducted under the supervision of land-grant universities in 38 states and Puerto Rico. They involved 802 whole-farm demonstrations and over 1,300 smaller fertilizer trials and demonstrations.

–TVA's influence in the field of fertilizer research and development goes beyond the national program. Working with the Department of State and others, TVA makes its expertise and experience available to developing countries. In a large measure they look to TVA to help them answer fundamental questions, and upon these answers their future food production in part depends.

ELECTRIC POWER

–The rising cost of coal was again the most serious problem affecting the power system. The cost per ton of coal burned at TVA steam plants increased to $12.99, up $4.38 from fiscal year 1974. Rising power costs, particularly for coal, necessitated rate adjustments. At June 1975, the average residential rate was 1.76 cents per kilowatthour, up three-tenths of a cent from the preceding year but still among the lowest in the Nation. Power revenues improved by $292.7 million, approaching $1.2 billion, but expenses were such that net income totaled $103.4 million, slightly less than the previous year.

–TVA paid $91.4 million to the U.S. Treasury–$20.0 million as repayment of appropriated funds invested in the power system and $71.4 million as a dividend on the Government's outstanding appropriation investment.

–State and local governments received $36.8 million from TVA as payments in lieu of taxes, nearly $6.0 million more than in 1974. Distributors of TVA power also paid $34.0 million in taxes or tax equivalents to state and local governments in the region.

PURCHASES

–TVA's purchases of equipment, materials, and nonpersonal services totaled almost $3.8 billion in fiscal year 1975. Purchases from the seven Valley states amounted to $1.8 billion, and purchases outside the Valley region almost reached the $2.0 billion level.

–More than $2.0 billion was committed during the year for the purchase of coal for the power system. Other than coal, the largest contracts awarded were for nuclear fuel and nuclear steam supply systems for future nuclear power units.

BUDGET SUMMARIES

The Tennessee Valley Authority is a corporation wholly owned by the Federal Government. It is an independent agency under a Board of Directors responsible to the President and the Congress. It was created by the Congress in 1933 for the unified conservation and development of the resources of the Tennessee Valley. TVA is charged with the responsibility for developing the Tennessee River and for providing a low-cost supply of electric power to the Tennessee Valley region; for chemical research and the introduction of experimental fertilizers useful in agriculture; and for aiding, in the national interest, the comprehensive resource development and economic growth of the Tennessee Valley region in cooperation with the states and their subdivisions and agencies.

The budget summaries shown below and on pages 4-8 support the 1977 program as described beginning on page 9.

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Obligations:				
Appropriations	$73,862	$106,907	$30,550	$121,185
Power proceeds and borrowings	1,703,802	2,950,460	1,490,257	2,905,343
Nonpower proceeds	58,916	71,485	15,384	56,329
Total obligations	1,836,580	3,128,852	1,536,191	3,082,857
Payments to the Treasury	91,399	85,069	22,100	88,038
Appropriations	77,400	100,025	30,550	121,185
Increase in borrowing authority	-	10,000,000	-	-
Income:				
Power proceeds	1,193,021	1,719,317	434,114	1,984,721
Nonpower proceeds	55,720	74,859	11,984	62,558
Total income	1,248,741	1,794,176	446,098	2,047,279

Summary of Budget Financed from Appropriations
(In thousands of dollars)

Page Reference	CAPITAL OUTLAY	1975 actual		1976 estimate		19TQ estimate		1977 estimate	
	REGIONAL DEVELOPMENT PROGRAM								
9	Water resources development								
	Multipurpose facilities:								
10	Duck River project:								
	Normandy dam and reservoir	9,760		8,493		767		-	
	Columbia dam and reservoir	2,647		10,435		2,588		17,000	
	Total Duck River project	12,407		18,928		3,355		17,000	
18	Bear Creek multipurpose water control system	5,237		10,590		5,338		16,049	
24	Tellico dam and reservoir	17,330		23,600		5,530		9,700	
29	Additions and improvements at multipurpose dams	632		779		88		1,002	
	Navigation facilities:								
31	Railway bridge alterations at Decatur, Alabama	295		2,000		3,296		2,455	
32	Additions and improvements at navigation facilities	263		765		96		386	
	Flood control facilities:								
33	South Chickamauga Creek	-		750		250		3,650	
36	Other local flood damage prevention projects	622		867		249		891	
37	Recreation facilities	94		829		202		803	
38	Investigations for future facilities	58	36,938	149	59,257	-	18,404	45	51,981
	General resources development								
69	Lower Elk town				1,000		1,000		2,700
102	Land Between The Lakes		2,058		2,126		868		1,833
	FERTILIZER DEVELOPMENT								
117	Chemical facilities		2,439		2,306		574		12,724
	GENERAL SERVICE ACTIVITIES								
	Reno Bridge–Great Falls reservoir	186		198		-		-	
211	General facilities	308	494	1,114	1,312	187	187	1,933	1,933
	Total capital outlay		41,929		66,001		21,033		71,171
	EXPENSES								
	REGIONAL DEVELOPMENT PROGRAM								
	Water resources development								
39	Navigation operations	1,143		1,280		295		1,220	
44	Flood control operations	889		992		220		1,092	
48	Regional water quality management	1,242		1,346		400		1,104	
	Sparta water supply demonstration	42		533		-		-	
51	Recreation development	755		836		211		1,097	
54	Fisheries and waterfowl resources development	617		687		197		757	
57	Preliminary surveys and engineering	187		192		63		200	
58	Multipurpose reservoir operations	6,249	11,124	7,019	12,885	1,498	2,884	7,378	12,848

(Continued)

Summary of Budget Financed from Appropriations—Continued
(In thousands of dollars)

Page Reference	EXPENSES—Continued	1975 actual		1976 estimate		19TQ estimate		1977 estimate	
71	General resources development								
72	Agricultural projects	1,558		1,591		264		1,681	
79	Waste heat utilization	243		276		48		555	
81	Forest resources development	1,502		1,490		373		1,650	
85	Strip mine reclamation demonstrations	313		3,200		517		3,200	
87	Minerals resources projects	287		282		72		257	
89	Environmental quality projects	319		442		111		483	
92	Development of tributary areas	1,860		2,025		500		2,100	
95	Human resources development	771		812		177		992	
97	Regional economic studies	601		744		186		750	
99	Townlift community improvement	788		701		177		705	
100	Interagency health service demonstrations	160		196		50		202	
	Multipurpose reservoir operations	121	8,523	176	11,935	32	2,507	169	12,744
	Land Between The Lakes								
106	Land Between The Lakes operations		2,423		2,661		810		2,983
126	FERTILIZER DEVELOPMENT								
126	Fertilizer research and development	6,331		6,944		1,791		8,008	
134	Fertilizer introduction	2,859	9,190	5,413	12,357	1,231	3,022	12,477	20,485
	GENERAL SERVICE ACTIVITIES								
217	Valley mapping and remote sensing	439		498		150		534	
220	Joint bicentennial demonstration caravan	-		350		75		125	
221	Scientific and technical cooperation	-		20		13		20	
222	Other expenses	82	521	200	1,068	56	294	275	954
	Total expenses		31,781		40,906		9,517		50,014
	INVENTORIES AND PROPERTY TRANSFERS								
	GENERAL SERVICE ACTIVITIES								
	General inventories	191		-		-		-	
	Property transfers	-39	152	-	-	-	-	-	-
	Total budget financed from appropriations		73,862		106,907		30,550		121,185
	FINANCING								
	Appropriations		77,400		100,025		30,550		121,185
	Balance brought forward		3,344		6,882		-		-
	Balance carried forward		-6,882		-		-		-
	Total financing		73,862		106,907		30,550		121,185

Summary of Budget Financed from Power Proceeds and Borrowings
(In thousands of dollars)

Page Reference	CAPITAL OUTLAY	1975 actual		1976 estimate		19TQ estimate		1977 estimate	
143	POWER SUPPLY AND USE								
147	Cumberland Steam Plant units 1-2	15,332		13,326		-		-	
148	Browns Ferry Nuclear Plant units 1-3	83,000		24,000		1,500		1,800	
151	Sequoyah Nuclear Plant units 1-2	131,015		70,000		15,000		60,000	
153	Raccoon Mountain pumped-storage project	50,929		38,548		8,402		34,398	
155	Watts Bar Nuclear Plant units 1-2	123,851		120,000		25,000		95,000	
157	Bellefonte Nuclear Plant units 1-2	122,810		140,000		55,000		150,000	
159	Hartsville Nuclear Plant units 1-4	-263,559		281,680		455,547		214,886	
161	Phipps Bend Nuclear Plant units 1-2	8,373		176,356		230,208		106,816	
163	Yellow Creek Nuclear Plant units 1-2	2,620		168,315		203,438		116,493	
165	Additional generating capacity	-		-		-		146,585	
166	Johnsonville Gas Turbine Plant units 1-16	39,264		2,820		-		-	
166	Gallatin Gas Turbine Plant units 1-4	31,536		2,464		-		-	
167	Transmission system facilities	87,398		94,908		19,773		100,553	
174	Land and land rights	18,315		95,571		25,185		94,843	
176	Additions and improvements at power facilities	100,604		158,361		86,969		102,437	
181	Nuclear fuel	39,134		80,063		8,300		48,319	
182	Investigations for future power facilities	684	591,306	1,472	1,467,884	410	1,134,732	1,545	1,273,675
	GENERAL SERVICE ACTIVITIES								
211	General facilities		3,590		4,194		1,347		5,112
	Total capital outlay		594,896		1,472,078		1,136,079		1,278,787
	EXPENSES								
	POWER SUPPLY AND USE								
183	Power operations	973,700		1,383,521		359,721		1,595,293	
58	Allocation of multipurpose reservoir operations	3,436		3,910		857		4,096	
	Total expenses		977,136		1,387,431		360,578		1,599,389

(Continued)

Summary of Budget Financed from Power Proceeds and Borrowings—Continued
(In thousands of dollars)

Page Reference	INVENTORIES AND DEFERRED ITEMS	1975 actual		1976 estimate		19TQ estimate		1977 estimate	
	POWER SUPPLY AND USE								
204	Power inventories	144,558		49,879		-11,495		497	
	Unamortized bond discount and premium	-475		-510		-116		-464	
	Unamortized discount on notes payable to public	-13,901		-		-		-	
	Unamortized prepayments	1,646		41,636		5,218		27,182	
	Unamortized debt expense	-58		-54		-7		-48	
	Total inventories and deferred items		131,770		90,951		-6,400		27,167
	Total budget financed from power proceeds and borrowings		1,703,802		2,950,460		1,490,257		2,905,343
	FINANCING								
	Balance brought forward		1,280,550		678,397		9,362,198		8,283,955
	Increase in borrowing authority		-		10,000,000				
	Current proceeds:								
	Power operations	1,190,818		1,716,279		433,742		1,983,158	
	Sale of retired plant	1,375		1,931		165		853	
	Miscellaneous receipts	828	1,193,021	1,107	1,719,317	207	434,114	710	1,984,721
	Payments to Treasury:								
	Reduction of appropriation investment	-20,000		-20,000		-5,000		-20,000	
	Dividend (return on appropriation investment)	-71,372	-91,372	-65,056	-85,056	-17,100	-22,100	-68,000	-88,000
	Balance carried forward		-678,397		-9,362,198		-8,283,955		-7,275,333
	Total financing		1,703,802		2,950,460		1,490,257		2,905,343

Summary of Budget Financed from Nonpower Proceeds
(In thousands of dollars)

CAPITAL OUTLAY	1975 actual		1976 estimate		19TQ estimate		1977 estimate	
FERTILIZER DEVELOPMENT								
Chemical facilities		1,523		2,279		510		-
EXPENSES								
REGIONAL DEVELOPMENT PROGRAM								
Water resources development								
Multipurpose reservoir operations	362		260		24		367	
General resources development								
Agricultural projects	460		345		44		329	
FERTILIZER DEVELOPMENT								
Fertilizer introduction	44,656		44,889		9,959		37,254	
GENERAL SERVICE ACTIVITIES								
Reimbursable services	11,915		23,712		4,847		18,379	
Total expenses		57,393		69,206		14,874		56,329
Total budget financed from nonpower proceeds		58,916		71,485		15,384		56,329
FINANCING								
Balance brought forward:								
Continuing fund	1,000		1,000		1,000		1,000	
Other	2,262	3,262	-961	39	2,400	3,400	-1,000	-
Current proceeds:								
Multipurpose reservoir operations	362		260		24		367	
General resources development	460		345		44		329	
Land Between The Lakes operations	329		357		134		365	
Fertilizer development	41,199		49,400		6,769		42,373	
Reimbursable services	11,915		23,712		4,847		18,379	
Sale of retired plant and miscellaneous receipts	1,455	55,720	785	74,859	166	11,984	745	62,558
Payments to Treasury		-27		-13		-		-38
Balance carried forward:								
Continuing fund	-1,000		-1,000		-1,000		-1,000	
Other	961	-39	-2,400	-3,400	1,000	-	-5,191	-6,191
Total financing		58,916		71,485		15,384		56,329

WATER RESOURCES DEVELOPMENT
(CAPITAL OUTLAY)

Capital outlays for water resources development in fiscal year 1977 will for the most part be applied to continuation of work on multipurpose projects begun in prior years and for which funds have been previously appropriated. Final statements describing and assessing the environmental impacts of these continuing projects have been filed with the Council on Environmental Quality as required by the National Environmental Policy Act and have been sent to the Public Works Subcommittees of the Appropriations Committees of both the Senate and the House, the Office of Management and Budget, and a number of other agencies. There have been no changes in the nature or scope of these projects subsequent to the preparation of the final environmental statements.

DUCK RIVER PROJECT

	In Thousands
1975 actual	$12,407
1976 estimate	18,928
19TQ estimate	3,355
1977 estimate	17,000

Location and Description

The Duck River project will control about 1,181 square miles of drainage area in Maury, Marshall, Bedford, and Coffee counties in Tennessee. The project consists of two dam and reservoir units. The Normandy Dam site is about eight miles north of Tullahoma, Tennessee, on the Coffee-Bedford county line. The Columbia Dam site is about two miles east of Columbia, Tennessee, in Maury County.

Benefit Cost Ratio—1.3:1

Summarized Financial Data

	In Thousands	
	Normandy	Columbia
Actual to June 30, 1975	$28,745	$6,827
Estimate for fiscal year 1976	8,493	10,435
Estimate for transition quarter	767	2,588
Estimate for fiscal year 1977	-	17,000
Estimate to complete	-5	16,650
Estimated Federal cost	38,000	53,500

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Project Status and Plans for 1977

Planning for the project was completed in September 1968. The process of assessment and review of environmental impacts as required by the National Environmental Policy Act was completed with the publication of the final environmental impact statement in April 1972. Minor preliminary land acquisition work was done in 1971. In 1972, engineering and design began, land acquisition was resumed, and a construction start was made on Normandy following completion of the review of environmental impacts. Land acquisition and engineering and design continued for both projects in 1973 and construction was accelerated at Normandy. In 1974, activity at Normandy continued and a modest construction start was made at Columbia. In 1975 construction continued at an intensified rate at Normandy and at a low level at Columbia. Closure of Normandy Dam was accomplished on January 5, 1976, and project completion is scheduled for September 1976. Construction will continue at a low level at Columbia until early in calendar year 1976. The 1977 estimate of $17.0 million provides for progress on Columbia at an intensified and efficient level. Funds will be applied as follows:

	Columbia In Thousands
Continuation of land acquisition	$4,000
Continuation of intensified relocation of highways, bridges, and utilities	5,700
Continuation of dam and spillway construction	4,600
Construction plant, equipment, and inventories	200
Construction supervision and services	1,282
General engineering and design	500
General administration	142
Changes in unpaid undelivered orders	576
Total obligations	17,000

Purpose and Scope

The Duck River project is a multipurpose water control system for development of the Upper Duck River area in middle Tennessee. The system is a central element in a coordinated plan for the unified development and utilization of the resources in this tributary area. It will control floods in urban, agricultural, and potential industrial areas, improve the quality

and quantity of water available for municipal and industrial use, create a broad range of new recreation opportunities, enhance land values, and provide more productive employment of the local labor force in construction of the project and in water-using industries it will make possible.

The two reservoirs will provide about 340,000 acre-feet of storage volume for flood control. Floods equal to the record flood of 1948 at Columbia, Tennessee, will be reduced to essentially a nondamaging stage. Shelbyville and Centerville, Tennessee, will also receive flood control benefits. Flood damages will be significantly reduced for almost 10,000 acres of agricultural and potential industrial land downstream from the dams and for roads and bridges in the area. The reservoir storage capacity also will assist in controlling floods along the Tennessee River downstream from Kentucky Dam and along the lower Ohio and Mississippi rivers.

The water control system will furnish a reliable source of water supply for present and future municipal and industrial requirements in the four counties of the Upper Duck River basin. The availability of raw water for the unified water grid distribution system now being developed in these counties will be greatly improved. Storage releases will supplement streamflow so that the residual load of municipal and industrial waterborne wastes after secondary treatment will not exceed the assimilative capacity of the river.

The reservoirs will provide excellent opportunities for a variety of water-oriented recreation activities now deficient in the watershed. They will be readily accessible from several regional population centers and will be only a day's travel time from metropolitan areas of the Midwest. Both reservoirs will offer attractive boat and bank fishing, and reaches of the river immediately downstream from the dam sites could also be developed for fishing.

Approximately 18,000 acres of project land will surround the two reservoirs. The project will enhance the value of approximately 9,000 acres of this land and some 1,500 additional acres of adjoining land remaining in private ownership.

Construction of the Duck River project and its operation and maintenance will aid in economic development of the Upper Duck River area by providing additional higher paying jobs in the subemployed group. A long step toward permanent relief of the subemployment problem in the region can be provided by the creation of more jobs in industrial and related trades and services enterprises. Significant industrial growth will occur on sites located downstream from the dams, which will be benefited by an assured water supply of high quality and by increased flood protection.

Local Cooperation

Leaders in the Upper Duck River area have been working with TVA for several years to identify and correct some of the basic problems impeding economic progress. The first step was taken in 1964 with formation of a citizen organization,

the Upper Duck River Development Association, made up of some 1,700 people. In March 1965 the Tennessee Legislature created the Tennessee Upper Duck River Development Agency, an organization with broad legal powers and one with official recognition in the governmental structure of the area, and gave it broad responsibilities for formulating and carrying out plans and programs for developing the resources of the area. The Tennessee State Planning Commission in 1966 designated the four Upper Duck River counties as a planning region and created the Upper Duck River Regional Planning Commission as an arm of the development effort.

Thus, three different organizations, each performing a separate but vital task, have been created to plan, guide, and support the overall economic development effort in the Upper Duck River valley. Effective coordination of effort is achieved through a deliberate overlapping of membership on the boards of directors of the three organizations and through the use of a common staff.

The five principal cities of the Upper Duck River area are already demonstrating their ability and willingness to cooperate in projects to improve the development opportunities of their region. They are participating in the construction of a water grid distribution system which, when completed, will tie the five municipal water systems with a four-county network of distribution lines to supply almost every suburban and rural community, along with a number of industrial sites. Upon completion of TVA's Duck River project, supplies to the area water distribution system will be greatly strengthened.

The local participation contract between the Upper Duck River Development Agency and TVA was executed in July 1971. Under its terms the agency agreed to:

1. Promote the implementation of the pioneering developmental planning concept to guide and optimize future development of the area.

2. Obtain the investment of $50.0 million in area development projects.

3. Assist in the planning, development, and utilization of the project shorelands.

4. Repay the $16.2 million project costs attributed to the water supply benefits.

The five municipal water systems of the Upper Duck area subsequently executed a contract with the agency to underwrite the $16.2 million obligation through additions to their rate schedules and are presently making payments into an agency-managed trust fund in accordance with contract provisions.

Project Information

Physical Data	Normandy	Columbia
Drainage area, square miles	195	1,181
Reservoirs:		
Normal maximum pool elevation	875	630
Length, miles[a]	17	54
Length of shoreline, miles[a]	72	236
Area, acres[a]	3,230	12,600
Volume, acre-feet[a]	117,000	294,000
Controlled flood storage, acre-feet	62,400	281,000
Dams:		
Type	Earthfill and concrete	Earthfill
Length, feet	2,726[b]	2,075
Height above foundation, feet	125	105
Spillways:		
Type	Concrete ogee	Concrete chute
Length, feet	94.5[b]	250
Gates	Radial(2)	Radial(5)
Land acquisition:		
Agricultural and rural residential lands with improvements consisting of farm buildings and residences	7,800 acres	31,900 acres
Relocations and protections:		
Highways	$5,000,000[c]	$8,500,000[d]
Highway bridges	3,200,000(4)	5,200,000(10)
Utilities, cemeteries, and other structures	900,000	3,900,000
Total	9,100,000	17,600,000

a. At normal maximum pool.
b. Spillway length is included in length of dam.
c. Approximately 18 miles.
d. Approximately 36 miles.

Status of Construction

	Estimated Percent Complete			Completion Date
NORMANDY	June 30, 1976	September 30, 1976	September 30, 1977	
Total project	98	100	100	September 1976
Land acquisition	100	100	100	September 1975
Reservoir	100	100	100	December 1975
Dam	100	100	100	January 1976
COLUMBIA				
Total project	20	25	50	June 1980
Land acqusition	35	43	75	June 1979
Reservoir	5	8	30	December 1979
Dam	15	20	50	January 1980

Summary of Construction Program

NORMANDY	Actual to 6-30-75	Estimate 1976	19TQ	1977	To Complete	Total Cost
	In Thousands					
Land acqusition	$5,396	$304	-	-	-	$5,700
Reservoir adjustments and clearing	4,491	5,209	-	-	-	9,700
Dam and spillway	11,139	2,100	$61	-	-	13,300
Public-use facilities and miscellaneous structures and improvements	234	900	666	-	-	1,800
Construction plant, equipment, and inventories	422	-300	-122	-	-	-
Construction supervision, general engineering and design, and general administration	5,803	1,540	162	-	$-5	7,500
Total expenditures	27,485	9,753	767	-	-5	38,000
Changes in unpaid undelivered orders	1,260	-1,260	-	-	-	-
Total obligations	28,745	8,493	767	-	-5	38,000

COLUMBIA						
Land acquisition	2,469	3,600	1,000	$4,000	1,831	12,900
Reservoir adjustments and clearing	293	1,500	400	5,700	12,707	20,600
Dam and spillway	812	2,500	900	4,600	388	9,200
Public-use facilities and miscellaneous structures and improvements	18	-	-	-	2,982	3,000
Construction plant, equipment, and inventories	353	150	-	200	-703	-
Construction supervision, general engineering and design, and general administration	2,719	929	238	1,924	1,990	7,800
Total expenditures	6,664	8,679	2,538	16,424	19,195	53,500
Changes in unpaid undelivered orders	163	1,756	50	576	-2,545	-
Total obligations	6,827	10,435	2,588	17,000	16,650	53,500

Cost Estimate. The estimated total cost of $91.5 million for the Duck River project includes an increase of $3.0 million over that presented in the Budget Program for fiscal year 1976. This increase relates to Normandy and results primarily from (1) more extensive requirements and higher construction quantities for highway and bridge relocations ($1.2 million); (2) severe earth dam foundation problems encountered during construction ($1.1 million); and (3) longer haul distance required for earthdam fill ($700 thousand). The Columbia estimate remains the same as that presented in the Budget Program for fiscal year 1976 pending development of a firm construction schedule.

BEAR CREEK MULTIPURPOSE WATER CONTROL SYSTEM

	In Thousands
1975 actual	$5,237
1976 estimate	10,590
19TQ estimate	5,338
1977 estimate	16,049

Location and Description

Construction of the Bear Creek water control system began in 1967. This is a multipurpose project consisting of four dams–Bear Creek, Cedar Creek, Little Bear Creek, and Upper Bear Creek–and nine miles of floodway on Bear Creek. Bear Creek rises in northwestern Alabama and flows through part of northeastern Mississippi before emptying into Pickwick reservoir at Tennessee River mile 244.7

Benefit Cost Ratio–1.2:1

Summarized Financial Data

	In Thousands
Actual to June 30, 1975 (planning, design, and construction)	$20,695
Estimate for fiscal year 1976 (design and construction)	10,590
Estimate for transition quarter	5,338
Estimate for fiscal year 1977 (design and construction)	16,049
Estimate to complete (design and construction)	4,328
Estimated Federal cost	57,000
Estimated value of non-Federal commitments	11,700

Project Status and Plans for 1977

Bear Creek Dam was closed in March 1969, channel improvements were essentially completed in 1973, and construction of Little Bear Dam was begun in 1973 and will be completed in 1976. Construction of Upper Bear Dam began in 1975 and Cedar Dam is scheduled to begin in 1976. The effort in 1977 will be directed toward continuation of Upper Bear Dam and Cedar Dam, leading to closure of these dams in 1978. Application of the 1977 estimate of $16.0 million is as follows:

	In Thousands
Completion of land acquisition	$6,100
Beginning of reservoir clearing and reservoir public-use facilities for Upper Bear and Cedar dams; beginning of utility relocations for Cedar Dam	2,800
Continuation of dams, spillways, and sluices at Upper Bear and Cedar dams	5,300
Continuation of other structures and improvements at Upper Bear and Cedar dams	500
Construction plant equipment and inventories	-74
Construction supervision and services	938
General engineering and design	700
General administration	124
Changes in unpaid undelivered orders	-339
Total	16,049

Purpose and Scope

The project is designed to provide flood relief for agricultural lands and a measure of control of Bear Creek's contribution to lower Tennessee River floods. It will afford increased industrial and municipal water supplies and will provide new shoreland resources which will significantly affect future development of the Bear Creek area. With the closure of the Bear Creek unit and the completion of the floodway, substantial flood damage was averted during unusually intense rainfalls in the

spring of 1973. New recreation facilities have been constructed and are receiving heavy use. The project is a key element in a cooperative comprehensive economic development program for the entire Bear Creek region, which has generated significant industrial and economic growth. Dozens of new manufacturing plants have not only provided new employment but placed a new level of demand on the region's water supply systems. To meet these demands a regional water grid system which will use the Upper Bear Creek unit as a water source was designated, funded jointly by local governments and EDA, and will be under construction soon.

The scope of state and local participation has been agreed to and includes major assistance by the state in highway relocations in the reservoir areas, local assumption of selected project responsibilities such as floodway maintenance, operation and management of shoreline lands, and commitments for long-range area development activities.

Project Information

Physical Data

Channel improvements:

Bear Creek channel–actual length improved	18 miles
Floodway, length–actual length of floodway constructed	9 miles

	Bear Creek	Cedar Creek	Little Bear Creek	Upper Bear Creek
Reservoirs:				
Drainage area–square miles	232	179	61	113
Normal summer level–elevation	576	580	620	797
Area–acres	670	4,200	1,560	1,850
Shoreline length–miles	39	64	38	100
Minimum pool–elevation	565	560	603	787
Dams (earth embankment with concrete spillway):				
Length–feet (including spillway)	1,385	3,160	2,425	1,585
Maximum height–feet (above foundation)	84	96	94	87

Land acquisition:

Agricultural and rural residential lands with improvements consisting of farm buildings and residences	24,100 acres

Relocations and protections:

Highways and bridges	$900,000[a]
Utilities, cemeteries, and other structures	1,700,000
Total	2,600,000

a. Construction of major relocations is to be performed and financed by the State of Alabama. This estimate provides for TVA participation in engineering and design for State construction of relocations and design and construction of minor tertiary road relocations.

Status of Construction

	Estimated Percent Complete			Completion Date
	June 30, 1976	September 30, 1976	September 30, 1977	
Total project	60	65	95	June 1978
Land acquisition	50	60	100	June 1977
Reservoirs	50	55	90	December 1977
Dams	60	65	95	January 1978
Floodway	100	100	100	October 1973

Summary of Construction Program

	In Thousands					
	Actual to 6-30-75	Estimate				
		1976	19TQ	1977	To Complete	Total Cost
Land and land acquisition	$2,506	$3,300	$2,300	$6,100	$94	$14,300
Reservoir adjustments and clearing	1,131	700	200	2,800	1,369	6,200
Dams, spillways, and sluices	8,503	4,600	1,900	5,300	1,897	22,200
Floodway	1,554	-	-	-	-	1,554
Other structures and improvements	1,105	600	100	500	395	2,700
Construction plant, equipment, and inventories	74	75	-	-74	-75	-
Construction supervision and services, general engineering and design, and general administration	5,582	1,264	434	1,762	1,004	10,046
Total expenditures	20,455	10,539	4,934	16,388	4,684	57,000
Changes in unpaid undelivered orders	240	51	404	-339	-356	-
Total obligations	20,695	10,590	5,338	16,049	4,328	57,000

Cost Estimate. The project cost estimate of $57.0 million includes an increase of $3.0 million over that presented in the Budget Program for fiscal year 1976. The increase provides for foundation problems and for higher unit costs encountered in the construction of Little Bear Dam ($2.2 million). The increase provides also for design modifications and increased design and archaeological investigations for Upper Bear Dam ($800 thousand).

TELLICO DAM AND RESERVOIR

	In Thousands
1975 actual	$17,330
1976 estimate	23,600
19TQ estimate	5,530
1977 estimate	9,700

Location and Description

Tellico dam and reservoir, under construction since 1967, is a multipurpose water resources and regional economic development project. The Tellico Dam site is in Loudon County, Tennessee, near Lenoir City, at mile 0.3 on the Little Tennessee River. Fort Loudoun Dam, on the Tennessee River, is immediately upstream of the confluence of the Tennessee and Little Tennessee rivers. The Tellico Dam will create a reservoir extending upstream approximately 33 miles and connected with the Fort Loudoun reservoir by a short canal. The canal enables the navigation and power features of the project to be attained without construction of a navigation lock or powerhouse, and a valuable flexibility is achieved in TVA flood control operations.

Benefit Cost Ratio—1.7:1

Summarized Financial Data

	In Thousands
Actual to June 30, 1975 (planning, design, and construction)	$60,328
Estimate for fiscal year 1976 (design and construction)	23,600
Estimate for transition quarter	5,530
Estimate for fiscal year 1977 (design and construction)	9,700
Estimate to complete (design and construction)	842
Estimated Federal cost	100,000

Project Status and Plans for 1977

The project was started in 1967. The concrete portion of the dam was completed in 1969. After a prolonged interruption, intensified construction is again in progress. Repeated yearly funding limitations and continuing litigation have prolonged the project long beyond the contemplated and efficient construction period. The 1976 and 19TQ estimates totaling $29.1 million and the 1977 estimate of $9.7 million will provide for continuation of effort, dam closure in January 1977, and substantial completion of the project by the end of fiscal year 1977. Application of the 1977 estimate will be as follows:

	In Thousands
Cleanup of land acquisition related activities	$100
Completion of design and construction of highway, highway bridge, and railroad bridge relocations	1,800
Completion of reservoir utility relocations	900
Completion of reservoir rim treatment and reservoir clearing	700
Completion of main earth dam and spillway gate installation	400
Completion of interreservoir canal and channel improvements	200
Beginning of public-use facilities	600
Continuation of permanent access road and dam site improvements	3,100
Construction plant equipment and inventories	-80
Construction supervision and services	1,322
General engineering and design	400
General administration	108
Changes in unpaid undelivered orders	150
Total	9,700

Purpose and Scope

The project will add 126,000 acre-feet of flood storage to the TVA system and will extend navigation to an important rail and highway crossing of the Little Tennessee River. It will add an average of about 200,000,000 kWh annually to the Fort Loudoun power generation. The project will stimulate the lagging economy of the area by providing industrial sites

with access to river transportation and by providing a water and shoreline resource with great potential for recreational and homesite development. TVA estimates that the wages from the industries expected to take advantage of the improved sites, and from the expansion in related trades and services type employment, will total $43.0 million annually by the end of a 25-year period. After deducting alternative earnings of those likely to be employed and averaging the effects of this 25 years of growth over the life of the project, it is estimated that the annual equivalent of this increase in wage incomes will be $3.7 million. Net proceeds from the sale of shoreline lands, as industrial and recreational uses develop, will result in a partial recovery of the Federal investment in the project.

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Project Information

Physical Data

Drainage area below Fontana Dam	1,056 square miles
Reservoir:	
Length at elevation 813 (normal maximum pool):	
Little Tennessee River	33.2 miles
Tellico River	20.0 miles
Length of shoreline at elevation 813	310.0 miles
Volume at elevation 813 (16,500 acres)	414,600 acre-feet
Controlled flood storage	126,000 acre-feet
Dam:	
Type	Concrete gravity nonoverflow dam and spillway and earth embankment
Length (main dam)	3,237 feet
Height above foundation (at deepest excavation)	129 feet
Spillway	Three radial gates 40- by 42-feet
Canal to Fort Loudoun reservoir	1,000 feet long by 500 feet wide
Navigation lock	Use Fort Loudoun lock
Extension of 9-foot navigable channel	30 miles (Little Tennessee River)
Power facilities (none):	
Increase in average annual energy at Fort Loudoun powerhouse	200 million kWh
Land acquisition:	
Agricultural and rural residential lands with improvements consisting of farm buildings and residences	38,000 acres
Relocations and protections:	
Highways (84 miles total–76 miles by TVA)	$22,900,000
Highway bridges (12 total–7 by TVA)	9,100,000
Railroad (3 miles)	1,300,000
Railroad bridge (1)	3,000,000
Utilities, cemeteries, and other structures	3,100,000
Total	39,400,000

Status of Construction

	Estimated Percent Complete June 30, 1976	September 30, 1976	September 30, 1977	Completion Date
Total project	80	85	98	December 1977
Land acquisition	100	100	100	June 1976
Reservoir	80	90	100	June 1977
Dam	90	97	100	January 1977 (closure)
Other structures	20	40	90	December 1977

Summary of Construction Program

	In Thousands					
	Actual to 6-30-75	Estimate 1976	19TQ	1977	To Complete	Total Cost
Land acquisition	$21,910	$3,900	$50	$100	$40	$26,000
Reservoir adjustments, clearing, and rim treatment	17,209	11,900	2,500	3,400	-9	35,000
Main dam, spillway, and auxiliary dams	9,851	6,300	800	400	49	17,400
Interreservoir canal, channel improvements, public-use facilities, access road, and other structures	300	1,700	1,800	3,900	900	8,600
Construction plant, equipment, and inventories	191	-100	-20	-80	9	-
Construction supervision and services, general engineering and design, and general administration	7,680	2,789	599	1,830	102	13,000
Total expenditures	57,141	26,489	5,729	9,550	1,091	100,000
Changes in unpaid undelivered orders	3,187	-2,889	-199	150	-249	-
Total obligations	60,328	23,600	5,530	9,700	842	100,000

Cost Estimate. The estimated project cost of $100.0 million is unchanged from that reported in the Budget Program for fiscal year 1976.

ADDITIONS AND IMPROVEMENTS AT MULTIPURPOSE DAMS

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Operational facilities and equipment	$511	$399	$19	$740
Visitor facilities and improvements	110	355	65	236
Distribution of administrative and general expenses	11	25	4	26
Total	632	779	88	1,002

Operational Facilities and Equipment

This category includes replacement equipment used in operating the multipurpose system of dams and reservoirs and improvements which contribute to the operating efficiency of existing facilities.

The 1977 estimate of $740 thousand includes $50 thousand for a floating bulkhead at Melton Hill Dam to facilitate maintenance of spillway gates and assure reliable gate operation; $23 thousand for a storage building at Kentucky Dam; $20 thousand for automatic hydrologic data collecting equipment to be used to collect rainfall data; $28 thousand for improvements to ensure safer working conditions for personnel at Wilson Dam; $300 thousand to begin replacement of hoisting equipment for the 21 spillway gates at Wilson Dam which was placed in service in 1924; and $319 thousand for equipment such as mowers, tractors, and other equipment and small tools for maintenance of dam reservations.

Visitor Facilities and Improvements

Visitors to TVA's multipurpose dam reservations totaled 11.9 million in calendar year 1974. Five projects had over one million visitors individually, and two others had over one-half million visitors each. Many of these visitors come seeking information about TVA and its programs. Others seek the enjoyment of outdoor activities such as picnicking, sunbathing, boating, and fishing which TVA reservations and reservoirs provide.

Facilities installed years ago in connection with the construction of TVA's multipurpose dams are now inadequate to serve a growing more mobile population seeking recreation opportunities. A continuing program of additions and improvements to existing facilities is essential for safe and sanitary accommodations for the level of visitors being experienced. The 1977 estimate of $236 thousand provides for additions and improvements at nine locations where present facilities are inadequate or nonexistent. Work planned includes shoreline improvements, boat launching ramps, more adequate parking, improved roads for better access, picnic tables and grills, and sanitary facilities.

NAVIGATION FACILITIES

Railway Bridge, Alterations, Decatur, Alabama

	In Thousands
1975 actual	$295
1976 estimate	2,000
19TQ estimate	3,296
1977 estimate	2,455

Location and Description

The Southern Railway bridge across the Tennessee River at Decatur, Alabama has long been a serious navigation hazard, causing frequent delays and damages to both rail and river traffic. At present, tows must pass through a bridge span supported by two unprotected piers about 180 feet apart, a little more than half the 350 feet of horizontal clearance which TVA regards as the minimum for safe navigation. The turnspan in the railroad bridge is poorly located adjacent to the south bank of the river. The navigation openings through two highway bridges, about 3,000 feet upstream, are near the middle of the river. Thus, long tows of barges, 1,000 feet or more in length, upbound, must carefully negotiate the railroad bridge on a course parallel to and adjacent to the south bank, then angle several hundred feet to the north before preparing to pass through the highway bridge openings. For downbound tows of empty barges, the problem is more difficult because empties are more vulnerable to wind.

Benefit Cost Ratio–1.6:1

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$383
Estimate for fiscal year 1976	2,000
Estimate for transition quarter	3,296
Estimate for fiscal year 1977	2,455
Estimate to complete	166
Estimated Federal cost	8,300
Estimated value of non-Federal commitments	200

Project Status and Plans for 1977

The estimated cost of $8.3 million includes an increase of $2.1 million over the estimate included in the Budget Program for 1976. The increase results from new cost estimate information furnished by the engineering design consultant which reflects a greater quantity of steel, increased price for operating machinery, escalation arising from the eight-month delay in the construction schedule, additional design, inspection, and general costs, and other miscellaneous factors.

Purpose and Scope

The improvement consists of replacing three spans of the existing bridge with a modern vertical lift span which will increase the horizontal clearance from about 180 feet to about 400 feet and will provide an improved sailing line more nearly in line with the two highway bridges immediately upstream.

Detailed project design started in fiscal year 1974 and continued in 1975. Construction will begin late in fiscal year 1976. In fiscal year 1977 funds will be applied to continuing construction. The project will be completed in 1978. Benefits consist of savings in time and related operating costs by tows using the waterway, decreases in accidents, avoidance of the possible loss of life, and reduced insurance rates.

Additions and Improvements at Navigation Facilities

	In Thousands
1975 actual	$263
1976 estimate	765
19TQ estimate	96
1977 estimate	386

Additions and improvements to the navigation system to accommodate the needs of modern-day navigation, correct the normal effects of aging, and to facilitate change in operating standards are necessary to maintain the safety, efficiency, and effectiveness of the navigable waterway.

The estimate of $386 thousand provides $175 thousand to construct two mooring cells in Kentucky reservoir for adequate tieup facilities during periods of heavy traffic. This item was deferred from 1976 for facilities of more urgent need. Also included in 1977 are $170 thousand to install fire protection equipment at Guntersville auxiliary lock and Melton Hill lock, and $41 thousand for miscellaneous additions at various locations.

FLOOD CONTROL FACILITIES

South Chickamauga Creek Project

	In Thousands
1975 actual	-
1976 estimate	$750
19TQ estimate	250
1977 estimate	3,650

Location and Description

South Chickamauga Creek flows into the Nickajack reservoir at Tennessee River mile 468.2 at Chattanooga, Tennessee. The project will consist of a levee system, together with stream channel improvements and related drainage facilities, along about four miles of South Chickamauga Creek in the Brainerd area of Chattanooga.

Benefit Cost Ratio–1.2:1

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	-
Estimate for fiscal year 1976	$750
Estimate for the transition quarter	250
Estimate for fiscal year 1977	3,650
Estimate to complete	7,350
Estimated Federal cost	12,000

Project Status and Plans for 1977

The city of Chattanooga, Tennessee, requested assistance from TVA in 1963. TVA finalized plans in August 1967 and executed an agreement with the city "for cooperative actions for flood damage prevention." During the major Tennessee River basin flood of March 1973, South Chickamauga Creek reached the level of record due primarily to headwater flooding, causing damages estimated at $12.0 million. Had the project been completed, it would have averted $10.0 million of these damages, thus essentially recovering all of the project cost in this single flood. In response to an immediate urgent request from local government officials, the project is now receiving high priority. In addition, the project has an unusual and interesting relationship with current expansion of the Chattanooga airport, adjacent to South Chickamauga Creek. Modification of the creek is a requirement of both projects and a location suitable for both was coordinated with the city's consultants. Further, the airport expansion needs substantial fill material and the flood control project will have a surplus of excavated material. Properly timed construction will save Federal dollars in fill-borrow costs for the airport and spoil costs for the flood control project. TVA is concerned about achieving this advantageous timing, which has now become critical. The city has demonstrated its full cooperative support of this project by already acquiring much of the necessary lands. The final environmental statement was sent to the Council on Environmental Quality and made available to the public on July 13, 1974. Construction is proposed to begin September 1976 with completion scheduled by May 1979.

Purpose and Scope

The Brainerd area of Chattanooga lies along the west bank of South Chickamauga Creek and is subject to both creek headwater flooding and Tennessee River backwater floods. A high degree of flood protection will be achieved by means of 3.9 mile-long levee system and interior drainage facilities, 2.3 miles of channel relocation, and 1 mile of channel widening. The purpose of the project is to relieve flooding of over 1,200 acres in this rapidly growing section of the city which in 1972 involved over 1,500 residences and 155 commercial establishments, together with a number of schools, churches, and public facilities.

The South Chickamauga Creek flood protection project is an element of an overall plan to provide the city of Chattanooga needed flood protection supplementary to that available from the main river flood control system. The project is a cooperative effort of the city of Chattanooga and TVA evidenced by a contractual agreement, in which the city makes contributions to project construction and provides for operation and maintenance. The present value of the city's contribution is estimated at more than one-fourth of the total capital cost.

In addition to flood control benefits of prevented damages and enhanced land values and values to airport expansion, the project would open up land for urban development and provide a levee-side park or green belt for open space recreation within the urban area.

Summary of Construction Program

	Estimate (In Thousands)				
	1976	19TQ	1977	To Complete	Total Cost
Adjustment and protection of structures	-	-	$400	$100	$500
Storm water retention basin	-	-	200	600	800
Levee and pumping stations	-	$100	1,800	4,200	6,100
Channel improvements	-	-	500	1,200	1,700
Construction supervision and services, engineering and design, and general administration	$150	150	750	1,850	2,900
Total expenditures	150	250	3,650	7,950	12,000
Changes in unpaid undelivered orders	600	-	-	-600	-
Total obligations	750	250	3,650	7,350	12,000

Cost Estimate. TVA's share of the project is estimated to be $12.0 million with the city of Chattanooga contributing the remainder of the project in the form of purchase of land and land rights and relocation of affected utilities.

Other Local Flood Damage Prevention Projects

	In Thousands
1975 actual	$622
1976 estimate	867
19TQ estimate	249
1977 estimate	891

TVA experience in constructing local flood damage prevention projects has shown that the regular processes for planning and funding small projects are too time-consuming and too inflexible. These programs typically include a number of elements having diverse sources of funding and each involving its own decision-making procedures. Flexibility is needed in the decision-making procedures for the flood control element. The $891 thousand estimate in fiscal year 1977 provides that needed flexibility. The financing authority would be limited to those situations involving not more than a $1.0 million TVA outlay. In accordance with section 73 of Public Law 93-251, planning for such projects provides flood plain regulations and other nonstructural measures to the fullest extent applicable. Whenever appropriate, the interagency reviews required by the National Environmental Policy Act and the Intergovernmental Cooperation Act of 1968 are secured prior to initiation of projects.

TVA's objective in these projects is to stimulate comprehensive development programs. Such projects are products of cooperative planning of Federal, state, and local agencies with private firms and local development associations. In 1975 projects were completed at Dayton, Tennessee, and Muscle Shoals, Alabama, and were in various stages of implementation at Briceville and Crab Orchard, Tennessee, and St. Paul, Virginia. In all of these, TVA provided the flood control and management assistance necessary to trigger a comprehensive community development program. Patterns of Federal, state, and local relationships involved in each were extensive. All are successful demonstrations of how a traditional Federal function, such as provision of flood control works, can be better integrated into comprehensive development programs.

The 1976 estimate provides for anticipated TVA assistance to Kingsport, Rockwood, and Jefferson County, Tennessee, in implementing projects and technical assistance in planning for possible future action in two other communities. The 1977 funds will be used to continue technical assistance with these and other communities and to initiate damage prevention actions if warranted. Also planned is assistance on other small local flood problems via a demonstration program whereby a planning and development district or other appropriate multicounty organization would undertake responsibility for the work in cooperation with local governments in its area.

RECREATION FACILITIES

	In Thousands
1975 actual	$94
1976 estimate	829
19TQ estimate	202
1977 estimate	803

The Tennessee Valley has abundant water-oriented recreation resources, and many free-flowing streams add variety of water-based recreation opportunities. The TVA reservoir system with almost 10,800 miles of shoreline and over 620,000 acres of reservoir impoundments received 62 million visitors in calendar year 1974.

As is the case elsewhere in the Nation, increases in population, income, and leisure time have led to growth in the demand for outdoor recreation opportunities in the Tennessee Valley. The pattern of this demand has been modified in recent years by high fuel costs resulting in fuel conservation. People now tend to recreate closer to home, putting additional use pressures on nearby recreation facilities. This situation is illustrated by the fact that between 1973 and 1974, visits to TVA public-use areas increased nearly 75 percent.

To help meet this growing need for more reservoir access areas, TVA will continue to develop selected sites along its reservoir shorelines and, in cooperation with other agencies, develop facilities at other scenic and natural areas. These facilities will provide the general public with safe and sanitary access to this recreation resource. Facilities to be provided will include roads, parking, boat launching ramps, picnic tables, grills, sanitary facilities, swimming beaches, and trails. The estimate for these improvements is $623 thousand. An estimate of $180 thousand provides for acquisition of land for water access on reservoirs where lack of shoreline in public ownership necessitates purchase and development of private land for public access.

INVESTIGATIONS FOR FUTURE FACILITIES

	In Thousands
1975 actual	$58
1976 estimate	149
19TQ estimate	-
1977 estimate	45

Investigations for future water resources development facilities determine the scope and evaluate the economic and environmental effects of possible projects in sufficient detail for decisions as to whether to recommend construction and provide basic information needed for project design. The 1977 estimate of $45 thousand is to complete an investigation started in 1976 for Athens, Alabama.

Athens, Alabama, is located on Swan Creek nine miles above its mouth at Wheeler Lake on the Tennessee River. Town Creek, which is a tributary to Swan Creek, flows in a southeasterly direction through the western and southern parts of the city. Significant commercial and residential areas of Athens along Town Creek are subject to flooding. The feasibility investigation will consider all practical methods of flood relief, and, if warranted, a planning report and environmental statement will be issued in 1977.

WATER RESOURCES DEVELOPMENT
(OPERATING EXPENSES)

NAVIGATION OPERATIONS

	In Thousands
1975 actual	$1,143
1976 estimate	1,280
19TQ estimate	295
1977 estimate	1,220

The nine-foot draft navigation channel from Knoxville, Tennessee, to Paducah, Kentucky, carried over 27 million tons of commercial freight in calendar year 1974. TVA operates the multipurpose system to provide full depth in the waterway at all times; it plans and provides necessary navigation improvements; and it gives technical assistance to transportation interests, state agencies, subregional planning and development agencies, and waterfront communities. The overall purpose of these activities is to assure that low-cost water transportation is an effective tool in regional development. The Corps of Engineers operates and maintains the locks and the channel. The U.S. Coast Guard maintains the channel markers.

The economic impact of the Tennessee River waterway reaches far beyond the 43,000 jobs directly related to the industries and river freight terminals that have located along the waterway. This impact extends throughout the Valley region to satellite plants located inland and using waterfront industry products as input or specializing in services and products required by the waterfront industries, trades, and services.

Navigation Engineering and Investigations

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Navigation engineering	$390	$386	$99	$361
Transportation economic studies	223	236	59	234
Cooperative development work with state and local agencies	420	452	112	467
Total	1,033	1,074	270	1,062

Navigation Engineering

Navigation engineering is necessary on a continuing basis to keep the Tennessee River navigation system adequate for modern-day transportation; to coordinate the operation and maintenance efforts of TVA, the U.S. Coast Guard, and the Corps of Engineers; to promote individual safety and protect the natural environment; to assist industries seeking waterfront sites for plant locations; to improve water transportation; and to maximize the economic and social benefits of the Tennessee River navigation system. Navigation engineering is performed on a continuing basis to meet changes in emphasis caused by economic demands of the particular time period.

Construction of the upper end of the Tennessee-Tombigbee Waterway, by the Corps of Engineers, also necessitates land-use assistance and public-use terminal planning for communities in northeast Mississippi related to that waterway. To date, requests for assistance have been received from seven northeast Mississippi communities. Because of the current demand for coal and the national emphasis on use of fuels other than foreign oil, requests for assistance in locating waterfront sites for coal terminals have increased. Eighteen requests for such assistance were received and handled in calendar year 1975. Other activities and requests for assistance relate to navigation safety for recreational and commercial users of the waterway and its 265 miles of secondary channels. Tools for this purpose are up-to-date navigation charts and the accurate placement of buoys marking channel depths for commercial and recreational boating. Missing buoys are replaced and navigation channels are inspected at least three times annually. Secondary channels help spread the benefits of water recreation by accommodating about 40,000 recreational boats.

Transportation Economic Studies

Economic studies are undertaken to determine the benefits to be derived from the system. The economic well-being of the region is heavily dependent on trade with other regions. About 75 percent of the traffic on the waterway originates or terminates in other regions. Thus the health of its transportation system, the understanding of the relationships among types of carriers, and the early assessment of the results of proposed changes are all of prime importance to the full development of the region's resources.

The changes taking place in the relative costs of barging and other modes of transportation bring new opportunities for shippers, both in the use of existing plants and the establishment of new production facilities. Helping them to analyze their transportation options creates a continuing need for commodity rate studies. These changes also require the evaluation of the feasibility of establishing additional public-use terminals, following coordination with local planning agencies.

Cooperative Development Work with State and Local Agencies

To assure that the Tennessee River and other resources are used to full advantage in the industrial development and economic growth of the Tennessee Valley region, TVA offers a comprehensive assistance program in planning for industrial development. The service offered includes technical and research assistance concerning the area's resources, industrial growth trends, industry location characteristics, and the identification of suitable industrial areas. Available economic data are analyzed to identify new interindustry relationships and the changing types of industry within the Southeast. Forecasts of emerging industrial opportunities for the region are based on these analyses. This assistance is available to all communities in the Tennessee Valley region through working relationships with various state offices of the seven Tennessee Valley states, multicounty organizations, and concerned community development groups.

Other Navigation Expense

	In Thousands
1975 actual	$52
1976 estimate	138
19TQ estimate	9
1977 estimate	88

The 1977 estimate of $88 thousand includes $18 thousand for power furnished to the Corps of Engineers for lock operations; $50 thousand to repair leaking contraction joints on the river lock wall at Melton Hill lock; and $20 thousand for miscellaneous engineering inspection activities related to locks, channels, mooring cells, and other navigation facilities.

Summary of Navigation Operations Expenses

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Navigation engineering and investigations	$1,033	$1,074	$270	$1,062
Other navigation expense	52	138	9	88
Distribution of administrative and general expenses	58	68	16	70
Total appropriation estimate	1,143	1,280	295	1,220
Allocated from multipurpose reservoir operations	2,132	2,383	534	2,500
Total expenses before writeoff and depreciation	3,275	3,663	829	3,720
Writeoff of floating caisson costs[1]	208	-	-	-
Depreciation	2,958	2,960	740	2,960
Total expenses	6,441	6,623	1,569	6,680

1. This charge to expense is for costs incurred by TVA in the design and purchase of a floating caisson to be owned and operated by the Corps of Engineers. Like depreciation, this item requires no financing and is included here in the interest of completeness of reporting.

Program and Performance

TVA's program for navigation improvement of the Tennessee River and its tributaries began in 1933 and by 1945 a dependable nine-foot channel for the full 650-mile length of the Tennessee River was essentially complete. The nine-foot channel was completed in all respects in 1952. Commercially navigable channels extend up a number of tributaries, and 130 miles of these channels are also used by commercial tows. Private industry has invested about $2.6 billion in waterfront plants, terminals, and distribution facilities.

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Tennessee River traffic volume in 1974 totalled 27.1 million tons. Savings on transportation charges to shippers are estimated at $72.1 million in calendar year 1974. This is the difference between the freight charges actually paid and those which would have been paid if the river had not been improved for navigation. Freight originating outside the Valley or moving from the Valley to outside destinations accounts for over 95 percent of the transportation savings estimate.

Operation of the Tennessee River navigation channel involves TVA, the Corps of Engineers, and the Coast Guard. Total cost to the three agencies in 1974 for operation and maintenance of the waterway, including provision for depreciation, was about 13 percent of the public benefits in the form of transportation cost savings in the same year.

FLOOD CONTROL OPERATIONS

	In Thousands
1975 actual	$889
1976 estimate	992
19TQ estimate	220
1977 estimate	1,092

TVA's approach to flood damage abatement is twofold. For the regions along the Tennessee River and its major tributaries, regulation by the reservoir system significantly reduces potential flood-producing flows. These operations also reduce crests along the lower Ohio and Mississippi rivers. Communities situated beyond the influence of the reservoir system—on upper reaches of streams or on small streams that flood during brief periods of intense rain—are assisted in finding specific solutions to their problems.

Flood control operations include: (1) collection of data to evaluate and improve reservoir flood control operations and to assess flood damages and flood damages averted, (2) assistance to communities in planning and implementation of flood damage abatement measures and in acquiring flood insurance, and (3) operation and maintenance of local flood control facilities.

System Flood Control Studies and Investigations

	In Thousands
1975 actual	$325
1976 estimate	481
19TQ estimate	108
1977 estimate	504

This program includes: (1) collecting data on current floods, (2) making engineering studies to guide current flood operations and appraise results, (3) developing and disseminating flood information, (4) appraising potential flood damages, (5) reviewing plans that affect the Tennessee River system which are submitted for approval under Section 26a of the TVA Act, and (6) evaluating the hydrologic safety of TVA dams.

The 1977 estimate of $504 thousand provides for continuing data collection and operating studies. The estimate includes also the cost of the development of a computer library file that will reduce the time required for response to requests for flood information. The workload, particularly that of collecting data on current floods, varies from year to year depending on the number and severity of floods. Accurate flood data are necessary for evaluating the effectiveness of existing facilities and their operation and to appraise flooding problems on unprotected tributaries.

Local Flood Damage Prevention

	In Thousands
1975 actual	$517
1976 estimate	450
19TQ estimate	100
1977 estimate	519

Continued urban and industrial expansion increases pressure to utilize land in the flood plain. Since 1953, TVA has provided information and technical assistance to communities and individuals to help them define their flood problems and to prevent unwarranted increases in flood damage potential. By the end of fiscal year 1975, some 130 flood hazard evaluation reports had been prepared for more than 160 communities. Eighty-seven communities had adopted zoning ordinances, 65 had adopted subdivision regulations, and more than 100 had adopted some form of regulations which included flood plain provisions. Flood damage prevention plans for more than a dozen communities have included some form of structural flood relief measures and 5 communities have merged the solution of their flood problems with plans for solutions of other major problems. Flood proofing is often suggested and has been implemented. Electronic flash flood warning systems and locally operated flood forecasting systems are being used successfully. In 1975, specialized technical assistance was provided on more than 460 requests at specific sites being considered for schools, post offices, hospitals, residences, commercial buildings, industries, and other developments. This specialized technical assistance uses flood hazard information to direct new developments away from areas subject to flooding, thereby avoiding unnecessary flood damages and associated hardships, and reducing future demands for public investment in major flood control structures and in federally financed flood recovery systems.

The impact of other Federal activity has greatly affected this program. Executive Order 11296 directs all Federal executive agencies to preclude uneconomic, hazardous, or unnecessary use of flood plains. The Executive Order also requires the provision of flood information for construction which these agencies propose in the Tennessee River basin. The National Flood Insurance

Act of 1968 added flood insurance to the list of practical measures that could be employed to avoid financial diaster due to flooding. To prevent federally subsidized flood insurance from encouraging accelerated flood plain encroachment and thereby increasing damages, the act requires land use restrictions as a prerequisite to flood insurance eligibility. More than 150 Valley communities have qualified for flood insurance. This represents more than a 67 percent increase over 1974. The Flood Disaster Protection Act of 1973 began eliminating on July 1, 1975, all Federal or federally-related financial assistance for purchase of or construction on flood-prone land, unless the community and the owner are participating in the flood insurance program. These and other national developments have caused and will continue to cause substantial increases in requests for flood information and for specialized technical assistance. The comprehensive approach developed by TVA has become a national model.

The 1977 estimate of $519 thousand provides for a continuation of 1976 activities with emphasis on specialized technical assistance to local governments. TVA's own flood-hazard development studies in those localized situations where needs cannot be met with FIA-supported work will be continued. Assistance to communities in preparing comprehensive flood damage prevention plans will be provided, and TVA will encourage towns to involve consulting engineers in such planning to the fullest extent feasible.

Operation and Maintenance of Local Flood Control Facilities

	In Thousands
1975 actual	$25
1976 estimate	36
19TQ estimate	6
1977 estimate	42

The 1977 estimate of $42 thousand provides for continuation of operation and maintenance of local flood control facilities at Bristol, Tennessee-Virginia. Activities include (1) collection of hydrologic data and (2) analysis of operations at the two detention reservoirs.

Summary of Flood Control Operations Expenses

	In Thousands			
	1975 Actual	1976 Estimate	1-TQ Estimate	1977 Estimate
System flood control studies and investigations	$325	$481	$108	$504
Local flood damage prevention	517	450	100	519
Operation and maintenance of local flood control facilities	25	36	6	42
Distribution of administrative and general expenses	22	25	6	27
Total appropriation estimate	889	992	220	1,092
Allocated from multipurpose reservoir operations	2,536	2,880	614	3,005
Total expenses before local flood control improvements and depreciation	3,425	3,872	834	4,097
Local flood control improvements[1]	1,144	-	-	-
Depreciation	1,322	1,340	335	1,355
Total expense of flood control operations	5,891	5,212	1,169	5,452

1. This charge to expense is for costs incurred in making local flood control improvements. Like depreciation this item requires no financing and is included here in the interest of completeness of reporting.

REGIONAL WATER QUALITY MANAGEMENT

	In Thousands
1975 actual	$1,242
1976 estimate	1,346
19TQ estimate	400
1977 estimate	1,104

In response to the resource management and regional development responsibilities expressed in Section 22 of the TVA Act, TVA water quality management activities have as their objective the maintenance of surface and groundwaters of sufficient quality to permit their optimum development and maintenance for

1. municipal, industrial, and agricultural water supplies;
2. propagation of fish and wildlife;
3. water-contact recreation; and
4. aesthetic satisfaction.

In accordance with the requirements and intents of the Federal Water Pollution Control Act Amendments of 1972, the emphasis of the program is on evaluating the effects of water quality associated with the TVA water resource system and its operation. TVA's water quality management activities include research, investigations, experiments, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of pollution. In addition, monitoring activities are conducted in accordance with the FWPCA of 1972, which calls for the Environmental Protection Agency to establish a water quality surveillance system in cooperation with state and Federal agencies and to make the resulting information available for use. The results of TVA's water quality monitoring are entered into the EPA STORET data storage and retrieval system, and they are made available to the public through published reports, correspondence, and other means. To achieve these program objectives, TVA works with state and local governments, industries, Federal agencies, and private citizens to characterize, protect, and enhance the water quality of the Valley.

Funds for water quality management are allocated as follows:

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Water quality planning	$210	$180	$54	$172
Water quality inventory	418	445	134	468
Pollution abatement activities	138	260	84	162
Special studies and demonstration projects	476	461	128	302
Total	1,242	1,346	400	1,104

TVA's continuing regional water quality management program may be divided into four principal areas of activity. The first is water quality planning. A comprehensive report on water quality throughout the Valley was prepared to assist Valley states in preparing detailed water quality management plans for each major subbasin in the Valley and for the main stem of the Tennessee River. These basin plans are required of the states by the Federal Water Pollution Control Act Amendments of 1972. TVA assists the states by providing technical input to their plans which varies according to the needs of the individual states. During 1975, considerable water quality data, hydrologic data, and staff assistance was provided the State of Tennessee for use in preparing basin plans for the French Broad, lower Tennessee, and Duck River basins. Assistance was provided also in developing draft river basin plans for the Holston and upper Tennessee River basins. In addition, during 1975 TVA received numerous requests from municipalities and planning organizations for basic water quality data and hydrologic data for use by their consulting engineers in the preparation of facilities plans and areawide plans as required by sections 201 and 208 of the Federal Water Pollution Control Act Amendments of 1972. In 1976 and 1977, TVA will continue to assist the Valley states by providing water quality and hydrologic data and reviewing and commenting on draft basin plans prepared by the states. TVA will assist municipalities in the Valley by providing basic data needed for the preparation of facilities plans and areawide plans and will cooperate in special water quality and waste treatment studies that are required.

The second element of the regional water quality management program is a water quality inventory based on results of periodic or continuous water quality monitoring. The inventory provides up-to-date information on water quality conditions for use in meeting the needs of TVA, EPA, USGS, other Federal, state, and local governmental agencies, industries, planners, and the general public. In 1973 a water quality monitoring network was developed to provide sampling at about 44 key locations throughout the Valley by utilizing TVA and local personnel as sample collectors. This network was built upon an existing temperature and dissolved oxygen monitoring network expanded to include additional water quality measurements and stations. In 1974 and 1975, this monitoring effort was increased in planned stages to cover additional areas and parameters.

TVA coordinates this monitoring activity with EPA and the Valley states to prevent duplication of effort and to provide maximum coverage. TVA conducts an active quality control program that includes joint sampling with state agencies to ensure that data gathered by various agencies are comparable and to promote the exchange and use of data between governmental agencies. Water quality studies initiated in 1973 on one major subbasin were continued through 1975 at the request of EPA. Assistance will continue to be given to EPA in the operation of its national monitoring system, and all data obtained will be made available to Federal, state, and local agencies.

TVA's pollution abatement activities for 1976 and 1977 include (1) detailed engineering review of plans to determine adequacy of water pollution abatement measures at new installations where Section 26a permit or TVA land rights are involved; (2) maintaining a water use and waste discharge (and potential pollutant discharge) inventory; (3) investigating fish-kills, accidental spills of oil and other hazardous materials, and pollution discharges associated with treatment plant malfunctions; and (4) special studies related to water pollution problems (the mercury problem, for example).

During 1975, numerous fish-kills and other pollution incidents were investigated. In addition, surveillance monitoring of mercury concentrations in fish flesh, water, and sediment were continued for Chickamauga, Pickwick, and Kentucky reservoirs and the North Fork Holston River. Surveillance of the mercury problem will be continued in 1976 and 1977.

Special studies and demonstration projects are performed to support the water quality management program. Many of these studies will be done in response to problems arising in water quality management, while others are continuing efforts to solve problems of a persistent nature. The continuing investigations are: (1) field documentation of water quality and biological conditions associated with depletion of dissolved oxygen in TVA reservoirs to facilitate a more complete understanding of changes in water quality during storage in a reservoir; (2) computer documentation of existing ecologic models and development of improved water quality models; (3) development of methods for predicting the effects of reservoirs on water quality in tailrace streams; (4) pilot-scale studies of oxygen injection at Fort Patrick Henry Dam; and (5) continuing review of possible reaeration methods for 10 other TVA dams.

RECREATION DEVELOPMENT

	In Thousands
1975 actual	$755
1976 estimate	836
19TQ estimate	211
1977 estimate	1,097

TVA's recreation program identifies land and water resources having recreational value, establishes priorities for their use, and develops these resources directly or through others for the benefit of the public. All levels of the public and private sector have been involved in the development of recreation resources of the region. Through technical assistance TVA has assisted states, towns, communities, local development groups, other Federal agencies, private organizations, and individuals to improve recreation opportunities in the region. In recent years TVA has found it necessary to construct public-use areas to provide safe, sanitary lake access to meet the significant increases in demand on the Valley's recreation resources.

The appeal of TVA lakes and shorelines continues to dominate the outdoor recreation scene in the Tennessee Valley. Despite the depressed state of the economy and the higher cost of gasoline, the number of visitors to TVA lakes and projects in 1974 totaled almost 62 million, a 28 percent increase over 1964. The cumulative investment by private and public interests in recreation facilities rose to $480.0 million in 1974, a $45.0 million increase over the preceding year.

Technical Assistance

A large part of recreation assistance to be given in fiscal year 1977 is expected to be in the form of site plans for city-county parks and other recreation projects, preparation of cost estimates, and assistance in Federal grant applications. Recent emphasis by Valley communities on specialized forms of recreation, such as bike trails, conservation-education areas, historic preservation, recreation for the handicapped, and year-round community recreation programs for all citizens, is expected to play an important role in the workload for fiscal year 1977. Continuing assistance will be given to private commercial recreation operators in an effort to upgrade their facilities and services. During fiscal year 1975, recreation technical assistance was provided to 83 different city, county, state, and other local agencies in the Valley region.

Recreation Planning

Recreation planning is essential to wise development and use of the region's recreation resources. It provides the guidance for the sound investment of funds for recreation projects. Activities included under this function for fiscal year 1977 are:

1. Preparation of prospectus for needed commercial recreation developments identified in the comprehensive Valley-wide recreation plan.

2. Planning for public-use areas to provide access to TVA reservoirs and shorelines.

3. Selection of site and preparation of development plans for areas to be acquired for access points on whitewater and float streams.

4. Providing planning, data, and information to schools, consultants, public agencies, and others involved in recreation development in the Valley.

5. Measuring recreation use of TVA reservoirs, analyzing recreation costs and benefits, appraising environmental impacts of other projects on recreational and cultural resources, and making economic and market analyses for various recreation projects.

Maintenance of Recreation Facilities

Cyclic maintenance of TVA's improvements and facilities at reservoir public access areas involves work which is nonroutine such as repaving or resurfacing roads and parking areas, repainting and roof replacement for sanitary facilities, and shoreline improvements. Due to the newness of the facilities, cyclic maintenance has been minimal to this time except for flood damage repairs in fiscal year 1973.

Summary of Recreation Development Expenses

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Technical assistance	$304	$326	$85	$356
Recreation planning	376	429	114	485
Maintenance of recreation facilities	34	34	-	207
Distribution of administrative and general expenses	41	47	12	49
Total appropriation estimate	755	836	211	1,097
Allocated from multipurpose reservoir operations	1,581	1,756	350	1,873
Total expenses before writeoff and depreciation	2,336	2,592	561	2,970
Writeoff of preliminary investigations[1]	22	-	-	-
Depreciation	177	200	50	270
Total expense of recreation development	2,535	2,792	611	3,240

1. This charge to expense is for the cost of preliminary investigations of the Poor Valley Creek project. Like depreciation, this item requires no financing and is included here in the interest of completeness of reporting.

FISHERIES AND WATERFOWL RESOURCES DEVELOPMENT

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Fisheries resource assessment	$174	$126	$45	$139
Fisheries resource management and use	262	327	89	380
Waterfowl management and use	181	234	63	238
Total	617	687	197	757

TVA is developing and managing the Valley's fisheries and waterfowl resources for optimum economic and social benefits. These objectives are obtained by (1) securing a high order of fisheries and waterfowl resource management and protection; (2) increasing public understanding of and involvement in the protection and management of fisheries and waterfowl resources; and (3) using these resources to stimulate related job and business opportunities. Specifically, TVA is developing and implementing the knowledge and techniques to secure the following by 1990: (1) 60 million pound annual harvest of sport and commercial fish, (2) 30 million annual sport fishing trips, (3) $12.0 million aquaculture industry, and (4) a population of 25,000 resident and 650,000 migratory waterfowl and 50,000 waterfowl hunting trips annually.

Fisheries Resource Assessment

A base of sound information is needed to recognize natural changes and manmade modifications and to understand the dynamics of aquatic systems. To achieve the objectives outlined above, the fisheries resources must be analyzed in terms of habitats and populations; and the ways the various populations respond and can be made to respond to imposed changes for improvement must be known.

In 1977 TVA will continue to develop a fisheries information system to simulate and predict the effect of various impacts on the Valley's aquatic system. For example, a system is being developed to estimate what effect a particular industry at a given location will have throughout the aquatic system; and the system will answer questions about the effects of increased sport and commercial fishing, the introduction of exotic species, and other pressures on the aquatic system.

Data on sport commercial fish harvest and aquaculture production are compiled regularly across the Valley to help determine resource production and use trends and detect emerging problems. Technical advice is given fish farmers on request. In 1977 a concentrated effort will be placed on development and adoption of an interagency aquaculture program.

Fisheries Resource Management and Use

The basic objective in the fisheries resource management program is to improve sport fish populations and increase sport fishing. A primary method for stimulating wise management of the Valley's fisheries resource is to improve the opportunities for harvest. If the fishermen know where the fish are, their chances of fishing success will be greater; and if their catches improve, the amount of fishing will increase. In 1977 studies will include fish population size, composition, species mix, growth, reproduction, survival, movement, food habits, and habitat preference. These studies are planned for Norris and Melton Hill reservoirs and involve sampling populations, tagging and releasing fish, and determining migration patterns from those recaptured. Concurrently, information will be given to fishermen so they will have positive guides to the sites of clustered populations.

Conditions which affect fisheries below TVA's dams are being assessed so management plans can be developed and implemented to improve fishing at these locations. At Wilson Dam, biologists are trying to find the reasons for its extraordinary smallmouth bass population with the hope of establishing equally good smallmouth bass populations at other TVA dams. In addition, physical, chemical, and biological conditions are being studied below Blue Ridge Dam to determine ways of increasing fish production.

Work will continue on the Tuckasegee and North Fork Holston rivers to determine how the recovery of these severely polluted streams progresses. The sources of pollution, large industrial plants, have been eliminated and recovery is under way. In fiscal year 1977 assessments of faunal recovery will be concluded and management programs aimed at improving the fisheries resource in the rivers will be started.

Waterfowl Management and Use

The opportunity for greater waterfowl use in the Valley results largely from TVA's development of the water resources along the Tennessee River and its tributaries. New reservoirs have changed seasonal water patterns and migratory

flocks have increased their use of this region. TVA, in cooperation with Valley states, is working to expand this use by establishing permanent flocks in appropriate areas. Flocks of Canada geese and wild ducks make the Tennessee Valley their permanent home and the way is now clear to sharply increase their numbers in future years.

To obtain 25,000 resident waterfowl, TVA is cooperating with Tennessee, Alabama, Georgia, Kentucky, and Mississippi to identify and develop new Canada goose release sites. TVA will continue to work with Tennessee to raise release stock and will also monitor and evaluate previous releases to determine survival, movements, behavior, and reproduction in an effort to refine various propagation and release techniques. Releases of Reelfoot mallard and blue-winged teal in Tennessee will be evaluated and additional habitat evaluations and releases will be made on TVA's mainstreams and tributary reservoirs in cooperation with the Valley state wildlife agencies and various private clubs. Various aquatic plants will be selected, propagated, and tested to determine their benefits to waterfowl.

Work will continue with state wildlife agencies and the U.S. Fish and Wildlife Service to collect and evaluate wildlife resource and public user data for designated wildlife areas in TVA reservoirs.

To enhance and preserve populations of wading, marsh, and shore birds and wetlands mammals, TVA will monitor critical habitats. Guidelines for management of heron and egrets will be prepared in 1977. Work will begin with Valley states, universities, and naturalist groups to obtain necessary literature reviews, habitat evaluations, migration studies, and life history information for significant marsh and wetland species.

TVA will continue to work closely with the U.S. Fish and Wildlife Service and the Alabama Department of Conservation and Natural Resources to manage dewatering areas on TVA's reservoirs for wildlife.

PRELIMINARY SURVEYS AND ENGINEERING

	In Thousands
1975 actual	$187
1976 estimate	192
19TQ estimate	63
1977 estimate	200

Preliminary surveys and engineering provide background data and information required to plan, keep current, or improve water resources activities. These activities include hydrologic investigations of surface and groundwater, interagency planning and coordination, and preliminary program planning and technical assistance.

Hydrologic investigations of surface and groundwater sources are performed to provide guidelines for efficient management of land and water resources. Activities required to develop these guidelines include: evaluation of effects of various land uses and management techniques upon the water resource, determination of the combined effect of these uses and techniques, and development of methods to predict effects of various alternatives. For example, in 1977 assistance will be provided to the First Tennessee-Virginia Development District in utilizing the recently completed watershed mathematical model to assess and control the problems of flooding, drainage, and water pollution. Other activities scheduled in 1977 include (1) water quality surveys to establish bases for monitoring groundwater quality changes, (2) groundwater evaluations of specific areas as to potential for industrial water supply, and (3) community water needs in cases of impending or existing water shortages. Groundwater investigations may prove to be especially valuable, since groundwater is a presently underutilized resource in the Valley, and these investigations may solve emergency water supply problems at many locations.

Interagency coordination is necessary to develop, test, and maintain planning policies and procedures for application in TVA water resources activities. Major activities include continuous monitoring of new and changing policies and procedures to assure compliance with Federal planning procedures and participation in meetings with other water resources planning and research organizations, such as the Water Resources Council.

Preliminary planning and technical assistance are extended to state and other governmental organizations to help them identify potential water resources problems and find solutions to them. This includes both long-range projections for the region and reconnaissance investigations for specific problem areas, encompassing both TVA-initiated investigations and assistance in response to requests from others.

Schedule B-1. Multipurpose Reservoir Operations
(In thousands of dollars)

	1975 actual		1976 estimate		19TQ estimate		1977 estimate	
Income		362		260		24		367
Expenses								
Development of water resource management methods	248		403		101		403	
Water control operations	1,268		1,309		251		1,250	
Water control investigations	161		128		22		129	
Investigations and control of reservoir ecology	835		1,059		199		934	
Plant protection and services to visitors	1,725		1,808		401		1,903	
Operation and upkeep of dam reservations	1,337		1,415		291		1,515	
Reservoir land management	2,278		2,514		408		2,878	
Maintenance	1,638		1,846		529		1,861	
Other expense	338		489		109		729	
Distribution of administrative and general expenses	340		394		100		408	
Total expenses before depreciation:								
Financed from appropriations	6,370		7,195		1,530		7,547	
Financed from power proceeds	3,436		3,910		857		4,096	
Financed from nonpower proceeds	362		260		24		367	
Total	10,168		11,365		2,411		12,010	
Depreciation	3,332		3,365		840		3,480	
Total expenses		13,500		14,730		3,251		15,490
Net expense of multipurpose reservoir operations		13,138		14,470		3,227		15,123
Allocation to Programs								
Water resources development								
Net expenses before depreciation	6,249		7,019		1,498		7,378	
Depreciation	2,000	8,249	2,015	9,034	500	1,998	2,065	9,443
General resources development								
Net expenses before depreciation	121		176		32		169	
Depreciation	101	222	115	291	30	62	175	344
Power operations								
Net expenses before depreciation	3,436		3,910		857		4,096	
Depreciation	1,231	4,667	1,235	5,145	310	1,167	1,240	5,336
Total allocation		13,138		14,470		3,227		15,123

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MULTIPURPOSE RESERVOIR OPERATIONS
(Schedule B-1—Operations and Maintenance)

Fiscal year 1977 expenses before depreciation for multipurpose reservoir operations are estimated at $12.0 million of which $7.5 million will be financed from appropriations, $4.1 million from power proceeds, and $0.4 million from directly related income.

Multipurpose reservoir operations involve principally the management, operation, and maintenance of TVA's system of 23 multipurpose projects. Operating activities are conducted to assure public benefits from the primary functions of navigation, flood control, and power and from the many other values created by a reservoir system with more than 10,000 miles of shoreline and 345,000 acres of surrounding lands under TVA ownership or control. Operating costs for the system are collected in a single program category and net costs are distributed to the programs benefited.

Development of Water Resource Management Methods

	In Thousands
1975 actual	$248
1976 estimate	403
19TQ estimate	101
1977 estimate	403

As more and more demands are made upon the reservoir system, operations become increasingly complex. Varying the water flow or level for one purpose will have some effect on all others as well. Currently, TVA is developing a mathematical model which can rapidly compute the effects any operating decision will have on all significant criteria thereby optimizing the use of the system. The first two steps of the project have been completed and the third has begun. Step one investigated the impact on reservoir operations of a large TVA steam plant and showed that slight modification of water scheduling could save hundreds of thousands of dollars per year. Step two proved the applicability of certain optimization methods for the large and complex TVA system. The third step will encompass the principal development phase. Over a period of several years, other models will be developed to provide versatility and refinements for day-to-day applications. During this development period, utilization of completed segments in actual reservoir operation will allow periodic reevaluation of the project.

Water Control Operations

	In Thousands
1975 actual	$1,268
1976 estimate	1,309
19TQ estimate	251
1977 estimate	1,250

Wise operation of the reservoir system provides significant benefits. For example, since its inception, operation of the TVA multipurpose dam and reservoir system has prevented flood damages that would have amounted to about $1.5 billion, almost six times the cost allocated for flood control expenditures. At Chattanooga, perennially one of the hardest hit areas, average annual flood losses have been reduced to less than 5 percent of those suffered on the unregulated river system. Flood damages averted outside the Valley, on the lower Ohio and Mississippi rivers, total nearly $80.0 million since the completion of Kentucky Dam in 1944. In fiscal year 1975 alone, total damages averted by the TVA reservoir system were $246.3 million: $216.0 million at Chattanooga, $22.1 million elsewhere in the Valley, and $8.2 million along the lower Ohio and Mississippi rivers.

Operating the reservoir system in a way conducive to navigation also provides dollar benefits. Through calendar year 1974, accumulated transportation savings amounted to about $829.0 million.

Another benefit is obtained from hydroelectric generation. Power benefits may be calculated in several ways, one being costs for alternative methods of generation. During an average year, hydroelectric generation amounts to about 18 billion kilowatthours. In a coal-fired steam plant, about 8.2 million tons of coal would be required to generate this amount of power. Based on the average price per ton of coal in fiscal year 1975, the cost of coal for this hydrogeneration would have been about $107.0 million. During fiscal year 1975 when coal supplies were critical, the value of hydroelectric generation was increased. During this period, the system produced 5 billion kilowatthours above normal for an additional coal savings of about 2.3 million tons.

Many accessible lakes are regulated for various types of recreation. These lakes are beneficial in providing millions of people enjoyment and in bringing millions of tourist dollars into the region. In 1974, almost 62 million visits were made to TVA lakes.

Operation of the reservoir system to provide additional benefits not easily determined by dollar amounts is nevertheless important. Water levels are fluctuated to interfere with the natural breeding cycle of disease-producing mosquitos and

to help control troublesome aquatic weeds that provide an environment conducive to mosquito breeding. Water flows are maintained for municipal and industrial water supplies and for diluting effluents, including thermal discharges, to minimize their effects on the environment.

Decisions concerning the operation of the reservoir system are the primary responsibility of a central water control office in Knoxville. To facilitate their work, this office collects and analyzes data from a network of streamflow and rainfall gages strategically located throughout the Valley and from public and private weather forecasting services.

Water Control Investigations

	In Thousands
1975 actual	$161
1976 estimate	128
19TQ estimate	22
1977 estimate	129

Water control investigations include such activities as measurement of sedimentation in streams and reservoirs; checks on the operation of the spillways, sluices, and other hydraulic facilities; basic hydraulic research; investigation of damage claims arising from the operation of multiple-purpose reservoirs; and investigation to determine the impact of structures proposed by others along the river or its tributaries.

Investigations and Control of Reservoir Ecology

	In Thousands
1975 actual	$835
1976 estimate	1,059
19TQ estimate	199
1977 estimate	934

Insect Control

This activity is directed primarily toward the control of a mosquito that carries malaria. In specific areas limited efforts are made to control flood water mosquitoes, biting flies, and ticks.

Natural methods are emphasized for mosquito control. Lake water levels are fluctuated to interfere with mosquito production. Water is pumped or drained from low areas. Shoreline vegetation is mowed or shorelines are planted with water-tolerant trees to provide a habitat that is not conducive to mosquito production. Larvicide is applied only when required to supplement these measures and only to priority areas based upon specific criteria that consider probability of human contact with mosquitoes. All uses of larvicides are in conformance with the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act.

Planned control measures in 1976, the transition quarter, and 1977 for the lower river reservoirs are shown below:

		Fiscal Year 1976	Transition Quarter	Fiscal Year 1977
Plant growth control (mechanical and herbicidal)	acres	2,200	120	896
Drainage maintenance	linear feet	93,400	0	103,000
Application of larvicide	acres	10,100	8,200	10,500
Operation and maintenance of dewatering projects	hours	23,200	11,300	23,200
Water-tolerant tree plantations	acres	20	0	0

All control work scheduled for fiscal years 1976, the transition quarter, and 1977 will be performed on Kentucky, Pickwick, Wheeler, Guntersville, Nickajack, and Chickamauga reservoirs. Water-level management is expected to provide satisfactory mosquito control on all other reservoirs.

Aquatic Weed Control

Eurasian watermilfoil has become the most troublesome weed in TVA reservoirs. TVA experience during the past decade has resulted in the development of two methods of controlling watermilfoil; water-level management to dry the plant by dewatering or by otherwise disturbing its habitat, and application of 2,4-D herbicide. Neither method has produced permanent control and they must be employed together or separately on an annual basis to keep present colonies within a tolerable level.

Liquid herbicide, 2,4-dichlorophenoxyacetic acid, is applied underwater to large watermilfoil colonies by two-man crews in boats specially equipped for the work and employed exclusively for search and treat operations. Small colonies of watermilfoil or individual plants in sparsely infested reservoir areas are treated with liquid or granular herbicide, applied manually from a boat or while wading.

TVA also applies herbicide by helicopter after evaluating the location, extent, and density of the watermilfoil infestation; the operational costs involved; and the potential danger to nontarget shoreline vegetation. All uses of herbicides are in conformance with the requirements of the Federal Insecticide, Fungicide, and Rodenticide Act.

Watermilfoil continues to be a major problem in Wilson, Guntersville, Nickajack, and Melton Hill reservoirs and a lesser problem in Wheeler, Chickamauga, and Watts Bar reservoirs. In 1976 and 1977 search-and-treat operations will be continued on all these reservoirs and limited treatment will be made as necessary in areas of high public use.

Plant Protection and Services to Visitors

	In Thousands
1975 actual	$1,725
1976 estimate	1,808
19TQ estimate	401
1977 estimate	1,903

As of June 30, 1975, TVA multipurpose projects represented an initial investment of more than a billion dollars. Many projects are in rural, isolated areas and all major projects are considered essential to national defense. All must be protected from fire damage, theft, vandalism, sabotage, and civil disorders. The major projects are open to the public. In

calendar year 1974 almost 12 million people visited them creating attendant problems of crowd and traffic control, visitor safety, maintenance of law and order, emergency first aid, and accident investigations.

Property protection is the major function of this activity. Receiving and protecting visitors and enforcement of Federal and state laws and project regulations are important subsidiary functions. The 1977 estimate of $1,903 thousand provides for the necessary protection to property and persons by uniformed employees on duty at major projects. The extent of protection is based on location, size, and type of project; current security information; recommendations from periodic surveys by U.S. military forces; and visitor load.

Operation and Upkeep of Dam Reservations

	In Thousands
1975 actual	$1,337
1976 estimate	1,415
19TQ estimate	291
1977 estimate	1,515

TVA's multipurpose dam reservations include about 15,000 acres of land, 108 miles of roads, extensive parking areas, walks and paths, maintenance and visitor buildings, and picnic areas with tables, benches, fireplaces, and grills. Additional facilities are placed in service annually to serve increased public demand. About 60 percent of the reservation acreage is in natural or forest cover; about 20 percent is maintained as meadow or pasture; and about 20 percent (3,000 acres) is maintained for intensive public use. A variety of operations is necessary for the upkeep of these grounds and the roads serving them to meet operating requirements of dams, locks, and other major installations, and to receive and safeguard the visiting public. Maintenance standards are designed to provide a clean and attractive appearance of all public grounds commensurate with intensity of use in the interest of public health, safety, convenience, and economy. In recent years, to alleviate the general inflationary trend, a program of maintenance changes has been initiated to reduce acreage requiring intensive maintenance and improve the safety and economy of the entire program. Changes in the types of plant material and increased use of approved chemicals and more efficient maintenance equipment are being used in this effort.

Income expected to be realized from the operation of dam reservations is $21 thousand in fiscal year 1977.

Reservoir Land Management

	In Thousands
1975 actual	$2,278
1976 estimate	2,514
19TQ estimate	408
1977 estimate	2,878

This activity relates primarily to the management of land and land rights acquired and held by TVA on a narrow 10,000-mile strip along the shores of its major multiple-use reservoirs. As of June 30, 1975, TVA owned about 231,000 acres of such lands and held easement rights on an additional 114,000 acres above full-pool lake levels. Also, easement rights to protect program objectives have been retained in much of the land TVA has sold or transferred to others. These lands and land rights are administered so as to assure unrestricted operation of the reservoirs for their intended purposes while also permitting and encouraging use and development of the shoreline resource. Administration of part-ownership land is often more complex and time-consuming than of fee-owned land. Individuals, public agencies, and private groups use TVA land for recreation developments, wildlife refuge, agriculture, utilities, and numerous other purposes. Multiple uses and a complex land ownership pattern necessitate continuous surveillance to ensure that trespass is controlled and that authorized uses do not conflict with the primary purposes of the reservoirs and are consistent with full public use of the reservoirs. To avoid public misunderstandings, every effort is made to promote information about the overall functioning of the reservoir system. Engineering surveys are made on reservoir lands to install and maintain boundary and to record changes in land ownership and physical developments which affect TVA program responsibilities. Lands retained by TVA are examined periodically in the light of changing program requirements and public needs. Land no longer necessary for program purposes is sold. Selling costs are included in this activity.

Some reservoir lands are licensed for agricultural purposes, involving public offering of available lands, establishment of minimum rental rates, review of applications, issuance of licenses, collection of rentals, and enforcement of license provisions. Approximately 750 licenses will be in effect in 1977 for the use of 15,700 acres of land for agricultural purposes, with estimated revenues of about $84 thousand.

Reservoir land operations also include reforestation of selected areas and marketing of timber and other forest products. Approximately 500 cords of pulpwood and 6,158,000 board-feet of timber are projected for sale in 1977 with a total estimated sales price of $169 thousand. Revenues from miscellaneous reservoir land operations, leased or licensed boat docks, cabin sites, and group camps are estimated at $32 thousand.

Other activities include a variety of "housekeeping" duties such as continuation of cooperative effort with the Department of Interior in sponsoring the Johnny Horizon program in the Tennessee Valley; promoting the establishment of sanitary landfills in counties adjacent to TVA reservoirs; removal of drift, debris, and clutter along TVA shorelines; protecting forested lands from fire, primarily under contracts with Valley state forestry divisions; operation and maintenance of backwater protection facilities such as dikes; and maintaining public-use facilities provided along the reservoir shorelines by TVA to assure safe, sanitary, and convenient access to the lakes.

Maintenance

	In Thousands
1975 actual	$1,638
1976 estimate	1,846
19TQ estimate	529
1977 estimate	1,861

The average age of TVA's major dam and reservoir projects is more than 30 years. Norris Dam, the first, was completed March 4, 1936. All but six of these projects antedate 1950. Maintenance work is becoming more significant in operation of the facilities. Routine maintenance activities consist mainly of periodic settlement and deflection surveys and leakage and drainage checks and measurements; painting spillway gates, maintaining spillway gate operating devices and other equipment and structures at multipurpose dams; maintaining visitor buildings located on the reservations; and resurfacing, resealing, and major repairs to roads, walks, and parking areas. Maintenance of certain earthfills is required under the terms of contracts entered into with the owners of the highways and railroads when TVA dams were built.

Major maintenance scheduled in 1977 is shown below.

Douglas Dam	Clean foundation drains Spillway gate repair
Guntersville Dam	Paint spillway gates
Hiwassee Dam	Overcore drilling
Kentucky Dam	Paint spillway gates
Norris Dam	Clean concrete drains
Wheeler Dam	Overcore drilling
Wilson Dam	Drill foundation drains Repair and paint spillway gates

Other Expense

	In Thousands
1975 actual	$338
1976 estimate	489
19TQ estimate	109
1977 estimate	729

The estimate for 1977 covers operation and maintenance of the dams in the Beech River watershed project, two dams in the Bear Creek watershed system, the Tims Ford Dam, and the Normandy Dam to be completed in 1976. Activities include vector control work, checking the flood detention features, maintaining access roads to all dams and earthfills, and minor surveying and mapping work.

GENERAL RESOURCES DEVELOPMENT
(CAPITAL OUTLAY)

LOWER ELK TOWN

	In Thousands
1975 actual	-
1976 estimate	$1,000
19TQ estimate	1,000
1977 estimate	2,700

Purpose and Scope

The Elkmont Rural Village project demonstrates how to provide an attractive, rural living environment through a system of planned rural villages. The project was initiated when local officials and residents began planning for future growth. These individuals were concerned that anticipated growth due to an expanding industrial base in the area would destroy and replace the existing rural environment with uncontrolled, inefficient, sprawling strip development. They requested TVA assistance in developing plans and actions to avoid the congestion and environmental decay that frequently occur in high-growth rural areas subjected to suburban development pressures.

To achieve a balanced rural environment, local officials, with assistance from TVA, developed a plan to demonstrate the feasibility of a system of rural villages that offer a high level of public services and amenities.

The plan for the new town provides for the land, water system, and waste management facilities to be financed by TVA. The proceeds from the sale of land and fees from utilities in the first village will establish a fund to finance future villages. At the conclusion of construction of all the villages, all unobligated funds will be used for the improvement of historical and cultural development in the Lower Elk River area. The Elkmont Rural Village serves also as a demonstration of new techniques in the treatment of waste water and the use of solar energy in residential heating and cooling.

Location and Description

The first Lower Elk town is located near the existing town of Elkmont in Limestone County, Alabama. The rural village is designed to house 3,000 to 4,000 people on 1,450 acres and serves as a demonstration of how the anticipated future housing demand may be met by providing a well-planned residential development with a full range of public services as a competitive alternative to unplanned, strip development. The Elkmont Rural Village is the first of nine villages in the Lower Elk River area which includes Lincoln and Giles counties in Tennessee and Limestone County in Alabama. The Village represents a cooperative effort by the Elk River Development Association, the Tennessee Elk River Development Agency, the Alabama Elk River Development Agency, and TVA.

Project Status and Plans for 1977

The land for the first village is being acquired in fiscal year 1976. About 30 percent of the required roads and utilities will be completed in 1976 and the transition quarter. The 1977 estimate of $2.7 million will complete the Federal investment for the project.

Schedule B-2. General Resources Development
(In thousands of dollars)

	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Income				
Income from sale of fertilizer materials	460	345	44	329
Expenses				
Agricultural projects:				
Appropriations	1,558	1,591	264	1,681
Nonpower proceeds	460	345	44	329
Total agricultural projects	2,018	1,936	308	2,010
Waste heat utilization	243	276	48	555
Forest resources development	1,502	1,490	373	1,650
Strip mine reclamation demonstrations	313	3,200	517	3,200
Minerals resources projects	287	282	72	257
Environmental quality projects	319	442	111	483
Development of tributary areas	1,860	2,025	500	2,100
Human resources development	771	812	177	992
Regional economic studies	601	744	186	750
Townlift community improvement	788	701	177	705
Interagency health services demonstrations	160	196	50	202
Total	8,862	12,104	2,519	12,904
Allocated from multipurpose reservoir operations	121	176	32	169
Total expenses before depreciation:				
Financed from appropriations	8,523	11,935	2,507	12,744
Financed from nonpower proceeds	460	345	44	329
Total	8,983	12,280	2,551	13,073
Other development activities[1]	-91			-
Depreciation	113	130	35	190
Total expenses	9,005	12,410	2,586	13,263
Net expense of general resources development	8,545	12,065	2,542	12,934

1. This is a net credit to expense, reflecting the adjustment of a charge made in prior years, less costs incurred in development assistance at tributary area projects. Like depreciation this credit does not involve financing and is included here in the interest of completeness of reporting.

GENERAL RESOURCES DEVELOPMENT
(OPERATING EXPENSES)

TVA has developed the Tennessee River system for navigation, flood control, and power purposes. Additional recreation, wildlife, water supply, and water quality benefits have resulted, and the total effect has been a major contribution to the economic and social development of the region. The general resources development program described below includes activities through which the diverse capabilities of the TVA organization are brought to bear upon special problems or additional development opportunities principally related to the land and its products and to the people of the region and their institutional resources.

AGRICULTURAL PROJECTS

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Financed from appropriated funds:				
Development program	$1,071	$1,181	$184	$1,248
Special projects	352	251	48	270
Program planning and analysis	75	91	15	93
Administrative and general expenses	60	68	17	70
Total	1,558	1,591	264	1,681
Financed from nonpower proceeds:				
Development program	456	316	39	299
Special projects	4	29	5	30
Total	460	345	44	329

The purpose of agricultural projects is to increase the income and social well-being of people in the Tennessee Valley region. Project activities reflect national goals of increased production of food and fiber, conservation of energy, and protection of the environment. Specific project goals are to:

1. Increase agricultural productivity and income through more efficient use of agricultural resources;

2. Improve soil productivity, management, and land use;

3. Improve the economic and social well-being of low-income rural residents;

4. Increase the efficiency of agribusiness and marketing systems; and

5. Assist area planning and development groups in recognizing, understanding, and developing solutions to rural and agricultural problems on a coordinated basis.

Project activities involve research and development and the use of results in demonstrations and educational projects to introduce improved production, marketing, and management systems to farmers and agribusiness firms. To increase the productivity of the 141,000 farms in the region, emphasis has shifted heavily to livestock and poultry production, expanded soybean production on level and gently rolling lands, and high-value vegetable crops for farmers with smaller holdings. For all types of farming, adequate use of fertilizers and limestone and other recommended practices are encouraged. New or improved agribusinesses are encouraged to process and market the products, and close liaison is maintained with banks and other lending agencies to assure that adequate capital is available to farmers.

For the past several years, increased productivity has advanced the value of Valley farm production by about $34.0 million per year in terms of 1973 dollars. Total farm sales now exceed $1.5 billion. The effect on the region's economy is even greater since each dollar in farm sales generates about three additional dollars in the agribusiness sector.

The scope of agricultural projects will remain relatively stable. Less emphasis will be placed on regional conferences and workshops in 1977 to provide more resources for work with limited resource farmers and the rural poor. Program efforts will be initiated to (1) develop and demonstrate forage-fed beef production systems; (2) correct the critical problem of inadequate lime production, marketing, and use; and (3) test on a pilot basis a management information system for regional farmers.

Development Program

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Financed from appropriated funds:				
Valley agricultural resource development	$1,003	$1,084	$161	$1,143
Special agricultural investigations and technical assistance	68	97	23	105
Total	1,071	1,181	184	1,248
Financed from nonpower proceeds	456	316	39	299

Valley Agricultural Resource Development

Agricultural resource development is an education program oriented to solving major problems and creating new opportunities in the region. New and improved fertilizers produced by TVA are often a principal input in the developmental process. Help also is given in farm management, introducing new farm enterprises, and developing related marketing systems. These activities are conducted in cooperation with the land-grant universities of the seven Valley states, farmers, and appropriate local development organizations, including tributary area associations. Program activities include fertilizer trials and practice demonstrations, resource management farms, rapid adjustment farms, garden and high-value crop demonstrations with low-income farm families, enterprise demonstrations, and supporting studies.

Fertilizer trials, usually no larger than one acre, are used to introduce and evaluate new TVA fertilizers. TVA generally supplies the fertilizer at no cost, including freight charges. These trials give professional agricultural workers experience with new TVA fertilizers under actual farming conditions.

Fertilizer practice demonstrations are established to show the value of recommended fertilization practices and related technology in solving soil fertility problems identified with particular soils or crops. Emphasis is placed upon demonstrating the value of recently developed agricultural production technology proven by research but not yet in general use by a large number of farmers. These demonstrations are well-suited for work with both commercial and part-time farmers. During fiscal year 1975, emphasis was on demonstrations to show potentials for increasing farm income by (1) using grain and forage in livestock production; (2) producing new specialty crops; and (3) solving fertility problems associated with low yield.

The following table shows the number of fertilizer trials and practice demonstrations by major type.

Forage, pasture, and feed grains	416
Specialty crops (vegetables, fruits, nuts, and shrubbery)	87
Field crops	104
Evaluation of TVA fertilizers	42
Total	649

Resource management farms are whole-farm demonstrations showing the results of managing land, labor, and capital resources for maximum income. These farms are used also by program personnel to promote the latest technological findings among other farmers with similar resource situations and adjustment needs. Information gained from rapid adjustment farms, fertilizer trials and practice demonstrations, and research results from land-grant universities is used to develop plans for these demonstrations. The resource management farm involves the operator, the land-grant universities, and TVA in developing and conducting on the operator's farm a concept of organizing and managing all resources to reach projected goals. Demonstrators include commercial farmers, potentially commercial farmers, low-income and part-time farmers, and resource owners with potential for recreation, tourism, and related enterprises.

Rapid adjustment farms are used to explore and demonstrate ways to accelerate realization of potential income and changes on a commercial scale. Introduced in the early 1960's, the rapid adjustment farm has become an exceptionally effective device for research and teaching. Rapid adjustment farmers become superinnovators and provide leadership for other farmers who must make major adjustments to achieve successful commercial operations. The magnitude and rate of changes on rapid adjustment farms are great, as are capital requirements and risks. TVA helps by furnishing fertilizer required in the demonstrations at no cost to the farmer, except for freight and handling charges. Cooperating university specialists give intensive, specialized assistance to each rapid adjustment farm.

Home garden demonstrations are conducted with low-income families in depressed rural areas of the Valley to show the economic value of a home garden in supplying food to stretch limited incomes and improve nutrition. Low-income families are advised on the kinds of vegetables to grow, cultural methods to use, and how to prepare and preserve food. TVA provides seed, insecticide, fertilizer, sprayers, other supplies, and technical help to conduct the demonstrations.

Enterprise demonstrations are used to show income possibilities from crop and/or livestock enterprises in specified areas of the Valley and obtain improved input-output data for farm planning. Emphasis is placed on enterprises new to the areas in which they are conducted.

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The following table shows the number of demonstrations by type to be conducted in fiscal year 1977, compared with the number in earlier years.

	1975 Actual	1976 Estimate	1977 Estimate
Fertilizer trials and practice demonstrations	649	650	675
Resource management farms	621	650	650
Rapid adjustment farms	33	35	40
Home garden demonstrations	2,074	2,000	2,000
Enterprise demonstrations	219	250	250

Many examples of agricultural resource development can be cited. A few are described below.

In the mountainous areas of western North Carolina, the agricultural program has stimulated the production of more than $12.0 million worth of trellised tomatoes, strawberries, ornamental shrubbery, and Christmas trees annually. These enterprises along with other horticultural crops have been introduced into north Georgia, southwest Virginia, and eastern Tennessee. Blueberries are being introduced now in southwest Virginia to increase agricultural income and to help reclaim strip-mined soils. As demonstrations are established to accelerate production of these crops, activities also are initiated to develop an adequate marketing structure.

In middle Tennessee, many farms have enough acreage for efficient livestock production. Activities are conducted to intensify forage and feed grain production. On many large farms, dairying is profitable. Swine production offers an opportunity to intensify output on smaller acreages, while beef cattle has a potential for many farms and fits particularly well on part-time farms. In western Tennessee and Kentucky, farm planning emphasizes a high return per acre of cropland. This results in a sizable acreage of corn, which usually is marketed through swine, and dairying where double-cropping is possible on the better classes of land. Forage-consuming livestock use the lower quality land. Improved beef-forage systems are being developed to make more effective use of the less desirable land classes.

In northeast Mississippi and the western portion of north Alabama, such labor-intensive enterprises as feeder pigs, pimiento peppers, and cucumbers are emphasized because of the limited acreage of productive soils. Other high-value enterprises, such as peaches and strawberries, are being introduced and evaluated. With the completion of the Yellow Creek Port and its proposed grain handling facilities, more emphasis will be placed on market hog and broiler production.

In the middle portion of north Alabama, emphasis is focusing on forage improvement for livestock consumption and on soybean production to support the new soybean processing plant at Decatur, Alabama, and other market needs. In the Sand Mountain area of north Alabama, high-value horticultural crops with related marketing facilities will continue to be emphasized.

A cooperative project to evaluate alternative systems of producing acceptable grades of slaughter beef on grass and legumes is under way at The North Mississippi Beef Research Center. The goal is to develop profitable, year-round systems for growing out and finishing beef cattle on forage which reduces dependence on high-cost feed grains and protein and creates no problems of waste management. Similar evaluations and demonstrations are planned for other sections of the Valley.

Special Agricultural Investigations and Technical Assistance

TVA conducts studies in specific subregions to determine the need for developmental projects beneficial to agriculture and to determine environmental effects of agriculture on such projects. Technical planning aid is given to subregional planning groups to help them realize agricultural development opportunities, to solve problems necessary to achieve these potentials, to conduct agricultural development activities, and to evaluate results. These include land-use studies to determine areas (1) that are most suited for continued agricultural production. (2) that have the capability of joint uses such as crop production and industrial waste disposal, and (3) that are not essential for agricultural production. Other studies provide information for planning and initiating intensive agricultural activities.

Special Projects

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Financed from appropriated funds:				
Agribusiness development	$86	$109	$19	$113
Development of high income agricultural enterprises and opportunities for the rural poor	193	142	29	157
Tennessee Valley rural life conferences	73	-	-	-
Total	352	251	48	270
Financed from nonpower proceeds	4	29	5	30

Agribusiness development is designed to expand the productive capability and profitability of Valley agriculture through improved marketing and farm-supply systems. Activities include joint market feasibility studies and technical assistance. TVA serves a unique function by providing leadership on projects of larger than state size necessary to promote

change in the basic market structure. For example, TVA in cooperation with the University of Georgia, North Carolina State University, and Western Carolina University recently completed a series of feasibility studies for livestock and vegetable markets. These studies were used by the Upper Hiwassee Watershed Association in securing funding for a multiple-purpose market facility. A study of the lime retail business will document retail margins, costs, and merchandising programs and evaluate ways to improve market efficiencies and merchandising. Inadequate lime use is one of the most limiting factors to increasing crop production in the Valley. Another study is examining the interrelationships among farm supply, farm production, and farm product marketing and will be used to identify the location of proposed farm service centers within the 125 Valley counties. A study is in progress to identify the types and kinds of facilities needed to service the marketing needs of grain and soybean producers. TVA also provides leadership to the greenhouse vegetable production and marketing industry through special studies and workshops. A "Greenhouse Vegetable Workshop" sponsored by TVA, the U.S. Department of Agriculture, and the Valley land-grant universities is providing information on production and marketing techniques, engineering aspects, diseases, and economics.

High-income agricultural enterprises and home gardens are effective in improving the economic position of low-income families. For many farm families, age, educational level, and lack of skills prevent transfer to nonfarm employment. Many lack the resources and technical know-how to become successful farmers, yet farm income and level of living can be increased substantially through use of intensive, high-income enterprises and well-planned home gardens. Pilot activities include demonstrations of specially designed, small units of beef, swine, and vegetable enterprises; promoting the commercial production of native shrubbery in the mountain section of the Valley; using para-professionals to work with low-income people in producing high-income enterprises and home gardens; and providing assistance in the production of cash crops by youth. The significance of these activities was delineated in a workshop on "Improved Rural Living on Limited Resources" sponsored by TVA, the Valley land-grant institutions, Tuskegee Institute, and USDA.

Program Planning and Analysis

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Total	$75	$91	$15	$93

To effectively plan, direct, and evaluate a program for encouraging development of agricultural resources, TVA continuously appraises regional rural and agricultural trends. These studies include farm size and value, land use, farm expenditures and product sales, farm type, operator tenure, changes in marketing facilities, and regional rural and farm migration.

Objectives of these studies are to (1) improve understanding of changing conditions in the Valley, (2) define the emerging problems of rural people, (3) appraise the influence of program activity in bringing about desired changes, and (4) improve planning guidelines for long-range Valley resource development.

WASTE HEAT UTILIZATION

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Total	$243	$276	$48	$555

Research and development activities are under way to develop technological systems that use the heat in power plant condenser water discharge as a new energy source. It will help speed economic development in the Tennessee Valley region, throughout the Nation, and around the world. The annual quantity of waste heat available from modern power plants in the U.S. is equivalent to 1.6 billion barrels of fuel oil, an amount of energy slightly less than 20 percent of total energy used in the U.S. annually. Both offsite and power plant sites will be used in the research and development activities. Objectives are to (1) identify, quantify, and assess new technologies needed to recover heat energy from power plant condenser discharge water as a new energy source; (2) develop economically feasible systems that use the new technology in the production of food and fiber; and (3) measure the environmental effects of the new technologies where applicable.

Greenhouse environmental control involves the use of heat in power plant condenser water discharge for heating and cooling greenhouses. Engineering, horticultural, and economic studies are being conducted in a prototype greenhouse producing tomatoes and cucumbers. Technology developed will be evaluated further in a demonstration scale greenhouse being constructed at the planned Southeastern Waste Heat Research Center at TVA's Browns Ferry Nuclear Plant.

Biological recycling of nutrients from livestock wastes evaluates the use of waste heat in managing livestock wastes. Research is being conducted to determine if nutrients in animal wastes can be removed and used by aquatic plants. Research will determine also if those plants can be used as a primary food source for beneficial marine animals or as a direct feedstuff for ruminant animals. The recycling systems are being designed to permit the operation of a livestock enterprise on limited land area with minimum environmental effects. Nutrients will be removed from liquefied livestock waste by algae and other aquatic plants. These will be harvested by fish and other aquatic organisms, such as clams, which will be used as a high-protein supplement for livestock rations and for possible human consumption. In cooperation with Auburn University, clams are being evaluated as a livestock feed ingredient.

Soil heating to extend crop growing season is determining the feasibility of using waste heat to extend the growing season and to increase the yields of field and horticultural crops. An inexpensive plastic greenhouse erected over warmed soil has been used successfully to produce vegetable crops during the late winter and spring months. In tests already completed, soil-warming, compared with nonheated soil, has more than doubled the yield of some vegetable crops under field tests. Further studies will be conducted using discharged hot water at the Waste Heat Utilization Center at Browns Ferry.

Environmental control for livestock facilities emphasizes the use of waste heat to improve the growth efficiency of livestock in confinement. Research indicates that livestock feed conversion is more efficient where temperature is controlled. Tests with swine have shown that maximum feed efficiency occurs at a constant temperature of around 60 degrees, and comparable results are expected with other livestock. Work already completed in the research greenhouse will be useful in developing an environmental control system for confined livestock production. This system has the potential for reducing scarce proteins and energy feeds required in conventional operations.

Expansion of this program in 1977 will provide for the establishment of a Southeastern Waste Heat Research Center at TVA's Browns Ferry Nuclear Plant. Increased resources will be allocated to operation of the greenhouse and soil heating demonstrations as an integral part of the Center. An oxidation ditch and heat will be added to the Muscle Shoals research facility for biologically recycling nutrients from livestock wastes. Research will be initiated to use waste heat in environmentally controlled livestock systems to reduce the quantity of scarce plant protein and carbohydrates presently used as animal feeds.

FOREST RESOURCES DEVELOPMENT

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Forest investigations	$387	$309	$78	$348
Forest industry development	361	441	107	512
Forest and wildlife management and wildlife use	366	373	92	387
Improvement and establishment of wild land vegetation	339	310	81	344
Administrative and general expenses	49	57	15	59
Total	1,502	1,490	373	1,650

The forests of the Tennessee Valley have been improving steadily and substantially. TVA has contributed to this economic and environmental transition by sponsoring successful reforestation efforts, conducting programs designed to improve management of forests and other wild lands, and promoting increased and improved utilization of the natural and renewable resources of these lands.

The forest resources development effort in the Tennessee Valley is directed toward a broad diverse public. Private landowners who control over 80 percent of the resource base, the general public through its influence on how lands and resources are managed and used, and land-use planners and industrial development specialists represent key groups contributing to the development of the region's forest resources. TVA's resource development programs are directed to informing these groups of resource problems and opportunities to increase their understanding and awareness of and participation in the management and utilization of the Valley's natural resources.

Forest Investigations

A necessary continuing requirement for efficient resource development is having the correct basic resources data so managers can move swiftly to solve problems or take advantage of opportunities. Specific efforts planned for 1977 include reinventorying forests in 10 of the 64 county units in the Valley, preparing trend analyses, and initiating work on an analysis of the forest and wild land resources of the entire Tennessee Valley using existing data from permanent forest plots.

This work supports and is used throughout the forest resources development program and provides essential information about Valley forest productivity, ecological and hydrological conditions, and wildlife habitat. Reliable localized and detailed data on Valley county timber resources are used also by industry and development groups in planning forest industry expansions and siting new wood-using plants. These efforts are in cooperation with forest landowners, Valley industries, the U.S. Forest Service, and other forestry agencies.

Resource specialists and computer experts combine existing ecosystem information and new data such as derived from satellite imagery to assist TVA's impact assessment and planning efforts. The emphasis is on maximum use of existing data and development of planning tools that permit easy evaluation of many combinations of resource parameters. The goal is the economical assessment of land characteristics so that planning functions at many levels can utilize the same data and reduce the secondary costs of poor planning which result when important information is ignored.

Forest Industry Development

TVA seeks to find better ways of harvesting, processing, and marketing forest products in the Tennessee Valley to make sure abundant, available, renewable resources work for the social and economic welfare of the people—and for the welfare of the resources themselves.

In the forests, TVA encourages loggers to use better, less damaging, and more economical methods. This is done by identifying and demonstrating improved harvesting methods. In the process, woods workers and logging managers are trained in the application of logging principles that are both economically and environmentally desirable. This training is vital because by the year 2000 the annual harvest of Valley-grown wood is expected to quadruple.

Wood utilization specialists are investigating total tree utilization to help offset increasing national shortages of fuel, petrochemical plastics, fibers, and high-quality hardwoods. They are finding ways to use wood fibers that are now wasted such as logging and mill residues, treetops and roots, and cull trees for energy and fiber products. Success can mean conserving exhaustible fuels and reducing pollution. For example, the energy content of wood residues produced in the Valley annually equals some five million tons of coal. The goal is to recover and use 50 percent of this wasted energy resource by 1985. Activities include information and demonstration programs to highlight wood waste potentials and show ways to produce and market useful products from it. Use of wood wastes for industrial and institutional heat and for steam and electricity production will be explored also.

The Valley's forest industry development patterns will be evaluated to assure full and continued development. Forest economists periodically analyze timber resource and industry data to determine a forest industry mix that is economically and environmentally optimum for the Valley. Forest industry development opportunities that fit the optimum are promoted through development groups, cooperating agencies, publication of prospectuses, and direct response to industry

requests. Prospectuses pointing out Valley opportunities for producing prime products from abundant low-quality and underutilized trees will be published in 1976-1977. Challenging new or promising products that might come from timber harvested in the Valley are being explored. These include molded wood fiber, oleoresin extractives, and medium-density fiberboard.

A major goal of forest industrial development is to create at least 30,000 new jobs by the year 2000.

Forest and Wildlife Management and Wildlife Use

Forests and wildlife provide a variety of products and services for people in the Tennessee Valley. To guarantee the flow of these benefits the resources must be more productively managed. TVA's goal is to develop and secure application of management techniques to unlock the resource potentials of the Valley's forests.

Wildland Resource Allocation Procedure, WRAP, is a significant effort that combines developing computer technology and land management concepts to give landowners a valuable decision-making tool. Development of WRAP has been under way in TVA for approximately four years with tests being conducted with state and consulting foresters on land in six Valley states. In 1977 efforts will concentrate on more intensive implementation of WRAP.

TVA is also working with states, U.S. Forest Service, and Association of Consulting Foresters to establish additional forestry consultants in the Valley. Another activity will be the evaluation of wildlife habitat improvement demonstrations under powerline rights of way, on private lands, and along the Bear Creek floodway canal.

While much of TVA's wildlife management work is directed at game species and their habitats, nongame animals such as songbirds are receiving increased attention. Specific activities are planned to demonstrate ways the public can increase backyard wildlife through habitat improvements.

In 1977 TVA will intensify urban natural resources development activities to enhance city environments by providing additional recreation opportunities, wildlife amenities, and other benefits. A demonstration project is under way in Knoxville, Tennessee, and an additional one will be established in the upper east Tennessee/southwest Virginia area in 1977.

Improvement and Establishment of Wild Land Vegetation

Improved forest management is a partial answer to growing more wood per acre. Improving the forest genetic makeup is also needed to meet the region's future wood requirements. Until recent years loggers have cut the best trees and left valueless specimens with inferior genetic traits to produce seed for the next generation of trees. Scientists are now selecting the remaining outstanding specimens, collecting, and crossbreeding them to produce superior seedlings that will be inherently 30 to 50 percent more productive. The total process is a long one, and many state and Federal agencies and universities are involved—along with private commercial wood utilization firms. However, activities are fully coordinated to avoid duplication of effort. TVA confines its work to black walnut; northern, southern, and chestnut oak; yellow poplar; and black cherry species. Virginia, shortleaf, loblolly, and white pine seed orchards established in earlier years are maintained to insure realization of their benefits. Finding efficient, successful ways to establish the superior trees in the Valley's forests is equally important. Geneticists are also working to identify the most promising woody plant species for use on problem sites such as recreation areas where heavy traffic limits use. Work will continue to evaluate results of urban planting tests, ash pond planting experiments, shoreline plantings, and plantings on sanitary landfills.

Another element of the revegetation work is finding ways to increase benefits from neglected submarginal lands, such as reservoir drawdown zones and mud flats where the potential for increasing wildlife production is outstanding. Work planned in 1976-1977 includes refinement of seeding techniques, visual impact assessment of shoreline seeding, and determining the response of fish and wildlife populations to previously completed shoreline seeding.

STRIP MINE RECLAMATION DEMONSTRATIONS

	In Thousands
1975 actual	$313
1976 estimate	3,200
19TQ estimate	517
1977 estimate	3,200

TVA is the largest single purchaser of coal in the Nation. Much of this coal is recovered through surface mining techniques, and TVA has a vital interest in the reclamation of these lands. TVA's past and continuing work in the field of reclamation research places the agency in a leadership position, and TVA is called on frequently to answer inquiries and provide data on economic and environmental problems involved in surface mining for coal. TVA's experimental back-to-contour mine on Massengale Mountain in east Tennessee, for example, has attracted national attention with work still continuing in analysis of data gathered in the course of the experiment. Research such as this is vital to the region and the Nation.

With the greatly increased emphasis on coal in meeting the Nation's future energy needs, TVA plans to continue its work in strip mine reclamation research. In fiscal year 1977, TVA will work cooperatively with landowners, state and Federal resource and regulatory agencies, coal surface mine operators, equipment manufacturers, and others in the development and application of improved mining and reclamation techniques throughout its coal purchase area. While technological development will be aimed principally at current and future mining activities, TVA will work also to solve the problem of 87,000 acres of abandoned, unreclaimed surface mines in the Valley region.

Reclamation research and demonstration work is designed to find quicker and more effective ways to protect environmental values and restore mined land to useful production. Work planned in 1977 will include initiation of a demonstration on how wood chips, salvaged from plant material removed from the mountainside prior to mining, can be used as mulch to spread over the disturbed area after mining to stop erosion and speed growth of new vegetation. Another research effort will demonstrate the effectiveness of water control techniques in reducing erosion.

The extractive phase of surface mining also will be studied in cooperation with the U.S. Department of the Interior and the U.S. Forest Service. The study will compare major environmental impacts and costs for three different methods of single-seam mining and reclamation on steep mountain terrain. The hydrology and ecology of three watersheds will be measured prior to and after mining. Mining and postmining measurements will begin in 1977.

The Piney Creek orphan land rehabilitation project is demonstrating how mined land restoration within a 22,000-acre watershed will improve stream quality. The watershed includes 225 acres of abandoned surface mines and numerous deep mines. Piney Creek flows through scenic Fall Creek Falls State Park in Tennessee. The project will document benefits of reclamation in terms of sediment and acid reduction in the water and biological recovery of the creek. A preliminary report on the project is planned for fiscal year 1977. The Tennessee Department of Conservation is cooperating in this project.

An abandoned strip mine reclamation demonstration project was initiated in fiscal year 1976 to promote physical and economical development of the region. The project is designed to test the feasibility and effectiveness of a cooperative Federal-state administrative arrangement for reclaiming orphan strip mined lands and developing guidelines for similar programs on a national scale.

Approximately 5,200 acres of orphan strip mines will be reclaimed in Alabama, 41,500 acres in Kentucky, 20,200 acres in Tennessee, and 19,800 acres in Virginia—a total of 86,700 acres in the four-state area. The project will provide approximately 300,000 man-days of employment for underemployed and unemployed residents of the region.

TVA will administer the program through contracts with the participating states. By the end of 1977, approximately 19,000 acres will have been reclaimed. This represents 22 percent of the 86,700 acres. The 1977 estimate is $2.8 million.

MINERALS RESOURCES PROJECTS

	In Thousands
1975 actual	$287
1976 estimate	282
19TQ estimate	72
1977 estimate	257

TVA's principal objectives in the field of minerals resources are to provide accurate and comprehensive basic data on all minerals resources in the region and to make these data available to the public as quickly and inexpensively as possible to facilitate their development. These objectives are accomplished in three primary categories: Valley Minerals Information, Mapping Cooperatives with the States, and Geophysical Investigations.

Valley minerals data are obtained from field and laboratory investigations and from the files of various agencies and companies. Ultimately, these data will be merged into the Computerized Resources Information Bank (CRIB). CRIB is a national computerized data bank instituted in 1972 to consolidate minerals resources data. The file is arranged to accept basic information needed to describe mineral occurrences. Yet, the format is flexible enough to allow the user to select the information in a form which best suits his purposes. When more fully operational, CRIB will effect savings in eliminating duplication of effort and in minimizing the time required and money spent to secure data. Thus, the availability of data will encourage minerals resources development to the distinct advantage of the region and ultimately the Nation. So far, TVA has contributed about 1,400 entries; this work and the supporting activities will be continued in 1977.

TVA encourages the Valley states to conduct geologic and minerals resources investigations and to create maps depicting the information. Cooperative agreements are made with individual states where TVA shares in the cost of map cartography and printing and furnishes editorial support throughout all phases of the program. The states provide minerals information to be displayed on the maps. Additional guidance is given to incorporate new developments in the field and to promote consistency and adequacy of format. A total of 297 geologic and minerals resources quadrangles have been published through 1975–286 in Tennessee, 4 in North Carolina, and 7 in Alabama. Tennessee is second nationally in extent of geologic map coverage at this detailed scale. In 1977, approximately 18 additional quadrangles will be completed.

The main effort in the area of geophysical investigations is aeromagnetic surveys. Magnetic data are obtained from a sensor trailing on a cable from an airplane. The data are coordinated and processed through a variety of computer programs to produce computer-drawn contour maps of total magnetic intensity. Magnetic anomalies as shown on the maps give industry

an additional tool for targeting its explorations for hidden minerals resources. In support of this program, gravity surveys are taken utilizing a small portable gravity meter which measures the attraction exerted by the earth. When used together, aeromagnetic and gravity surveys permit distinction of buried rock masses, such as geologic mapping allows distinction in rock differences at the surface.

ENVIRONMENTAL QUALITY PROJECTS

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Solid waste disposal demonstrations	$172	$273	$63	$288
Regional air quality management	132	152	44	177
Administrative and general expenses	15	17	4	18
Total	319	442	111	483

TVA demonstrates concern for the quality of the environment in all its projects and programs. This is an essential part of unified resource development. TVA also works with others in enhancing and maintaining environmental quality, selecting particular activities for emphasis on the basis of the seriousness of the situation, TVA program responsibilities, and TVA staff competence.

Solid Waste Disposal Demonstrations

Solid waste has become recognized as an environmental concern equivalent in scope to air and water quality problems. Public concern about increasing volumes and ultimate disposal of solid wastes emphasizes the need for planning and developing economically and environmentally sound methods for disposing of municipal solid wastes, sludges, non-radioactive hazardous waste, construction and site clearing waste, industrial wastes, and agricultural waste. TVA considers solid waste problems as opportunities, however, and looks upon various types of solid wastes as resources for which a use needs to be found. Therefore, TVA is developing plans and methods for collecting waste, processing waste for recovery and extended use of valuable materials, converting waste to energy, and ultimately disposing of waste in environmentally satisfactory ways.

Work with Valley counties and municipalities will be continued to establish effective, environmentally acceptable solid waste collection and disposal systems. A rural minicollection system is being demonstrated, based on a specially-constructed, low-cost, multipurpose collection vehicle. Technical assistance during the development and implementation of these systems will be provided, and increased activity by consultants in the field of solid waste management and disposal systems in the Valley will be encouraged.

During fiscal years 1976 and 1977, emphasis will be given to development of complete plans and implementation of solid waste management systems that incorporate resource recovery to obtain maximum use and reuse of dwindling natural resources on a Valley-wide, regional, and local basis. These systems will include provisions for recovery of metals and glass by separation and recovery of energy by burning the remaining combustible fraction of solid waste as supplemental fuel in utility boilers. Chemical and engineering research to develop a method for converting discarded automobile tires into energy forms as oil and gas is being undertaken in cooperation with educational institutions and tire manufacturers. The use of rubber-asphalt mixtures to produce road paving materials will be explored.

Investigations have been made to provide for recovery, collection, and recycling of waste oil-base materials generated by TVA activities to extend the use of natural resources and conserve energy. Waste oils will be conditioned by a contractor for recycled industrial fuel oil.

In the interest of natural resource conservation, a program is rapidly being developed to reduce leakage of refrigerants, Fluorocarbons F-11 and F-12 (Freon), and to recover these chemicals for recycling from TVA air conditioning and refrigeration units.

Research is continuing into new methods for disposing of municipal solid waste that are more environmentally acceptable than present methods and that will provide for recovery of energy and materials. High-temperature pyrolysis, the most advanced system, is being investigated to determine if combined wastes—municipal solid waste, municipal sewage sludge, and various problem industrial, commercial, and agricultural wastes—can be pyrolized and converted to a fuel gas of a quality suitable for many uses and which can be processed further into liquid fuels for chemical feedstock and vehicular and turbine fuels.

Investigation of factors contributing to leaching of objectionable substances from landfill areas includes the development of new techniques for monitoring the location and rate of travel of these substances through soil by detection and analysis of chemical, biological, and physical factors. Further testing and improvement of a fast and economical technique of detecting leachate production and movement in sanitary fills will be continued in fiscal years 1976 and 1977.

Research into developing safe, efficient methods for disposing of agricultural, industrial, and forest byproduct wastes will be continued. These will include systems for recovering methane gas from poultry wastes for use in heating poultry houses, methods for converting tanning wastes such as leather scraps and hide fleshings into useful soil conditioners and animal feed, and methods for rehabilitating and revegetating furnace ash disposal ponds and sanitary landfill areas by establishing various species of shrubs and trees to stabilize the surface and provide food and shelter for wildlife.

Rail haul offers many advantages for transportation of solid wastes, but rail systems need additional development for handling this hetergeneous, low density, perishable material. Specially designed rail cars will be developed to handle solid wastes economically and efficiently.

Regionalized solid waste systems will require use of transfer stations of improved design. Various design criteria will be investigated, and standards for different size transfer stations will be established.

Disposal of sludges from wastewater treatment plants is a serious problem for most municipalities. Methods for recovering energy producing materials from these wastes will be developed.

Regional Air Quality Management

In carrying out its program for proper maintenance of the air resources, TVA conducts one of the largest known monitoring and research efforts related to atmospheric emissions from steam plants. Extensive research is being conducted both within the agency and for the Air Pollution Control Office of the Environmental Protection Agency on the removal of SO_2 from flue gases as discussed on pages 131 and 223, respectively. Air quality and meteorological data and technical information on control technology derived from TVA studies are made available to control agencies and industries.

TVA's monitoring program includes five regional air quality trend stations, remote from the influence of large urban and industrial sources of pollution, to obtain a systematic record of air quality trends throughout the Valley. This monitoring is conducted in areas that are not monitored by the Environmental Protection Agency, state control agencies, or industry. Also, a low-cost bioindicator air quality monitoring network is being developed to monitor long-term trends in air pollution effects with white pine trees.

In accordance with provisions of contracts and deeds, TVA reviews plans for new industrial plants on sites that involve TVA land or landrights and requires the inclusion of effective air quality control.

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DEVELOPMENT OF TRIBUTARY AREAS

	In Thousands
1975 actual	$1,860
1976 estimate	2,025
19TQ estimate	500
1977 estimate	2,100

Through the tributary area development program, TVA aids local governments and citizen groups to plan and implement subregional resource development efforts to accelerate social and economic growth. TVA provides a broad range of technical assistance to these organizations to aid them in the proper planning and development of local resources for improved quality of life. The program is based on the premise that desirable and lasting change most often occurs when it is directed by local citizens with such aid as they may need and when it recognizes the special needs and opportunities that exist in different parts of the region. Today almost all of the Valley counties participate through citizens associations, special state agencies, multicounty development organizations, and local governmental agencies.

TVA involvement in tributary area development consists of working with the local people of each tributary area and helping them to identify area needs and opportunities. From this understanding a series of cooperative activities or projects is developed to accelerate the area's rate of progress. Efforts are concentrated on achievement of each project by consolidating inputs from the private sector, local government, state agencies, other Federal agencies, and TVA.

Tributary area development includes the application to these areas of the broad range of TVA regionwide resource development activities that are described elsewhere in this document. These activities include, for example, those in agriculture, forestry, minerals, recreation, and water. Tributary area development includes also a number of activities especially applicable to area development. The 1977 estimate for tributary area development covers the cost of planning and coordinating groups and for conducting development work in selected fields for which TVA does not have regional programs. TVA is presently working with 42 local organizations in 24 areas covering the entire Tennessee Valley.

Tributary area development activities change from year to year in response to changing conditions in tributary areas and shifts in aspirations, needs, and opportunities. These activities often provide a testing ground for new concepts and new approaches to regional problems. Following development, testing, and demonstration many of these innovative projects and activities are "spun off" to TVA regional programs, to area organizations, local units of government, or to the private sector.

Practical application of solar heating techniques to the needs of the home is a recent focus of attention. Successful application of new solar energy technology to home heating and hot water production can help minimize the demands of these needs on conventional energy sources. Demonstrations at TVA facilities and on the University of Tennessee campus are designed to lead the way to broadened home and commercial use of solar energy.

The development of practical, efficient methods to clear natural streams of litter and other debris has helped to restore the potential of such streams as a recreational resource. An initial cooperative demonstration between TVA and a local government in western North Carolina provided a testing ground for such activities. Title X public employment funding has made possible the early implementation of four additional stream restoration projects.

Ways to conserve energy by providing improved mass transit have been demonstrated through the establishment of van pools and express bus services. A TVA demonstration with six vans begun in fiscal year 1975 provided the basis for a newly funded 90-van demonstration by the city of Knoxville, Tennessee. With TVA assistance, that city has become a national model for mass transit systems by providing express bus service for central city workers. During the first year of operation, 109,850 riders used the service provided by 12 buses. Similar bus transportation efforts are being implemented in Chattanooga, Tennessee, and the van concept is being extended to the transportation of employees to TVA construction sites.

Multicounty groups and individual local governments are helped to provide more efficient services through the application of computer techniques to such functions as tax records, classroom scheduling, and payrolls. In cases where capital or operating costs of computerization would be too great a burden for any one of several small local governments, computer cooperatives are being formed in which a single central facility serves the needs of all. Using its data processing expertise, TVA encourages the maximum interchange of programs and assists in feasibility studies to determine types of computers and programs needed for specific situations. Four computer cooperatives that use existing computer facilities available at community colleges to provide services to local governments in the surrounding area have been formed, and a Valley-wide consortium has been formed to encourage and assist additional similar efforts. Two development districts are being assisted in the establishment of computer cooperatives for all of the local governments in their districts.

Countywide fire protection for rural residents at reasonable costs is the objective of another current activity. Specially designed demonstration rural fire equipment has been constructed and system design assistance is being made available to interested counties. The prototype system in Cumberland County, Tennessee, proved very effective with 180 fire emergencies being met during its initial year. Two additional counties have equipment purchases under way and an additional six counties are in various stages of the planning process leading to countywide rural fire systems.

A community supported dental clinic now assures improved dental health in one remote area while medical services are being provided in several small mountain communities by bringing together the efforts of local people with those

of all interested agencies. The Valley's tourism potential is being enhanced through the provision of public access for canoeing and rafting on Bear Creek and on the Hiwassee, Clinch, Duck, and Elk rivers, totaling more than 200 miles.

Where water resource development is an essential element of area development, the tributary area organization often becomes an active partner with TVA in managing the full development and utilization of the resources and facilities created. Thus, reservoir shoreland development in tributary areas is often under local management reflecting local needs and desires along with the up-to-date concepts of land and water-use planning developed over the years by TVA. At Tims Ford this partnership resulted in the announcement of a 413-acre rustic state park on the shoreland of this attractive multipurpose reservoir. Recently completed facilities of a similar nature in Beech River resulted from earlier efforts of another local-state-TVA partnership in that west Tennessee watershed. Such high-quality recreation facilities complement the flood control, general economic development, and water supply benefits normally associated with tributary water resource development. In addition to the kinds of activities described above, the area development program serves as a delivery system for TVA capabilities in meeting the continually widening variety of local needs.

HUMAN RESOURCES DEVELOPMENT

	In Thousands
1975 actual	$771
1976 estimate	812
19TQ estimate	177
1977 estimate	992

One of the goals of human resources development is to improve the functioning of labor markets throughout the Tennessee Valley region by developing local projections of occupational demand and supply, wage data, and other employment information. These data are useful to manpower planning agencies for labor market studies, and they are used by TVA to avoid skill bottlenecks in its construction and operating programs. A second and related goal is to develop training programs to (1) alleviate expected skill shortages in TVA's construction program, (2) train local people for jobs created by TVA operations, and (3) reduce unemployment and underemployment in the Valley.

The training program for construction craftsmen, implemented in 1976 at the Watts Bar Nuclear Plant, combines training at state area vocational schools with formal on-the-job training at TVA construction projects. It produces entry-level craftsmen or advanced apprentices for construction jobs. The training program will be expanded to other TVA construction projects in 1977.

The skill supply study, completed in 1976, and other labor market information such as updated occupational demand projections will be used for local manpower planning purposes. The data will be made available to local manpower planning agencies.

As a component of the manpower data and planning efforts, a construction labor market information system will estimate employment by craft for all electric utility construction throughout the Nation and all other construction for the Valley region. This program is coordinated with the Federal Power Commission, the Energy Research and Development Administration, and the Department of Labor.

In cooperation with Volunteer State Community College at Gallatin, Tennessee, a demonstration will be conducted during 1976 and 1977 which is expected to increase from 125 to 525 annually the number of general educational development graduates in the area of TVA's Hartsville Nuclear Plant.

Special emphasis is directed toward acquainting and attracting women and minority students to engineering and other professional careers. The program, now active in two major metropolitan areas of the Valley, will be expanded to four areas by 1977.

Another goal of human resources development is the improvement of the quality of life in the Valley by demonstrating ways to improve the environment. Sometimes this can be accomplished by providing the necessary impetus to capitalize on existing interest. For example, TVA will assist in the Bear Creek Watershed Environmental Education project by helping the local group build a facility to enhance the environmental education program of a seven-county area. TVA will contribute staff time and financial assistance in the program development.

Developing environmental interpretive centers to involve the general public in a wide range of programs which promote environmental understanding is a significant factor in the informal phase of the environmental improvement effort. TVA facilities–nuclear plants, dams, steam plants, reservoirs, and lands surrounding reservoirs–provide a network of potential sites which extend across the Valley. The objective through 1980 is to establish one major interpretive center in the Valley each year. Currently, major interpretive programs are being intensified at Land Between The Lakes, Nolichucky, and the TVA's Forestry and Fisheries Laboratory at Norris, Tennessee. Planning for the interpretive program at the Hartsville Nuclear Plant is scheduled to begin during the transition quarter. In fiscal year 1977 new areas will be reviewed for possible inclusion in the Small Wild Areas program, and intensive interpretive development will be focused on Ladyfinger Bluff in west Tennessee and in Muscle Shoals, Alabama.

TVA is developing around the Nolichucky Dam, powerhouse, and reservoir near Greeneville, Tennessee, an environmental study area. The dam has been renovated and altered to permit raising and lowering the water level in the heavily silted reservoir for waterfowl management purposes. The powerhouse is being developed as an environmental facility with space for exhibits and learning stations. The land surrounding the reservoir is being used to cultivate crops for waterfowl, songbirds, and other wildlife. Also on these lands and around the powerhouse, TVA is building trails and other facilities to take advantage of the varied outdoor learning opportunities. Central themes for the exhibits will be Energy and Natural Resources. A program for their use is being developed with the Upper East Tennessee Educational Cooperative representing 13-member school systems. In addition, direct opportunities will be identified for participation of other organized groups in research and demonstration oriented activities of the center. While maintaining the formal commitments with organized groups, members of the general public sector will be provided the opportunity to observe wildlife, forestry, and waterfowl management practices. Results of the effort will be evaluated as to their effectiveness and applicability in other regional areas.

Specific efforts in the more formal phase of the program include development of a regional environmental development program in the west Kentucky area. Special programs are also planned including a Youth Conservation Corps camp in cooperation with the U.S. Forest Service and energy/environmental workshops. In fiscal year 1977, intensive resource identification work will begin on two new regional projects, Hartsville nuclear site and the lower Hiwassee River area.

REGIONAL ECONOMIC STUDIES

	In Thousands
1975 actual	$601
1976 estimate	744
19TQ estimate	186
1977 estimate	750

The estimate for regional economic studies covers staff expenses for analyzing and interpreting basic social, economic, and demographic data on the Tennessee Valley and for translating the findings into plans for development concerned with the general economic and environmental quality of life. These plans serve to guide TVA programs and to help Valley institutions determine how far the region has come and how far and how fast it can go in solving its problems and realizing its opportunities.

A major objective of current regional development planning studies is the systematic preparation of overviews of planning and development within the 201-county Tennessee Valley region. These studies are on a subregional basis developed cooperatively with the official state, subregional (multicounty), and local planning and development agencies serving the Valley area and provide a useful tool for land use and TVA program planning.

TVA maintains information on population, employment, income, unemployment, public finance, and other socioeconomic measures in the region to assist in planning. Changes in geographic distribution as well as regional changes over time are analyzed to determine their meaning and implications for planning and development in the region and their impact on ongoing and planned programs and projects.

Cooperative population and economic studies are conducted to provide basic data and techniques, such as regional economic accounts, community profiles, retail trade analyses, and regional simulation models, in order to understand the changes in the region. Data and projections from these analyses give important support for meeting requests for assistance in regional and community development plans and for relating TVA water resources development and other programs to city and regional planning efforts, in addition to being used in TVA program planning.

Relationships with state and local governments and their legal powers, their willingness to take political and administrative action, and their financial resources all impinge upon the ultimate success of many activities carried on by TVA. Moreover, the public sector is one of the larger segments of the regional economy, particularly in employment. Information and technical data are continuously assembled on current developments in the state and local field in the Valley region, with

emphasis on public finances and tax trends. This is made available to TVA staff and is provided to state and local officials and their organizational representatives to help in adjusting to evolving trends and to meet specific problems.

Environmental values and amenities are of paramount concern in regional development planning. TVA conducts environmental resource surveys in conjunction with state, regional, and local planning agencies and environmental groups to provide an environmental "early warning" system, to identify opportunities for improving environmental quality, and to make available needed information for the public. TVA also works with state, regional, and local planning groups to ensure that land-use plans consider environmental quality implications.

TOWNLIFT COMMUNITY IMPROVEMENT

	In Thousands
1975 actual	$788
1976 estimate	701
19TQ estimate	177
1977 estimate	705

Townlift community improvement activities include improvement of the physical structure and the economic base of existing communities and the development of new communities. Assistance is provided upon request and only when it is not available from other sources. Another requirement is that the assistance will stimulate self-help actions that are otherwise not likely to take place. The use of private funds is strongly encouraged and all activities are coordinated with existing state and local planning agencies. Townlift activities attempt to develop a balance between metropolitan and rural development. Particular attention is given to small communities in planning the development of a viable economic base and adequate public service facilities. In cooperation with local leaders, plans are oriented toward achieving community development through community growth areas such as industry, commerce, and recreation; and through the rehabilitation of existing business, residential, and commercial areas.

With reasonable assurance of continued Federal general revenue sharing, and with the enactment of the Community Development Act, community requests for TVA assistance in formulating plans and implementation programs for potential projects continue to increase. Community inquiries are increasing and are forecast to continue to do so in 1977. Assistance is being asked not only for plan formulation but for specific recommendations to tie these plans to the Federal revenue-sharing programs. Increasing emphasis on implementation will require more intensive staff effort in the future. This staff effort will give more attention to help Townlift communities arrange financing to carry their plans through to realization.

INTERAGENCY HEALTH SERVICE DEMONSTRATIONS

	In Thousands
1975 actual	$160
1976 estimate	196
19TQ estimate	50
1977 estimate	202

TVA conducts an occupational health program offering a broad range of employee health services, and it continues in the forefront in the development of ways to deliver health care services to people in remote areas. Many components of the program originally developed for TVA employees have useful application in community health situations, with minor adaptations. TVA recognizes a responsibility to share the benefits of its health services capabilities with the people of the region and the Nation, which it fulfills in part through pilot interagency health service demonstrations.

Health testing demonstrations show how the technology of automated and nonautomated health testing equipment and procedures used in the routine care of TVA employees may be used in reaching people in remote areas through early detection of disease. These demonstrations provide training for future health professionals and show how people without regular family physicians can gain entrance into the health care system. These demonstrations are carried out primarily through health fairs, which in turn may promote the creation of primary care centers in low-income and depressed rural areas.

Primary health care demonstrations show how various organizations can pool resources to make health care available to residents of communities where facilities and personnel are lacking. These demonstrations sometimes involve at the outset the loan of TVA-developed mobile health units, operated by local health groups, often with the aid of area medical schools and foundations. Similarly, dental health service demonstrations are used to show the importance of oral health to general health.

Demonstrations of medical systems and technology are cooperative projects with hospitals, medical schools, and physicians. They involve demonstrations on computer interpretation of electrocardiograms, multiphasic health testing, and emergency medical services, such as helicopter ambulance service and emergency medical technician training.

LAND BETWEEN THE LAKES

Land Between The Lakes is a 170,000-acre natural area lying between TVA's Kentucky Lake and Corps of Engineers' Lake Barkley. TVA is developing and managing the resources of the area as a national demonstration of outdoor recreation and environmental education. It serves not only as a vast outdoor playground for vacationers and visitors from all over America, but also as an outdoor laboratory and working model for similar developments and programs elsewhere.

An educational flavor injected into the recreation program enriches the visitor's experience and makes a positive national impact by creating an awareness of his relationship to natural resources. Programs and facilities are designed specifically to awaken the visitor to his natural resource heritage and dependency and permit a "hands on" experience which is frequently not possible in a highly urbanized and industrialized society.

A broad array of programs and facilities are needed for Land Between The Lakes to fulfill its unique mission. Programs range from those for one person who participates in one activity to those planned and designed for groups of up to several thousand people who may participate in numerous activities. Facilities range from designated informal use areas to modern housing for group camping.

The programs and facilities are designed to handle families and individuals, service organizations such as the Boy Scouts of America, teachers, school classes, special interest groups, and various groups and individuals in a work/study capacity.

Various cooperative arrangements are developed to help test and evaluate selected programs and facilities, to help stimulate the development of the surrounding region, and to extend the lessons of Land Between The Lakes to potential users of the knowledge. These arrangements are made with universities; local, state, and Federal governmental units; and selected quasipublic and private organizations.

CAPITAL OUTLAY

	In Thousands
1975 actual	$2,058
1976 estimate	2,126
19TQ estimate	868
1977 estimate	1,833

The Land Between The Lakes program is planned, designed, and built to accommodate a broad array of visitor use in an optimum manner. Capital resources are used to make permanent improvements to increase the production and enhance the public use of the area's natural resources. These funds also provide for public-use facilities such as campgrounds, environmental education facilities, roads, and hiking trails. In addition they provide for common support facilities such as the administration building, visitor orientation centers, and facilities and equipment needed to support the total program.

Conservation and Education Facilities

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Upland game, waterfowl, and fisheries	$85	$98	-	$43
Education stations	16	61	$57	79
Other facilities	20	42	16	51
Total	121	201	73	173

The 1977 estimate of $43 thousand for upland game, waterfowl, and fisheries will be used for permanent improvements to enhance wildlife and fisheries production. The estimate provides for 150 waterholes; 100 nesting structures for wood ducks, songbirds, resident Canada geese, and squirrels; and feeders in selected areas to enhance wildlife viewing opportunities. Fish shelters (attractors) will also be installed adjacent to fishing piers and at selected campground sites to improve the fishermen's chance of success.

An estimate of $79 thousand in 1977 for education stations provides for improvements to the Youth Station and development of a primitive farm. Old structures left in the area will be used to begin development of a vintage 1850's living historical farming complex reminiscent of the between-the-rivers era. Improvements at the Youth Station will include a lighted play court and a dock facility to store aquatic supplies.

The estimate of $51 thousand for other facilities provides for development of graveled pulloff areas, trails, brochures, and interpretive materials to demonstrate various resource management practices at selected sites along trails and roads. Blinds and platforms will be constructed at strategic points to enhance wildlife observation.

Recreation Facilities

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Family campgrounds	$132	$89	-	$78
Group camps	411	84	$71	197
Informal use areas	-	113	30	59
Other recreation additions	37	38	133	211
Total	580	324	234	545

The $78 thousand estimate for family campgrounds in 1977 provides for renovation of 28 old deteriorated campsites at Rushing Creek Campground and the addition of 10 campsites and a boat ramp at the Ginger Bay primitive camp.

The estimate of $197 thousand in 1977 for group camps includes the addition of a 200-capacity campfire theater and equipment storage facility at Brandon Spring and the renovation of 48 camping pads at Camp Energy.

An estimate of $59 thousand for informal use areas provides for upgrading several areas by adding camping units with tables and fireplaces, potable water, sanitation facilities, picnic tables, grills, and parking.

The $211 thousand estimate for other recreation additions provides for installation of a fishing pier to accommodate up to 75 fishermen including the handicapped; addition of a shelter, toilets, electricity, water, and parking

facilities to the central group assembly area which accommodates very large groups (up to 20,000 individuals per day) on a day-use basis; additions of facilities to teach sailboating, canoeing, archery, and other outdoor skills; and miscellaneous hiking trail improvements.

General Support Additions

	In Thousands						
	Actual to 6/30/74	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate	Ensuing Years	Total Cost
Golden Pond field office	$584	$489	-	-	-	-	$1,073
Central Visitors Building–Golden Pond	-	-	$61	$149	$369	$521	1,100
Maintenance Center	-	3	362	149	-	686	1,200
Road improvements:							
Highway 453 (north)	891	194	5	-	-	-	1,090
Highway 453 (south)	-	22	355	145	369	409	1,300
Other		181	231	51	87		
Cleanup and aesthetic improvements		5	40	14	40		
Other general support		463	547	53	250		
Total		1,357	1,601	561	1,115		

Central Visitors Building–Golden Pond. The main base for visitor reception-information services is presently in a mobile trailer located near the center of the project. The mobile trailer is inadequate to serve as the major visitor orientation facility. Over a million people pass this point each year with thousands stopping for information. The new centrally located visitors building will include display space, a small auditorium, automated postal service, patrol headquarters, and parking for 125 vehicles. The building is being designed to demonstrate the use of solar energy for heating and cooling. Construction will start in 1976 and will be completed in 1979. The 1977 estimate is $369 thousand.

An estimate of $369 thousand in 1977 will be used to improve eight miles of The Trace–Highway 453 (south). This section of road is part of the main north/south highway that extends the entire length of Land Between The Lakes. Upgrading is necessary to safely carry the present traffic load and projected increases and to eliminate congestion during peak periods. The road will be upgraded with a paved width of 22 feet. The work is expected to be completed in 1978.

Other road improvements include $61 thousand to plan and design a south lakefront scenic road along Kentucky Lake, improving that portion of The Trace (Highway 49) located in Tennessee, and $26 thousand for upgrading four miles of existing gravel roads to make them safe for visitation use.

The cleanup and aesthetic improvement program is a continuing effort to remove the remains of old building sites, land scars and litter left from the days of private ownership. Out of a total of 1,050 sites requiring cleanup, about 75 percent was completed through fiscal year 1975. The cleanup work will be 95 percent completed in 1977. The 1977 estimate for this activity is $40 thousand.

An estimate of $250 thousand for other general support includes the installation of directional and information signs for the main entrance roads; necessary equipment such as backhoes, tractors, and dozers needed for construction activities; and farm equipment and miscellaneous equipment such as two-way radios, chain saws, boats, and motors.

OPERATING EXPENSES

Summary of Land Between The Lakes Operating Expenses

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Income	$329	$357	$134	$365
Expenses				
Conservation and education operations	734	829	230	868
Recreation operations	817	832	285	940
Supporting operations	811	929	278	1,101
Distribution of administrative and general expenses	61	71	17	74
Total expenses before depreciation	2,423	2,661	810	2,983
Depreciation	406	455	120	560
Total expenses	2,829	3,116	930	3,543
Net expense of Land Between The Lakes operations	2,500	2,759	796	3,178

Land Between The Lakes is operated to achieve optimum public use from its resources and facilities for outdoor recreation and environmental education. The natural resources are managed to provide a high quality resource base and desired mix of resources needed for a wide variety of visitor interests and activities. Special care is required to avoid overdevelopment of one resource at the expense of another equally important one. Upland wildlife, waterfowl, fisheries, and forest resources receive primary management attention at Land Between The Lakes.

The development and operations of numerous visitor programs and activities in recreation and environmental education are of paramount importance to the success of Land Between The Lakes. These include (1) programs and activities for families and individuals; (2) cooperative programs with various organizations and institutions; (3) special events such as the

campers fair and arts and crafts fair; (4) training in various outdoor skills such as boating, fishing, and wildlife tracking; (5) special activities for senior citizens, handicapped, and other disadvantaged persons; (6) workshops and seminars for teachers, school classes, and other groups of individuals; (7) work/study programs for both youth and adults; and (8) interpretive programs that are both self-guided and TVA conducted.

The operation and maintenance of campgrounds and other facilities and lands are an important, necessary aspect of the overall operation of the program. Visitor control, orientation, and protection are essential to the welfare of every visitor to and each resource within Land Between The Lakes and require special attention. Increasing populations of ticks have become a serious problem that needs immediate attention to protect the visiting public and permit development of a full range of outdoor activities.

Conservation and Education Operations

The environmental education goal for Land Between The Lakes is to give every visitor an opportunity for one or more environmental education experiences. Learning experiences are woven into every visitor activity but the focal point for environmental education is a 5,000-acre environmental education center. Center Station is the present reception building for visitors. Here the story and goals for the demonstration are told in display, brochures, and by films. Several nature trails lead out from the center, including one specially designed trail for handicapped persons. Other points of interest include the ruins of historical Center Furnace and other marks of the iron age, the Silo Overlook, and wildlife observation stations. About 60,000 visitors register at Center Station annually. In 1977, some 150 workshops and special interest programs will be planned and developed.

Many and varied conservation and interpretive programs are conducted throughout Land Between The Lakes to promote interest and appreciation in the area's natural and cultural resources as well as to provide constructive leisure time activities. In 1975, the annual Arts and Crafts Festival attracted 150 exhibitors from 10 states and 28,000 visitors. Other activities conducted during the year included an Eagles Weekend, River Culture and Crafts Workshop, Archaeology Weekend, Fall Color Weekend, spring walks, food and fiber processing, and several arts and crafts workshops. Eight special event weekends are planned for 1977.

The Youth Station within the environmental education center was built to demonstrate approaches to environmental education in school systems. Eight new schools were introduced to the program last year. The station has overnight capacity for 72 people and it serves from 7,000 to 10,000 students and adults overnight annually. In addition, 18,000 to 20,000 students make day-use visits to the station annually.

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Empire Farm was developed as a special education station to broaden the Youth Station program and provide an interesting learning experience for the general public. Here school classes and the public are brought into direct contact with the land and farm animals and with practical lessons in the production and processing of foods and other farm products. Regional schools within a 100-mile radius are increasingly using the farm and other facilities for single-day field trips. Visitation averages 45,000 persons per year, of which 10,000 are students; 75,000 persons are expected by 1977.

Environmental education extension is a phase of the program conducted in conjunction with the Environmental Education Center. TVA staff assists schools in developing environmental education programs. Efforts are primarily directed toward working through groups of regional school systems. The approach assures strong leadership, lessened financial obligation for the school involved, and enables TVA to contribute its professional and technical assistance to a broad base of community leaders and school administrators involved in environmental education. Many schools are being aided in developing environmental study areas at their school sites or on other community-owned lands. Other assistance includes teacher training and curriculum development.

Upland wildlife and waterfowl management activities are directed to achieving optimum wildlife populations. The work program is directed to improving wildlife food and habitat, thus ensuring bird and animal propagation and enhancing recreation and education opportunities for sightseers, organized study groups, and sportsmen. An annual program provides and maintains cover plantings, woods openings, waterholes, and control of reverting lands and of timber harvests. Investigations are conducted on wildlife species, population densities, levels for harvesting, and disease occurrences and their control.

Approximately 10,000 acres of open lands are devoted to wildlife food crops, about 6,500 acres in annual crops, and the remainder of perennial pastures. Local farmers will operate 5,000 acres under crop-sharing arrangements in 1977.

Other activities include the management of four major subimpoundments and numerous ponds for wildlife and fisheries management; studies and research on deer, turkey, and other upland game; trapping, tagging, and banding work on upland game, doves, and waterfowl; development of plans for management and distribution to ensure optimum wildlife populations; and management of special features such as the resident flock of Canada geese and the buffalo herd.

Managed hunting opportunities are available on 150 days of each calendar year. Hunts are scheduled for deer, wild turkey, ducks, geese, upland birds, and small game. Total hunter days (hunting and scouting) was about 102,000 in 1974. The deer harvest in calendar year 1975 was 2,696 animals of which 287 were taken by bow and arrow. Permits for deer hunting were issued to 8,345 persons for bow hunting and 16,048 for gun hunts. Over 9,000 small game permits were issued in the 1974 season. Cooperative relationships are maintained with representatives of agencies of Kentucky and Tennessee and with other Federal agencies concerned with wildlife resources in this area.

Forest management is carried out under a comprehensive resource management plan which incorporates the most recent recommendations from wildlife biologists and research foresters. Management of the 145,000 acres of forest emphasizes the production of forest resources which are of direct benefit to visitors. The educational aspects of forest management are also emphasized. Timber production, though necessary and important, is of secondary importance. The work includes reforestation for wildlife cover, timber stand improvement, timber harvest, and forest fire protection. The latter is accomplished through contracts with the states of Kentucky and Tennessee. Through fiscal year 1975, a total of two million seedlings have been planted; about 200,000 pine seedlings are to be planted in fiscal year 1976; and 300,000 pine seedlings in 1977. Long-range plans call for planting 500 pine cover plantings for wildlife. Timber stand improvement work has been completed on 5,700 acres and plans call for continuing at an annual rate of 600 acres. About 250 woods openings are being maintained. Timber harvests covering 2,000 acres in 1977 are expected to yield income estimated at $60 thousand.

Other forestry program activities include inventory of timbered areas, growth and quality studies on which to base management plans, checking for disease and insect damage and applying control measures if needed, and developing and implementing plans for forestry educational demonstrations in extension of environmental education activities.

Recreation Operations

Recreation operations include management of campgrounds for families and groups and care of day-use areas, overlooks, picnic and lake access areas and associated roads, playgrounds, swimming areas, water supply systems, and sanitary facilities. Services include reception and registration of guests, collection of user fees where appropriate, preparation and distribution of informational materials, planning and conducting group recreational activities, teaching outdoor skills, and protection of visitors and their property. Maintenance services ensure clean, safe, and attractive conditions. In 1977 the area will have a daily camping capacity as follows: campsites for 736 families; 1,228 individuals in group camps; and 3,000 individuals (or 500 families overnight) in informal use areas. An estimated 600 thousand individuals will use these facilities in 1977. The new Brandon Spring group camp is expected to accommodate about 125 separate groups by 1977. The optimum capacity for Land Between The Lakes is estimated at 1.2 million camping nights annually.

Other activities include development of plans for increasing the variety of outdoor recreation opportunities and facilities; testing of innovative ideas and practices of possible demonstration value; and encouraging and cooperating with other agencies in the conduct of recreational activities of general economic and social benefit to the region. TVA manages special features such as the Off-Road Vehicle (ORV) area, the Wranglers Camp for horseback riders, and a trails system consisting of a 26-mile trail complex, a 17-mile trail, and several lesser trails for hiking and nature walks. Cooperative programs include Project Appollo for disadvantaged youths, High Adventure Camp for scouts and the more experienced campers, camporees by youth

organizations, tree plantings and other conservation projects by youth groups, hike days, and cleanup days. An annual reunion of former residents of the Land Between The Lakes area attracts up to 2,000 persons.

A work-study program is conducted for college-level students majoring in recreation and environmental education curricula. The students are assigned to Land Between The Lakes under an agreement between TVA and sponsoring colleges and universities which provide that the students continue to be eligible for academic credit during the intern (practicum) period of 12 to 14 weeks. Thirty-eight students from 21 universities participated in the program during the summer of 1975. Requests to participate in the program far exceeded the capability of existing staff and facilities.

Supporting Operations

Supporting operations include diverse activities associated with both the conservation and education and the recreation programs. Major activities include:

Administration and reception. Management and administration for the demonstration is conducted from an administration building located at the geographic center of the area adjacent to U.S. Highway 68. The main reception station for visitors is located in this complex and presently is housed in a mobile trailer. Over 48,000 visitors were received in fiscal year 1975 at this station. Several thousand written inquiries and requests for information are handled each year. Visitors entering Land Between The Lakes from the north are assisted at a new control station; those from the south at a temporary information booth.

Maintenance and additions. This activity provides maintenance and repair services for buildings, roads, grounds and other support facilities; grounds development and beautification; supervision of project additions; application of vector control measures; site planning; and development of plans for general betterments to project facilities. A major function is the upkeep of roads and trails. The road system receiving regular maintenance totals 637 miles, consisting of 96 miles of hard surface roads, 291 miles of gravel surface secondary roads, and 250 miles of unimproved roads. Constructive maintenance is being applied to upgrade most of the secondary roads to make them adequate for recreational vehicular traffic. In addition, some 68 miles of hiking and horseback riding trails require regular maintenance. All roads and trails which serve visitor use require adequate signs for directional and informational purposes.

Other maintenance activities. These include (1) operation and maintenance of four major subimpoundments totaling approximately 1,000 acres and about 350 small ponds devoted to wildlife, recreation, and education—30 of these are managed for fish; (2) elimination of hazards such as open wells and cisterns, old wire fences, and dead and down trees in public-use areas for protection of persons and wildlife in the area; (3) cleanup of drift and floatage at heavy use points along the 300 miles of shoreline; (4) mowing of some 800 acres of grass in high visual impact areas; and (5) operation of shops, warehouses, and maintenance bases for the upkeep of grounds, buildings, and equipment and for the construction of additions.

Property protection and services to visitors. An adequate, well-trained and equipped, uniformed patrol force is essential for the security of visitors and protection of their property. They provide services to visitors, protect government property from theft and vandalism, enforce game laws, and respond to emergency situations on both land and water. Collaborative relationships are maintained with other law and conservation officers at local, state, and Federal levels.

FERTILIZER DEVELOPMENT

Food production is one of the things that the United States does best. With only 11 percent of the world's cultivated cropland and 0.4 percent of the world's agricultural population, the United States produces nearly 18 percent of the world's cereals and 70 percent of all world grain exports (1973 data).

This capability depends heavily on the widespread use of commercial fertilizers and the practical technology that TVA has developed for their manufacture. The result is that we are one of the best fed nations in the world. In addition, we supply huge quantities of food to others—in humanitarian response to emergency needs and as commercial sales that offset a major share of the billions of dollars we spend to purchase petroleum and other products in world markets.

Seeing that the Nation has the necessary know-how to produce high-quality fertilizers at reasonable cost and that farmers and the fertilizer industry understand how to use new fertilizer developments to advantage are major TVA objectives. With the TVA National Fertilizer Development Center's "team" approach and its wide range of experimental facilities, TVA can continue to marshal the resources necessary to achieve major advances and resolve major problems. At the same time, its practical orientation keeps researchers responsive to needs for day-to-day innovations to cope with special situations.

TVA's leadership in developing new fertilizers and introducing them into the Nation's economy benefits all consumers by helping to assure adequate supplies of food at low production cost. Of all purchased inputs, fertilizer is the biggest contributor to bumper yields, and the production of nearly all modern fertilizers involves processes developed by TVA. With fertilizers, today's expanded production comes from fewer acres and with half the manpower required 30 years ago.

The fertilizer program also contributes to other national objectives. It benefits small businesses by giving them ready access to advanced technology. It promotes better resource use—in fertilizer manufacture through the development of processes that make better use of raw materials and on farms by making it possible to intensify efforts on the most productive lands. Fertilizers also enhance the environment by promoting plant growth that reduces erosion and stream siltation. Major program spinoffs in recent years include the application of chemical and engineering expertise acquired in fertilizers to environmental problems associated with air and water pollution at electric power plants and the provision of technical assistance to developing nations striving to improve their food and fertilizer production.

The program contains two elements: (1) research and development and (2) fertilizer introduction. Research and development in this context embraces basic agronomic, chemical, and engineering research to develop new products and new processes, including ways to use in fertilizers sulfur recovered from coal-fired generating plant stack gases. Facilities include laboratories, greenhouses, pilot plants, and prototype production units. State land-grant universities cooperate in agronomic research. Fertilizer introduction takes the results of research and development to the farmer and the fertilizer industry through

farm test demonstrations and industry demonstrations. Developmental (prototype-scale) production of new and improved fertilizers is the link between research and development and these demonstrations. Demonstrations are conducted in 47 states and Puerto Rico with the land-grant universities and 263 manufacturers and wholesale distributors and their retail dealers.

TVA works closely with farmers, land-grant universities, the fertilizer industry, and with other Federal agencies such as USAID and the Environmental Protection Agency in the conduct of this program. Cooperation was initiated in 1976 with the newly organized International Fertilizer Development Center, located on the TVA Muscle Shoals Reservation and sponsored by the U.S. State Department, the International Development Research Center of Canada, and others.

IMPACT OF TVA'S FERTILIZER PROGRAM

The effects of the program on the U.S. fertilizer industry and the agricultural economy can be measured by these accomplishments:

1. American fertilizer technology has been revolutionized. TVA pioneered and promoted high-analysis fertilizers, resulting in lower transportation cost. TVA developed the fertilizer granulation method now widely used which resulted in free-flowing fertilizers that store well and can withstand the impact of high-speed spreading. TVA developed the process for producing diammonium phosphate that is the base for all bulk blend programs, resulting in most fertilizers being formulated to a prescription based on soil tests. TVA has developed high polyphosphate fertilizers with desirable physical properties and a pipe reactor for use in their production, making it possible for the liquid fertilizer industry to develop. Through June 30, 1975, TVA has granted 588 patent licenses to 357 firms for use in 533 plants in 39 states.

2. Farm fertilizer use has improved. Demonstrations in nearly every state in the Union have helped solve major soil fertility problems, determine the best methods of fertilizer application, and fit fertilizer into balanced whole-farm programs for greater agricultural efficiency. Nutrient use is 11 times that of 25 years ago.

3. The small business segment of the fertilizer industry has been preserved. The availability of new methods, materials, and technical help from TVA has been a key factor in keeping small fertilizer business alive and competitive and in helping them overcome pollution problems.

4. TVA fertilizer technology has helped to keep the U.S. fertilizer industry competitive in the world market. Two fertilizers introduced by TVA accounted for 44.5 percent of all fertilizer exports from the U.S. in 1973, and U.S. fertilizer exports amounted to about 14 percent of total world fertilizer trade.

BASIC PROGRAM CHANGES

TVA's fertilizer program is designed to be responsive to changing situations—in demand for products, availability of raw materials, energy supplies, and environmental concerns. Estimates for the transition quarter and for 1977 reflect changes under way or projected for fertilizers and American agriculture.

The biggest change in research emphasis over 1976 will be an increased effort to find ways to use low-grade phosphate deposits to make fertilizers. Additional effort will go into developing new technology for using wet-process phosphoric acid more effectively in fertilizer production. Construction of a prototype plant to produce sulfur-coated urea, a fertilizer with controlled nitrogen release, will be continued. Studies of the urea polyphosphate process will be accelerated in a large pilot plant. Several processes will be evaluated for their potentials to conserve energy and/or minimize pollution problems. The need for and important potentials of major changes are highlighted below:

1. Use of marginal phosphate deposits. Development of technology to make better use of phosphate reserves will be an object of highest priority. Goals are to make feasible the recovery of a larger share of the mined phosphate (only about half is recovered today) and to make it practical to mine lower grade deposits. Any significant improvements would greatly enhance utilization of the phosphate resource.

2. New wet-process phosphoric acid technology. The fertilizer industry has become almost totally dependent on wet-process acid, which is made by treating phosphate rock with sulfuric acid. The price disparity of thermal phosphoric acid made by electric furnaces has increased in recent years with the changing energy situation. Nitric phosphates, made by treating the phosphate rock with nitric acid rather than sulfuric acid, also remain uneconomical by comparison. The increasing reliance on wet-process acid makes imperative the resolution of problems associated with production and use of this relatively impure material.

3. Alternative routes to ammonia. Dwindling supplies of natural gas, the prime feedstock for manufacture of ammonia (the building block for all nitrogen fertilizers), signal severe problems for fertilizer and food production unless alternatives can be developed. Coal is the one plentiful national resource that could provide that alternative in the near future. However, current coal gasification technology is inefficient and expensive. TVA is starting work in 1976—and will continue the effort in 1977—to identify potentials for improvements in this area of technology. Longer term studies will investigate radically different possibilities for making hydrogen for ammonia production and for direct fixation of atmospheric nitrogen.

4. Shift to private producers for source of TVA phosphate. Reflecting this trend, TVA will shut down its electric phosphorus furnaces as commercial supplies of wet-process acid can be obtained and an orderly transition made. This will enable TVA to benefit from industry's larger scale of production and more favorable manufacturing locations. It will eliminate TVA's high operating costs for mining, electric-furnace, and acid unit operations; avoid large expenditures for maintenance and replacement of basic facilities; and avoid large outlays for meeting standards for pollution abatement and worker safety. Developments in technology and marketing will be more readily adaptable by industry and benefits more rapidly available to agriculture.

5. Pushing forward with urea. Urea fertilizers, which are made from ammonia and the byproduct carbon dioxide of ammonia manufacture, are rapidly replacing ammonium nitrate as the leading solid nitrogen fertilizer. Urea contains more nitrogen, has fewer pollution problems during manufacture, and is less hazardous to handle and store. TVA laid the groundwork for exploring the full potentials of urea with completion of a new ammonia plant and a urea solutions unit in 1972. Demonstration production and nationwide introduction of granular urea, whose large particle size is superior to ordinary prilled urea for many uses, and of urea ammonium phosphate, a new type of fertilizer, are under way. Work with sulfur-coated urea, a highly promising new fertilizer that slowly releases its nitrogen to crops, has advanced to a large pilot-plant stage. To further refine the process and demonstrate the potential of this new product, construction will continue on a prototype facility that will begin operation in 1978.

6. Energy and environmental considerations. Novel types of granulation that require less energy for drying or need no separate drying will be investigated more thoroughly. This work potentially can lead to lower production costs and conserve energy. Development of processes and minor innovations that reduce pollution during fertilizer manufacture will be emphasized. This will help commercial producers meet increasingly stringent Federal and state environmental regulations.

CHEMICAL FACILITIES
(CAPITAL OUTLAY)

	Summary (In Thousands)											
	1975 Actual and Financing			1976 Estimate and Financing			19TQ Estimate and Financing			1977 Estimate and Financing		
	Appr.	Nonpower Proceeds	Total	Appr.	Nonpower Proceeds	Total	Appr.	Nonpower Proceeds	Total	Appr.	Nonpower Proceeds	Total
Sulfur-coated urea unit	$349	-	$349	$515	-	$515	$87	-	$87	$3,185	-	$3,185
Wet-process phosphoric acid concentrator	-	$58	58	-	$166	166	-	$342	342	3,384	-	3,384
Storage facilities for clarified liquid fertilizer	-	-	-	-	-	-	-	-	-	500	-	500
Storage facilities for suspension fertilizer	-	-	-	-	-	-	-	-	-	300	-	300
Primary pollution abatement facilities	699	588	1,287	631	1,485	2,116	282	-	282	4,003	-	4,003
Improvements and additions to production facilities	1,066	275	1,341	911	396	1,307	205	33	238	575	-	575
Plant replacements	82	298	380	40	5	45	-	50	50	306	-	306
General equipment, design studies, and administrative expenses	243	304	547	209	227	436	-	85	85	471	-	471
Total obligations	2,439	1,523	3,962	2,306	2,279	4,585	574	510	1,084	12,724	-	12,724
Changes in unpaid undelivered orders	-280	-261	-541	1,458	-289	1,169	150	450	600	-4,300	$100	-4,200
Total expenditures	2,159	1,262	3,421	3,764	1,990	5,754	724	960	1,684	8,424	100	8,524

Chemical facilities additions are essential to demonstrate new fertilizer developments for the Nation. The 1977 estimates reflect continuation of the shift from TVA produced thermal-process to purchased wet-process phosphoric acid as a source of fertilizer phosphates. Work will be continued on facilities to demonstrate production of sulfur-coated urea, a fertilizer with controlled nitrogen release. Two new fluid fertilizer storage facilities will be started in 1977, one of which will be completed in 1978 and one in 1979. These new facilities will provide necessary storage capacity for liquid and suspension fertilizers.

Sulfur-Coated Urea Unit

	Appropriations (In Thousands)
1975 actual	$349
1976 estimate	515
19TQ estimate	87
1977 estimate	3,185

The 1977 estimate covers continuation of work on facilities for making sulfur-coated urea (SCU). The $3.0 million total estimated cost shown in the fiscal year 1976 Budget Program was based on a factored estimate of the conceptual design of demonstration-scale facilities. A revised estimate of $4.7 million is based upon more complete design of the facilities and on additional pilot-plant operating data and reflects a significant increase in general cost levels.

SCU is the only low-cost, slow-release nitrogen fertilizer in advanced development with potential for widespread use. Its prolonged period of nutrient release makes SCU especially promising for use on long-season crops. The cost of a unit of nitrogen is higher with SCU than for soluble forms, but this often is more than offset by more efficient use of the applied fertilizer and by reduced labor and equipment costs because fewer applications are needed. Tests indicate that nutrient leaching on porous soils is reduced when SCU is used. The danger of "burning" crops and excess nutrient consumption also is reduced.

An analysis of potential markets identified the following four major uses for SCU which will have important national benefits:

1. To improve efficiency of crop production. Because of its controlled release property, SCU could be expected to replace soluble nitrogen use on at least 14 million acres of farmland.

2. As a nitrogen product with improved physical properties primarily for blending with other materials. SCU lightly coated with sulfur only should find wide use by bulk blenders. It eventually should replace ammonium nitrate in blending and direct application.

3. For export. Lightly coated SCU should be a valuable export material because of its high analysis and excellent physical properties. The United States so far has been unable to capture much of the nitrogen export market using conventional materials.

4. As a substitute for soluble nitrogen fertilizer to reduce potential nitrate pollution from farmlands. Realization of this benefit and its extent would depend upon whether restrictions are placed on use of nitrogen fertilizers.

Because the product and process are unique and the material untried on the market, the fertilizer industry has been reluctant to invest in commercial-sized facilities to produce SCU until TVA completes a demonstration-scale unit to further perfect the process and to introduce the product.

Wet-Process Phosphoric Acid Concentrator

	In Thousands		
	Total	Appropriations	Nonpower Proceeds
1975 actual	$58	-	$58
1976 estimate	166	-	166
19TQ estimate	342	-	342
1977 estimate	3,384	$3,384	-

TVA is committed to changing from TVA-produced thermal phosphoric acid to purchased wet-process phosphoric acid as the source of phosphate for fertilizer production. About two-thirds of TVA's annual use of this acid must be concentrated (from 54 to 70 percent P_2O_5) for production of granular ammonium polyphosphate and liquid fertilizers. Concentrated, or superphosphoric, acid is commercially marketed in quantities that TVA requires, by only one company. The price is prohibitive and the company is foreign-controlled. Concentrating its own acid will provide TVA with greater flexibility in levels of concentration in future developmental processes. By concentrating its own phosphoric acid, TVA will realize savings of $0.7 to $1.3 million per year.

Construction of a 125-ton-per-day concentrator will commence in 1976 and completion is scheduled for June 1978. Current estimated project cost is $4.4 million.

Storage Facilities for Clarified Liquid Fertilizer

	Appropriations (In Thousands)
1975 actual	-
1976 estimate	-
19TQ estimate	-
1977 estimate	$500

Construction will commence in 1977 on facilities for cooled storage of liquid fertilizer of 11-37-0 grade made from wet-process superphosphoric acid and ammonia. The storage life of this high polyphosphate product has been found to be significantly affected by storage temperature. To maintain its quality, storage at or under 60 degrees Farenheit is necessary. At higher temperatures, hydrolysis lowers polyphosphate content, which permits precipitation of magnesium compounds introduced in the wet-process acid raw material. Previously, liquid fertilizer made with TVA-produced thermal phosphoric acid has been stored in railroad cars and other field storage facilities since the thermal acid contains no magnesium compounds. Two 500,000-gallon storage tanks will be constructed for storage of 5,800 tons. Completion of the project is scheduled for March 1978 at a total cost of $1.2 million.

Storage Facilities for Suspension Fertilizer

	Appropriations (In Thousands)
1975 actual	-
1976 estimate	-
19TQ estimate	-
1977 estimate	$300

The 1977 estimate includes $300 thousand to begin construction of storage facilities to handle suspension fertilizers. Multinutrient suspension fertilizer made from merchant-grade wet-process phosphoric acid, ammonia, and clay as a

suspending agent offers advantages of low cost, high analysis, and suitability for blending. The introduction of suspension fertilizers is an important part of the TVA fertilizer program.

As the TVA chemical plant has only 3,200 tons (561,000 gallons) of fixed storage available for suspension fertilizers, the suspensions have been pumped into tank cars for immediate shipment. Handling of the suspensions in this manner has proved to be very unsatisfactory. Variations in quality and grade are inevitable. Lack of agitation and lack of control over rate of cooling in tank cars often lead to growth and encrustations of large crystals in the cars. The proposed storage will comprise three tanks (two of 500,000 gallons each and one of 600,000 gallons) with a total capacity of 10,000 tons. Quality and grade of the fertilizer will be smoothed, holdup and agitation in the tanks will limit crystal size and promote suspension of the crystals, and adequate storage space will be provided. Total estimated installed cost of the tanks is $1.8 million. Part of these will be put in service in 1978 and the remainder in 1979.

Primary Pollution Abatement Facilities

	In Thousands		
	Total	Appropriations	Nonpower Proceeds
1975 actual	$1,287	$699	$588
1976 estimate	2,116	631	1,485
19TQ estimate	282	282	-
1977 estimate	4,003	4,003	-

The process steam plant produces all of the steam required for fertilizer production and for heating shops, laboratories, and offices at the TVA National Fertilizer Development Center. Coal is used as fuel since natural gas is no longer available for this purpose. In order to meet Alabama particulate emission standards, an electrostatic precipitator at the process steam plant is being installed to remove particulates from the flue gas discharge. Estimated obligations for the transition quarter are $150 thousand and for fiscal year 1977, $725 thousand. Total estimated cost is $2.3 million and the project will be completed by the end of March 1977.

Presently, collected fly ash from the process steam plant is sluiced to a dewatering bin and then trucked to a dump after it is dewatered. The fly ash is so fine that some of it escapes the dewatering bin and is discharged into a storm sewer and subsequently into a creek and the Tennessee River. Settling basins will be constructed to settle out fly ash and bottom ash from the process steam plant. The clarified pond water will be treated to reduce its alkalinity to an acceptable

limit to meet pollution abatement standards before it is allowed to escape. Periodically the pond will be cleaned out and the ash will be transported to a dump and covered with earth. Estimated obligations in 1977 for facilities to dispose of fly ash and bottom ash from the process steam plant required to meet pollution abatement standards are $190 thousand.

Facilities will be completed in 1977 for treatment of effluent from the process steam plant. Boiler water is treated with ion exchange resins. Wastes are produced from chemicals in boiler blowdown and in steam condensate when the exchange resins are regenerated. Estimated obligations in fiscal year 1977 are $42 thousand and total estimated cost is $68 thousand.

Facilities will be installed for treatment of sludge from the water plant in order to meet pollution abatement standards. Two settling ponds will be constructed. The sludge will flow to the ponds by gravity, clarified water will be discharged and settled solids will be removed and discarded as solid waste. Estimated obligations for the transition quarter are $16 thousand; for fiscal year 1977, $156 thousand; total cost is $200 thousand.

Equipment will be installed to remove potential pollutants, principally ammonia nitrogen, from liquid effluent resulting from ammonia production. Steam stripping to remove the ammonia from ammonia plant condensate will be used unless a more desirable ammonia recovery process is found. Transition quarter obligations are estimated to be $50 thousand; for fiscal year 1977, $200 thousand; and total cost is $310 thousand.

Means will be provided for removal of urea from liquid effluent resulting from urea solution production. Urea in the effluent will be hydrolyzed to ammonia, and the ammonia will be removed in a system similar to that used for treatment of the ammonia plant condensate. Transition quarter obligations are estimated to be $50 thousand; for fiscal year 1977, $150 thousand; and total cost is $255 thousand.

Environmental regulations for thermal pollution abatement require that process water discharged from the chemical plant in the future be cooled before release. Water discharges will be monitored, and cooling will be provided to meet standards. Facilities will be completed in fiscal year 1977. Estimated obligations for the transition quarter are $4 thousand and for fiscal year 1977, $1,362 thousand. The total cost is estimated at $1.4 million.

Facilities will be completed in 1977 for handling wet-process phosphoric acid to and from storage tanks. A total of eight storage tanks have been installed beginning in fiscal year 1973 replacing old leaky tanks. Estimated obligations in 1977 are $500 thousand.

Facilities will be installed in 1977 for improved treatment of sanitary waste from the TVA National Fertilizer Development Center. The facilities are required to comply with an executive order covering standards of waste treatment for government facilities. Estimated obligations in 1977 are $504 thousand and total estimated cost is $550 thousand.

Modifications will be made in 1977 to the facilities for production of UAN solution to eliminate a water pollution problem and meet abatement standards. Estimated obligations are $113 thousand.

Administrative and central services expenses for primary pollution abatement facilities are estimated to be $12 thousand for the transition quarter and $61 thousand for 1977.

Improvements and Additions to Production Facilities

	In Thousands		
	Total	Appropriations	Nonpower Proceeds
1975 actual	$1,341	$1,066	$275
1976 estimate	1,307	911	396
19TQ estimate	238	205	33
1977 estimate	575	575	-

Improvements to new prototype developmental production facilities are required to overcome problems and to increase efficiency in the large scaleup from pilot-plant during preliminary operations. Other improvements and additions are routinely necessary in a complex, multiproduct chemical plant to increase operating efficiency and reduce maintenance cost. The cost of such technological improvements is increasing. Estimated transition quarter obligations are $238 thousand and for fiscal year 1977, $575 thousand. Included for 1977 is $450 thousand for completing facilities for clarifying liquid fertilizer (11-37-0) produced from wet-process phosphoric acid.

Plant Replacements

	In Thousands		
	Total	Appropriations	Nonpower Proceeds
1975 actual	$380	$82	$298
1976 estimate	45	40	5
19TQ estimate	50	-	50
1977 estimate	306	306	-

In a plant the size, complexity, and age of the TVA chemical plant, facilities must often be replaced immediately to continue operations or to protect employee health and safety. Emergency replacements ordinarily cannot be anticipated as individual items.

An estimate of $250 thousand is included in 1977 for purchase of a set of replacement catalyst tubes which is a critical item in the ammonia plant. Sets of 56 catalyst tubes have failed twice in the last three years, causing prolonged shutdowns of the plant with adverse effect on fertilizer introduction and financial results. TVA has concluded that tubes with thicker walls will give extended service life. A set of tubes with thicker walls will be purchased so that prolonged shutdown will not occur should the tubes fail at a critical time, such as the autumn or spring fertilizer application period.

Failure of other essential equipment will occur but this cannot be identified in advance. Nevertheless, the equipment will have to be replaced.

General Equipment, Design Studies, and Administrative Expenses

	In Thousands		
	Total	Appropriations	Nonpower Proceeds
1975 actual	$547	$243	$304
1976 estimate	436	209	227
19TQ estimate	85	-	85
1977 estimate	471	471	-

This category includes continuing needs for uninstalled equipment and work tools, chemical and agronomic research laboratory equipment, transportation and rehabilitation of surplus property transferred to TVA at no cost from other Federal agencies, prefabricated metal building for research and development, and preliminary design studies for future chemical facilities.

The increasing age of the present inventory of plant work tools and equipment tends to result in decreased efficiency and safety problems if the tools and equipment are not updated. Routine replacements also are required as items wear out.

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In a research and development program which involves intensive technological studies, modern instruments and equipment are necessary. Use of the newest generation of instruments and equipment will help to maximize results from a technical staff of limited size. Routine replacement of small equipment also is required.

A prefabricated metal research and development building will be constructed to provide much needed space for applied research and process engineering technical staff. Existing facilities are already crowded and becoming more so as some employees are being added for important new projects. The crowded and antiquated appearance of present offices adversely affects recruitment of new engineers. A low-cost facility containing approximately 3,200 square feet will be constructed as an attachment to the northeast side of the Research and Engineering Building. Fiscal year obligations, representing total cost, are estimated at $102 thousand. This investment will provide an additional 14 offices, 2 restrooms, and an equipment room.

TVA uses surplus government property to the fullest extent possible. Transportation and rehabilitation are the only costs.

Preliminary design studies for future facilities define the scope and estimated cost of new fertilizer process demonstration units. Costs of usable portions of such studies are transferred to new projects when started and are capitalized.

FERTILIZER DEVELOPMENT
(OPERATING EXPENSES)

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Expenditures				
Fertilizer research and development	$6,331	$6,944	$1,791	$8,008
Fertilizer introduction	47,515	50,302	11,190	49,731
Total	53,846	57,246	12,981	57,739
Financing				
Appropriated funds	9,190	12,357	3,022	20,485
Nonpower proceeds	44,656	44,889	9,959	37,254
Total	53,846	57,246	12,981	57,739
Income from program	41,199	49,400	6,769	42,373

FERTILIZER RESEARCH AND DEVELOPMENT

	In Thousands
1975 actual	$6,331
1976 estimate	6,944
19TQ estimate	1,791
1977 estimate	8,008

The TVA National Fertilizer Development Center at Muscle Shoals, Alabama, is the Nation's major source of advanced fertilizer technology and the world's principal center for fertilizer research and development. TVA's research and development program is strongly mission oriented, involving basic and applied research and continued development of

promising new products and processes in pilot plants. Basic research provides the fundamental knowledge for new advances. Applied research carries the discovery process through laboratory-scale development and evaluation. Small pilot plants permit the solution of some process and equipment problems and provide sufficient material for initial agronomic evaluation.

TVA has a special interest in the preservation of a quality environment, both in the vicinity of plants making fertilizers and in the waters draining from fields to which fertilizer has been applied. This extends to such investigations as to what happens to fertilizer nitrogen and to heavy metals (zinc, chromium, and lead are examples) reaching soils as contaminants in fertilizers and in organic wastes, to the uptake of these metals by crops, and to their movement in surface and groundwater. Studies also involve ways of recovering sulfur, a raw material in the manufacture of fertilizer, from industrial emissions in which it is a pollutant.

The program generates a wide range of technical advances and inventions and every effort is made to move them into the economy rapidly. Research results are widely publicized, using a variety of ways to obtain a payoff to the national economy by transfer of technology from laboratory, pilot plant, greenhouse, and field test to commercial fertilizer plants and operating farms. TVA patents its discoveries where possible and issues nonexclusive licenses for their use. Articles in professional and trade journals, presentations at technical meetings and training sessions, and published reports keep the interested public informed. Through correspondence and informal discussions TVA assists technical and scientific inquirers all over the world. On-site research and development demonstrations introduce new products and processes. Fertilizer introduction through tests and demonstrations on practical farms and in commercial fertilizer plants throughout the country spreads the results of TVA research and development nationwide.

Basic Agronomic Research

	In Thousands
1975 actual	$1,126
1976 estimate	1,228
19TQ estimate	295
1977 estimate	1,304

Research on soil-plant-fertilizer relationships contributes new knowledge on the agronomic properties and behavior of fertilizers for specific soils, climate conditions, and crops. This helps set the stage for creation of improved fertilizer materials and more efficient use of fertilizers. Laboratory, greenhouse, lysimeter, and field studies are conducted at Muscle

Shoals. The work is extended through cooperative arrangements with selected land-grant universities throughout the Nation. Specific objectives are to:

1. Provide information for the development of new TVA fertilizers for specific crop and forest production needs.

2. Evaluate experimental TVA fertilizers as to their effectiveness on crops under different farming conditions.

3. Increase the efficiency of fertilizer use in crop production.

4. Investigate and solve plant nutrition problems.

5. Clarify the relationships between fertilizer use, crop plants, and water quality.

The scope of basic agronomic research will remain fairly stable in 1977. Emphasis will be on efficient use of phosphorus and nitrogen fertilizers under field conditions. Nitrogen isotopes produced by the Los Alamos Scientific Laboratory will be used to study methods of reducing nutrient losses to surface and groundwater. Other studies will be conducted to find solutions to problems associated with phosphate accumulations in agricultural soils.

The movement of toxic heavy metals into food plants and water supplies as influenced by fertilization practices will be investigated. Special fertility problems connected with minimum tillage cropping systems will be studied. Forest tree fertilization research will emphasize the development, evaluation, and efficient use of fertilizers for accelerated commercial timber production. The effects of fertilizer use on water quality will be studied in a 128-acre forested watershed. Fertilizers made with wet-process phosphoric acid produced from low-grade rock will be evaluated more fully with respect to their contents of micronutrients and heavy metals.

Field, laboratory, greenhouse, and lysimeter studies will continue to help determine fundamental relationships among crop response, nutrient uptake, and fertilizer and soil characteristics. This research is concerned with micro and secondary nutrients as well as with the primary nutrients nitrogen, phosphorus, and potash.

Cooperative research will be continued at 10 to 12 locations, utilizing the expertise of university scientists. Preliminary work on the fertilization and management of high phosphorus and potassium soils will be concluded and reported. Basic studies to identify the various pathways that nitrogen follows in soil and plant use will continue, as will work with micronutrient carriers and new TVA fertilizer evaluation and development.

Chemical Fertilizer Research and Development

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Basic chemical research	$1,527	$1,877	$560	$2,336
Sulfur recovery research	178		-	-
Fertilizer processes research and development	3,500	3,839	936	4,368
Total	5,205	5,716	1,496	6,704
Income from program	22	-	-	-

The Nation depends almost exclusively on TVA to develop the new fertilizer technology required to maintain its position of world leadership in agricultural production. The following objectives of chemical research and development were formulated to lay the foundation for meeting the Nation's fertilizer technology needs:

1. To develop more efficient fertilizers and methods for their manufacture.

2. To encourage and assist in adoption of the new developments by industry with resultant saving to the farmer and increased supply of low-cost food for the consumer.

3. To produce new and improved fertilizers in quantities sufficient for testing of their efficiency in greenhouses and fields.

4. To develop and encourage the adoption by industry of improved manufacturing technology that lessens environmental pollution and conserves energy.

5. To develop fertilizer technology that does not require oil or natural gas for raw material or energy.

6. To study recovery of sulfur dioxide from stack gas with emphasis on means of integration of sulfur recovery and fertilizer processes.

The chemical fertilizer research and development program for the transition period will have the same objectives and major project items as for 1977. However, the project funding and manpower will be at the lower levels of 1976. Therefore, several of the major new projects, including coal gasification for ammonia and use of marginal grades of phosphate rock, will proceed at the slower pace budgeted for 1976.

Basic Chemical Research

Basic chemical research is needed to establish the foundation for new product and process breakthroughs. This includes exploratory research, obtaining necessary background theory for specific applied research, and measurements of physical and chemical properties of compounds related to fertilizer technology.

Major emphasis in 1977 will be on new fertilizer research and development projects. These new projects include (1) beneficiation of low or marginal grades of phosphate rock, (2) finding new means for fixation of nitrogen as fertilizer, and (3) development of improved slow- or controlled-release nitrogen and/or potassium fertilizers. Also, a significant amount of basic research effort will be for unstructured investigations of promising new ideas and theories.

The studies of beneficiation of marginal grades of phosphate rock will be the largest basic research project. Only about half the phosphate mined is recovered as product by today's methods, and the "best" deposits are being depleted rapidly. However, the country has large reserves of lower grade deposits—enough to last hundreds of years—if suitable technology were available. The objective of this work is to make better use of U.S. phosphate reserves, while also reducing pollution problems related to discarding of low-grade material as practiced with present technology. This work will be an extension of TVA's phosphate rock characterization studies which are recognized worldwide for excellence.

New nitrogen fixation investigations will include studies of both direct fixation of nitrogen from the air in fertilizer and improved means of hydrogen production for ammonia synthesis. The direct fixation project is viewed as a long-range effort. Hydrogen production studies will include improving the efficiency of electrolytic processes. About three-fourths of the total energy consumed in fertilizer manufacture is related to nitrogen fertilizer production. Therefore a breakthrough on this new technology would have a substantial impact on national energy savings.

Continuing studies of controlled-release fertilizers have the objective of improving the efficiency of fertilizer use. (At the present time only about half the applied fertilizer is utilized by the crop.) This will involve studies of materials coated to control the rate of nutrient release and also slowly soluble materials.

Further studies will be made of methods for practical and economical synthesis of ultra-high-analysis compounds of phosphorus and nitrogen that will constitute the next generation of fertilizer materials. Several such compounds have been prepared in the laboratory and evaluated in the greenhouse, but synthesis methods suitable for commercial production need to be developed.

Study will be continued on conditions affecting the precipitation of fluorine during the acidulation of phosphate rock to make wet-process phosphoric acid. The fluorine will be combined with other impurities and removed in an environmentally acceptable form. This would decrease pollution problems and also improve the quality of the product acid.

Basic research also will continue to provide support for other TVA organizations in solving special problems and in obtaining background scientific data.

Sulfur Recovery Research

In the future the U.S. will become increasingly dependent on recovered sulfur as its proportional output of mined sulfur declines. Therefore emphasis will be given to methods of recovery of stack gas sulfur in forms that are useful in the production of fertilizers and to the possibility of eliminating or sharing processing steps by integrating fertilizer production with sulfur recovery. Projects to be studied are listed below.

1. Exploratory research on scrubbing stack gas with phosphatic limestone to solubilize the limestone and leave beneficiated phosphate ore for fertilizer production.

2. Developmental studies of processes for production of elemental sulfur from stack gas scrubber solutions.

3. Small-scale studies of ammonium sulfate production and crystallization from ammonia scrubbing process solutions.

4. Exploratory studies to identify the simplest and most economical process for recovery of sulfur oxides as sulfuric acid suitable for fertilizer production.

5. Computer simulation of processes as a low-cost method to provide guidance on variables to be tested experimentally at laboratory and pilot-plant scale.

The major increase in basic research over 1976 is for acceleration of studies of use of marginal grades of phosphate rock. Other substantial increases are for exploratory research for new breakthroughs, direct fixation of nitrogen, and improving efficiency of fertilizer use.

Fertilizer Processes Research and Development

Developing technology for improving the utilization of low or marginal grade phosphate rock will be the number one research and development priority. This project will extend the useful life of this essential raw material (phosphate rock) and simultaneously alleviate an extremely serious environmental problem in phosphate mining and producing areas. A major phase of the work will include studies of efficient systems for upgrading the quality of the rock to make it more suitable for use in fertilizer production.

Work on production of wet-process phosphoric acid directly from the marginal grade phosphate rock also will receive increasing emphasis. During the 1980's about 80 percent of the U.S. phosphate fertilizer will be produced from wet-process acid intermediate. The quality of U.S. phosphate rock is steadily declining, making obvious the need for technology to use lower quality rock to produce the wet-process acid. TVA has many years of experience in basic wet-process acid technology and has been a major factor in development of the existing production systems.

A substantial amount of research and development remains to be completed to accomplish the plant changeover to wet-process phosphoric acid and urea-based products, but the proportion of total effort for this work is declining. Major project items in this category include (1) improving the quality of the ammonium phosphate suspension; (2) completing process development and design of a system for producing premium-quality, clear ammonium polyphosphate liquids from impure merchant-grade phosphoric acid; and (3) continuing construction of a plant for demonstration-scale production of sulfur-coated urea, a new fertilizer with controlled nitrogen release.

Continued effort will be concentrated on development of new fertilizer processes that utilize wet-process phosphoric acid or urea or combinations of the two materials because of their inherently favorable economics. Processes for improving the quality of the wet-process acid will be emphasized. Processing methods that avoid pollution and minimize energy consumption will be given high priority.

Large-scale pilot-plant studies of the urea polyphosphate process will be accelerated. This process involves treatment of low-quality merchant-grade wet-process acid with urea to crystallize relatively pure urea phosphate. The urea phosphate is separated and further processed into a high-grade intermediate that is especially suited for production of premium-quality liquid fertilizers.

Development of melt-type granulation processes will be continued with the objective of using reaction heat to evaporate water, thereby avoiding the drying step and conserving fuel. Novel types of granulation will be studied to define systems that minimize energy consumption and pollution.

Studies of less energy intensive means of granulation will be evaluated, including formation of ammonium polyphosphate solids. One promising process under study involves use of a simple, water-cooled belt to produce a flaked product from a melt. This system has been particularly efficient with ammonium polyphosphates which require relatively large amounts of energy for granulation.

Development of economical means for production of potassium phosphate products will continue to receive high priority. Potassium phosphates have several advantages over equivalent materials now marketed, including higher nutrient concentration, higher water solubility, lower salt index, chloride-free properties, and better suitability for bulk blending.

Processes and process modifications that minimize broad-based pollution problems will be emphasized, with priority on aqueous problems. More stringent Federal regulations for aqueous effluents will be enacted in 1977, and many commercial fertilizer plants will need to make process modifications to ensure compliance.

Studies of technology for production of nitrogen-phosphorous and nitrogen-phosphorous-potassium suspensions will be pursued. In some situations the suspension combinations have economic advantages over other types of fertilizers. Work on high-nitrogen suspension-type fertilizers will be continued. There is an apparent need for this type product in the U.S. fertilizer market, and none is available.

Other continuing work will include (1) evaluation of physical and chemical properties of new products and (2) preparation of isotope-tagged products for field studies of the fate of applied nutrients. Other experimental materials will be prepared for agronomic testing as needed.

The major increase in fertilizer processes research and development for 1977 is for expediting the work with low or marginal grades of phosphate rock that cannot be used in current technology. Other significant increases are for development of the urea polyphosphate process and a potassium phosphate system.

FERTILIZER INTRODUCTION

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Expenses				
Developmental production	$6,965	$527	$4,300	$6,458
Farm test demonstrations	1,341	1,369	265	1,471
Fertilizer industry demonstrations	39,209	48,406	6,625	41,802
Total	47,515	50,302	11,190	49,731
Financing				
Appropriated funds	2,859	5,413	1,231	12,477
Nonpower proceeds	44,656	44,889	9,959	37,254
Total	47,515	50,302	11,190	49,731
Income from program				
Developmental production	3,403	2,801	674	2,971
Farm test demonstrations	560	476	45	413
Fertilizer industry demonstrations	37,214	46,123	6,050	38,989
Total	41,177	49,400	6,769	42,373

Following the completion of research and development and technical demonstrations of fertilizer processes and production on a pilot-plant scale, fertilizer introduction requires two steps. The first is developmental production of the new fertilizers on a semicommercial scale. Pilot plants have low output and product cost is high. They are essential to research and development but are inadequate for assuring the transfer of research and development results into the economy. Prototype production supplies the quantities needed for the second step in fertilizer introduction–a nationwide educational program to carry the results of development to the land-grant universities, the fertilizer industry, and the American farmer. The educational program is made up of two basic components, farm test demonstrations and industry demonstrations.

Developmental Production

	In Thousands			
	1975 Actual	1976 Estimate	1-9TQ Estimate	1977 Estimate
Total expenditures for developmental production	$45,963	$48,274	$10,599	$47,061
Less materials transferred at market prices to educational programs	38,998	47,747	6,299	40,603
Net	6,965	527	4,300	6,458
Financing:				
From appropriations	-	2,237	436	8,606
From nonpower proceeds	6,965	-1,710	3,864	-2,148
Total	6,965	527	4,300	6,458

TVA experimental fertilizers are transferred at market prices from developmental production to farm test demonstrations and industry demonstrations for educational distribution. Sales through these introductory programs help to cover the cost of developmental production. However, TVA's costs are inherently higher than the cost of commercial products. There are many reasons for this—the costs of operating experimental plants are greater, the plants are smaller than commercial units, some facilities operate only part of the time, more time-consuming product switchovers are required; and the plants are not located near raw material sources. Planned program restructuring to use wet-process phosphoric acid as the only source of phosphate will help minimize developmental costs.

Objectives of developmental production are:

1. To demonstrate practicality and economics of more efficient fertilizer products and processes by scaling up from small pilot plant to semicommercial-scale operation.

2. To provide sufficient quantities of new and improved fertilizers for introduction through educational programs to industry and farmers.

Prototype-scale production of new fertilizers provides an essential link between fertilizer research and development and educational programs. The cycle of research and development, developmental production, field introduction, and phase-out of fertilizers in this national program continues. In 1974, new urea-based fertilizers entered the program. It is planned that highly concentrated phosphate-nitrogen combination fertilizers, both fluid and solid, will be fully converted by about 1978 to demonstrate the use of low-cost, wet-process phosphoric acid in their production as commercial sources of acid become available. Fiscal year 1977 will be a period of transition from use of thermal-process phosphoric acid to use of all wet-process acid. Wet-process phosphoric acid will be bought from industry. Total distribution of fertilizer materials in the transition period, which is in the fertilizer off-season, will be 50,025 tons, and for fiscal year 1977 it will be 305,399 tons.

Urea-ammonium phosphate (28-28-0) was produced and distributed for the first time in 1974. This is a high-analysis homogeneous fertilizer, not now commercially available, for which TVA has developed an efficient production process. Agronomic qualities are superior for many U.S. crops and are outstanding for rice. Introduction will contribute much to fertilizer technology and to farm efficiency, will help overcome the world food deficit, and likely will improve the U.S. position on the nitrogen fertilizer export market now dominated by other countries. Production of this fertilizer will be increased in steps to a level adequate for its introduction. Small quantities of fluid fertilizers also are produced incidental to solid urea-based fertilizer production.

Granular urea (45-0-0) is another new fertilizer made from the new "building block" urea, which has met needs for introduction of more efficient solid straight nitrogen fertilizer. This fertilizer was introduced in the program in 1974 and will be phased out in 1977.

Small quantities of solid 12-54-0 grade ammonium polyphosphate made from merchant-grade wet-process phosphoric acid and gaseous ammonia, the cheapest forms of acid and ammonia, were produced in 1975 and will be produced in 1976 and 1977. This will be done in equipment in the urea-based fertilizer production facilities.

In 1977, developmental production will be continued on a high-analysis ammonium phosphate suspension fertilizer (12-36-0) made from the lowest cost feed materials, ammonia and impure wet-process orthophosphoric acid. It is made in relatively simple and low-cost equipment. It should be a major breakthrough in lowering the cost of fertilizer to the farmer. It is low in cost, high in analysis, and is suitable for easy blending with other fertilizer ingredients.

Developmental production of liquid fertilizer 11-37-0 from thermal-process phosphoric acid will continue through the first part of 1977, as will solid ammonium polyphosphate 15-62-0. The liquid 11-37-0 also will be made from concentrated, impure wet-process phosphoric acid, mainly in the latter part of the year.

The following table lists the fertilizers to be distributed in fiscal year 1977.

Developmental Production 1977

	Year Introduced	Plant Nutrient Content (N-P-K)	1977 Distribution–Tons Fert. Intro.	Agri. Projs.	Other	Total
Ammonium polyphosphate	1967	15-62-0	5,502	-	-	5,502
Ammonium polyphosphate	1976	12-54-0	35,999	-	1	36,000
Liquid APP	1976	9-30-0	499	-	-	499
Liquid fertilizer	1959	11-37-0	70,713	-	-	70,713
Suspension fertilizer	1975	12-36-0	45,000	-	-	45,000
Suspension fertilizer	1976	8-24-0	1,800	-	-	1,800
Urea-ammonium phosphate	1974	28-28-0	39,801	198	1	40,000
Granular urea	1974	45-0-0	18,134	377	17	18,528
Fluid UAP	1976	18-9-0	6,412	-	-	6,412
UAN solution	1972	32-0-0	58,657	-	-	58,657
Custom blend fertilizers		Various	3,416	2,583	1	6,000
Other[1]		Various	1,035	163	2	1,200
Total fertilizers			286,968	3,321	22	290,311
Phosphoric acid[2]			-	-	7,038	7,038
Ammonia			-	-	300	300
Nitric acid[2]			-	-	7,750	7,750
Total intermediate products			-	-	15,088	15,088
Total all products			286,968	3,321	15,110	305,399

1. Granular superphosphate 0-46-0.
2. Tonnage expressed as 100 percent acid.

Farm Test Demonstrations

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Fertilizer materials	$664	$614	$64	$575
Educational activities	677	755	201	896
Total expense	1,341	1,369	265	1,471
Less farmer payments for fertilizer (nonpower proceeds)	555	476	45	413
Net expense financed from appropriations	786	893	220	1,058

	Number of Units		
	1975 Actual	1976 Estimate	1977 Estimate
Participating states and territories	32	33	37
Fertilizer trials and field demonstrations	653	618	902
Unit test demonstration farms	129	106	60
Fertilizer technology farms	19	50	63
TVA materials (tons)	4,274	3,734	3,988

Purpose and Objectives

The nationwide farm test demonstration program introduces new fertilizers to American farmers and promotes more efficient fertilizer use. This speeds the realization of benefits of TVA's research. It helps reduce the farmer's cost of producing food for the Nation's expanding population and increases his own purchasing power. More efficient fertilizer use also reduces the possibility of unfavorable environmental effects from fertilizer use. Objectives are to:

1. Investigate specific soil-fertilizer use problems of national importance.

2. Evaluate new TVA fertilizers under farm conditions.

3. Introduce new TVA fertilizers and fertilizer technology to the agricultural sector.

4. Improve fertilizer use efficiency for different farm production and management systems.

Program

The farm test demonstration program is a vital link between TVA, the state land-grant universities, and farmers to accomplish rapid evaluation and adoption of new and improved fertilizers and practices. TVA supplies limited amounts of new and experimental fertilizers for use in state agricultural programs jointly planned by TVA and the universities. Fertilizers for plot-size demonstrations are supplied without charge. Farmers pay about three-fourths of the market value for products used in field-size and whole-farm demonstrations. They bear all other farm costs and assume the risks involved in conducting the program.

Priorities in the test demonstration program are tuned to current conditions in American agriculture, the fertilizer industry, and in TVA's research and development and demonstration-scale production activities. For example, as new nitrogen fertilizer materials based on urea are being introduced, applied agronomic research is emphasized on test demonstration farms to ensure that reliable information is obtained on the new products. Less emphasis is placed on the demonstration approach because innovative farmers who produce most of the agricultural output are responsive to accurate reports of crop response and economic returns to improved fertilizer use.

Farm test demonstrations are conducted in a variety of ways. Small plots—usually one acre or less in size—are very useful for new product evaluation and introduction. Whole fields are used to introduce or evaluate a new TVA fertilizer in combination with all recommended practices for a crop or crop-livestock enterprise. This type program activity is useful in promoting forage fertilization to reduce the amount of grain needed for milk and beef production. Whole farms are used to obtain information for improving fertilizer use and efficiency. A limited number of farms carefully selected to be representative of groups of farms having common fertilizer use problems become centers of innovation. Application of cost/price data to reliable input-output information determines relative levels of profitable fertilizer use. The farms also provide information on fertilizer use practices that minimize adverse environmental effects.

More investigations and experiments will be conducted in 1977 on methods of improving fertilizer use efficiency. Benefits will occur in (1) reduced pressures on mineral and hydrocarbon reserves for fertilizer production and (2) protection and enhancement of the rural environment.

Fertilizer Industry Demonstrations

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Fertilizer	$37,728	$46,693	$6,170	$39,600
Educational activities	1,481	1,713	455	2,202
Total expense	39,209	48,406	6,625	41,802
Less distributor payments for fertilizer (nonpower proceeds)	37,136	46,123	6,050	38,989
Net expense financed from appropriations	2,073	2,283	575	2,813

The U.S. fertilizer industry—including fertilizer manufacturers, wholesale distributors, bulk blenders, and retail dealers—cooperates with TVA in the introduction of new TVA fertilizers to farmers. Also, TVA makes available to the fertilizer industry information on processes and techniques that reduce production costs of fertilizer, help reduce air and water pollution from fertilizer plants, lower energy requirements, and make better fertilizer products available to the farmer. The two main features of the program are:

1. Cooperating dealers provide farmers with information on the best fertilizer and fertilizer practices for the farmer's specific soil, climatic, and cropping conditions based on state land-grant university recommendations.

2. Fertilizer manufacturers conduct demonstrations in their plants to show how new TVA fertilizers and technology can be used to improve industry processes and products.

TVA fertilizers are provided to cooperators at prices slightly lower than costs of commercial products. This incentive encourages dealers to conduct fertilizer education programs and to provide extra services to farmers. Educational techniques used include farmer meetings, demonstration plots, field trips and schools, radio and television programs, and printed educational materials.

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TVA collects and maintains worldwide fertilizer production, consumption, and other marketing data, and makes supply-demand projections needed for its own use and to provide advice and assistance to other government agencies and the U.S. and world fertilizer industries. It develops computer application systems relating to optimum formulations, production planning, and order management to improve fertilizer marketing and distribution efficiency.

TVA provides process engineering assistance to all segments of the fertilizer industry on problems relating to increasing efficiency in fertilizer manufacture, distribution, application, and use. Help was provided to over 300 manufacturers in 40 states in 1975. Major emphasis is devoted to assisting small fertilizer companies in the control of water and air pollution in their plants, assisting in maintaining the quality of finished products, and developing formulations for more efficient operations to lower production cost. Some were helped to overcome dust problems in their plants and to increase production rates. Others were shown procedures for minimizing the use of energy. The application of new technology resulted in improved fertilizers, dollar savings, conservation of energy, and reduced pollution of the environment. Work was accomplished with plants of various sizes from the large basic producers in Florida to the small fertilizer mixing plants in major crop-growing areas. Considerable work was accomplished in the improvement of application equipment.

By 1985, over 1.8 billion tons of coal will be used annually for energy production. To utilize high-sulfur coal will require the removal of more than 20 million tons of sulfur per year. Marketing studies will be conducted to determine the impact of sulfur products from power plant sulfur oxide recovery processes on the traditional sulfur marketing system. Further, TVA will develop a national strategy for incorporating the recovered sulfur products in fertilizer manufacturing processes. This information will be extremely useful to both the utility and the fertilizer industries.

The program will be expanded in 1977 to provide more resources for the introduction and utilization of products based on wet-process phosphoric acid by industry cooperators who have been using production technology based on TVA furnace acid. Increased emphasis will be placed on improving efficiencies in the transportation, storage, and marketing of fertilizers, including an accelerated development of managerial information systems based on computer technology. Studies to assess the potential for cost reduction in fertilizer production from byproduct sulfur will be initiated.

POWER SUPPLY AND USE
(CAPITAL OUTLAY)

The TVA power program provides the Tennessee Valley region with an ample supply of electric power at the lowest feasible cost–a vital tool for social and economic development. The program requires: (1) facilities for producing electric power and delivering it to local distribution systems and to Federal and industrial establishments with large or unusual power requirements, and (2) efficient operation of these facilities. The power program discussed on the following pages is financed from power proceeds and from borrowings secured by future revenues.

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Generating capacity additions	$345,171	$1,037,509	$994,095	$925,978
Transmission system facilities	87,398	94,908	19,773	100,553
Land and land rights	18,315	95,571	25,185	94,843
Additions and improvements at power facilities	100,604	158,361	86,969	102,437
Nuclear fuel	39,134	80,063	8,300	48,319
Investigations for future power facilities	684	1,472	410	1,545
Total capital outlay	591,306	1,467,884	1,134,732	1,273,675

GENERATING CAPACITY ADDITIONS

Capital outlays during fiscal year 1977 for generating facilities to supply the expected future electric power requirements of the area served by TVA are estimated at $926.0 million. TVA system loads are estimated to increase from 18,633 MW in January 1975 to about 31,250 MW by the winter of 1981-1982 and to further increase to about 40,550 MW by the winter of 1986-1987. The rapid buildup of the Energy Research and Development Administration's power requirements, in addition to the continued growth in farm, home, and industrial use, accounts for these increases during this period. Nuclear generating facilities must be planned nine to ten years in advance of needs, and major construction expenditures must begin about six to seven years in advance of operating dates.

To meet the estimated increase in power requirements, the program for expanding power supply for the period fiscal year 1976 through fiscal year 1981 provides for an additional 10,326,960 kilowatts of nameplate capacity. An additional 13,136,000 kW is planned to meet the requirements through 1986.

The following table summarizes capacity, schedule, and financial data for the major generating capacity additions now scheduled to be made to the TVA power system.

	Fiscal Year Construction Started	Scheduled Commercial Service Date	Nameplate Capacity kW	Obligations (In Thousands) Actual to 6-30-75	Estimate 1976	19TQ	1977	To Complete	Total Cost
Cumberland Steam Plant units 1-2	1968	Mar. 1973 Nov. 1973	1,300,000 1,300,000	$424,110	$13,326	-	-	$-436	$437,000
Browns Ferry Nuclear Plant units 1-3	1967	Aug. 1974 Mar. 1975 June 1976	1,152,000 1,152,000 1,152,000	807,696	24,000	$1,500	$1,800	4	835,000
Sequoyah Nuclear Plant units 1-2	1970	Sept. 1977 May 1978	1,220,580 1,220,580	595,798	70,000	15,000	60,000	14,202	755,000
Raccoon Mountain Pumped-Storage Project units 1-4	1971	Feb. 1978 Apr. 1978 June 1978 Aug. 1978	382,500 382,500 382,500 382,500	196,122	38,548	8,402	34,398	22,530	300,000
Watts Bar Nuclear Plant units 1-2	1973	Nov. 1978 Aug. 1979	1,269,900 1,269,900	436,594	120,000	25,000	95,000	128,406	805,000
Bellefonte Nuclear Plant units 1-2[a]	1975	June 1980 Mar. 1981	1,332,000 1,332,000	309,460	140,000	55,000	150,000	345,540	1,000,000
Hartsville Nuclear Plant units 1-4[a]	1976	Dec. 1981 Dec. 1982 June 1982 June 1983	1,287,000 1,287,000 1,287,000 1,287,000	114,338	281,680	455,547	214,886	1,433,549	2,500,000
Phipps Bend Nuclear Plant units 1-2[a]	1977	Mar. 1983 Mar. 1984	1,287,000 1,287,000	8,835	176,356	230,208	106,816	1,077,785	1,600,000
Yellow Creek Nuclear Plant units 1-2[a]	1977	June 1983 June 1984	1,407,000 1,407,000	3,332	168,315	203,438	116,493	1,408,422	1,900,000
Additional Generating Capacity[b]	1980	Oct. 1985 Oct. 1986	1,300,000 1,300,000	-	-	-	146,585	2,053,415	2,200,000
Johnsonville Gas Turbine Plant units 1-16	1975	June 1975	1,088,000	92,725	2,820	-	-	-45	95,500
Gallatin Gas Turbine Plant units 1-4	1975	July 1975	325,200	31,536	2,464	-	-	-	34,000
Total obligations				3,020,546	1,037,509	994,095	925,978	6,483,372	12,461,500

a. Site is tentative pending completion of review of environmental impacts.
b. Undetermined location.

Power Exchanges

Seasonal exchanges of generating capacity between TVA and adjacent utilities will provide TVA with additional capacity during the winters when TVA's requirements are highest. The total of 2,060,000 kW of diversity exchange is considered by TVA to be firm generating capacity during the winter peak exchange period and a firm commitment for deliveries during the summer exchange period. This load-management technique serves to levelize the winter to summer peaks while saving a capacity installation on the TVA system and on each of the three neighboring systems that have such agreements with TVA.

Winter of	Firm Power Available from Other Utilities - kW			
	Mississippi Power & Light Company	Southern Services, Inc.	Illinois-Missouri Group	Total
1976-1977 and later years	1,500,000	300,000	260,000	2,060,000

Power Supply and Demand

With the installation of the generating units previously described, the interchange agreements with neighboring utilities, and reflecting the capacity retained by the Southeastern Power Administration from the Corps of Engineers hydroelectric projects on the Cumberland River, the relationships between expected system capacity and predicted power requirements in the winters of 1976-1977 through 1980-1981 are estimated to be as shown in the following table.

Winter of	Approximate System Dependable Capacity - kW	Presently Estimated Demands - kW		Available Margin	
		Total	Served by TVA Capacity	kW	Percent
1976-1977	26,483,000	22,550,000	20,490,000	5,993,000	29.2
1977-1978	27,631,000	24,400,000	22,340,000	5,291,000	23.7
1978-1979	31,241,000	26,500,000	24,440,000	6,801,000	27.8
1979-1980	32,418,000	28,300,000	26,240,000	6,178,000	23.5
1980-1981	33,631,000	29,800,000	27,740,000	5,891,000	21.2

The margins in the foregoing table reflect the difference between loads which TVA must serve and the dependable capacity available to supply these loads. To provide an acceptable degree of reliability, these margins must be adequate to allow for maintenance and emergency outages of generating capacity, reductions in hydro capacity due to adverse streamflow conditions, and unexpected variations in system loads.

CUMBERLAND STEAM PLANT–UNITS 1-2

	In Thousands
1975 actual	$15,332
1976 estimate	13,326
19TQ estimate	-
1977 estimate	-

Two coal-fired generating units totaling 2,600,000 kW capacity at the Cumberland site in middle Tennessee will be completed in 1976. This site is near Cumberland City in Stewart County about 50 miles northwest of Nashville, Tennessee. It is on the Barkley reservoir (Cumberland River) which serves as the source of cooling water.

On-site construction of the project began in March 1968. The first unit was placed in commercial operation on March 1, 1973, and the second unit on November 1, 1973. Major modifications required for optimum plant operation are scheduled for completion by June 1976.

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$424,110
Estimate for fiscal year 1976	13,326
Estimate for transition quarter	-
Estimate for fiscal year 1977	-
Estimate to complete	-436
Total	437,000

Cost Estimate. The estimated project cost of $437.0 million includes an increase of $2.0 million over the estimate reported in the Budget Program for 1976. The increase results primarily from a design decision to install longer wearing cast basalt lined coal piping in the pulverizer system and from higher than expected employee compensation benefit costs.

BROWNS FERRY NUCLEAR PLANT–UNITS 1-3

	In Thousands
1975 actual	$83,000
1976 estimate	24,000
19TQ estimate	1,500
1977 estimate	1,800

Three identical nuclear power generating units totaling 3,456,000 kW are being installed at Browns Ferry site in northern Alabama. This site, on the north bank of Wheeler reservoir in Limestone County, is about 10 miles northwest of Decatur and about 30 miles west of Huntsville. The General Electric Company is providing the fuel and major components (boiling water nuclear steam supply system, turbogenerator, and some of the auxiliary systems). TVA designs and supplies or constructs other plant facilities.

Construction of permanent structures was started in May 1967, following the granting of a construction permit by the Atomic Energy Commission for the first two units. License to build the third unit was issued on July 31, 1968, and construction on it was started August 1, 1968. Commercial operating dates for the three units were originally scheduled for October 1970, October 1971, and October 1972. Due to delays in equipment deliveries by the manufacturer, modifications in scope of project features, evolving requirements of AEC for environmental protection and engineered safeguards, stringent preoperational testing requirements, and other factors, units 1 and 2 were placed in commercial operation on August 1, 1974, and March 1, 1975, respectively, and unit 3 commercial operation has been rescheduled to June 1976. The five-month delay in commercial operation for unit 3 since the January 1975 President's budget is the indirect result of the March 22, 1975, fire damage to units 1 and 2, for which restoration and repair activities were coordinated with construction activities on unit 3 in such a way as to achieve the most productive overall schedule.

The plant includes a 500-kV switchyard. Auxiliary station service is supplied from the transmission system at 161-kV and is backed up by emergency diesel generators. Mechanical draft cooling towers are also included as part of the original construction program.

Plans for 1977

Estimated obligations of $1.8 million will be applied as follows:

	In Thousands
Completion of general yard improvements and architectural finishing work for various buildings	$768
Completion of modifications and adjustments to reactor and turbogenerator systems	1,877
Completion of accessory electric and miscellaneous power plant equipment installations	91
Completion of transmission plant equipment adjustments	31
Construction plant, equipment, and inventories (transfer of depreciation and use to work features)	-2,100
Construction supervision and services	395
General engineering and design	743
General administration	25
Changes in unpaid undelivered orders	-30
Total	1,800

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$807,696
Estimate for fiscal year 1976	24,000
Estimate for transition quarter	1,500
Estimate for fiscal year 1977	1,800
Estimate to complete	4
Total	835,000

Status of Construction

	Estimated Percent Complete June 30, 1976	September 30, 1976	September 30, 1977	Completion Date
Total project	99	99	100	June 1977
Land acquisition	100	100	100	June 1969
Structures and improvements	97	99	100	June 1977
Reactor plant equipment	97	98	100	December 1976
Turbogenerator units	99	99	100	December 1976
Transmission plant	99	99	100	December 1976

Cost Estimate. The estimated cost of $835.0 million includes an increase of $20.0 million over the estimate reported in the Budget Program for 1976. This increase results from (1) an additional 1.1 million craft labor man-hours ($9.8 million) and additional equipment, materials, and facilities ($1.8 million) required for continuing modifications and revisions necessary to meet NRC safeguard and quality assurance requirements; (2) additional interest during construction arising from schedule delays and higher estimate of project expenditures ($14.5 million); and (3) contingency reduction and other adjustments ($-6.1 million). The project completion date has been delayed by six montbs to June 1977.

SEQUOYAH NUCLEAR PLANT–UNITS 1-2

	In Thousands
1975 actual	$131,015
1976 estimate	70,000
19TQ estimate	15,000
1977 estimate	60,000

Two nuclear generating units with a total rating of 2,441,160 kW are being installed at the Sequoyah site in east Tennessee. This site is about 18 miles northeast of Chattanooga, Tennessee. It is on Chickamauga reservoir (Tennessee River) which will serve as the source of cooling water.

Construction of permanent structures began upon receipt of the Atomic Energy Commission permit May 27, 1970. The two units are scheduled for commercial operation in September 1977 and May 1978, respectively. These dates reflect delays of eight months each from the previously reported schedules due to late delivery of equipment and materials for critical work activities. The plant will be connected to the transmission system at 161 kV and 500 kV.

Plans for 1977

Estimated obligations of $60.0 million will be applied as follows:

	In Thousands
Substantially complete the reactor and turbine buildings and continuation of general yard improvements	$1,300
Substantially complete reactor plant equipment installations	6,200
Substantially complete turbogenerator and cooling water facilities installations	2,100
Substantially complete accessory electric, miscellaneous, and transmission equipment installations	2,900
Construction plant, equipment, and inventories (transfer of depreciation and use to work features)	-1,800
Interest capitalized during construction	46,300
Construction supervision and services	5,846
General engineering and design	3,400
General administration	238
Changes in unpaid undelivered orders	-6,484
Total	60,000

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$595,798
Estimate for fiscal year 1976	70,000
Estimate for transition quarter	15,000
Estimate for fiscal year 1977	60,000
Estimate to complete	14,202
Total	755,000

Status of Construction

	Estimated Percent Complete			Estimated Completion Date
	June 30, 1976	September 30, 1976	September 30, 1977	
Total project	80	85	95	May 1979
Land acquisition	100	100	100	June 1971
Structures and improvements	90	91	95	May 1979
Reactor plant equipment	75	80	95	May 1978
Turbogenerator units	80	82	95	May 1978
Transmission plant	93	93	95	November 1977

Cost Estimate. The estimated cost of $755.0 million includes an increase of $80.0 million over the estimate reported in the Budget Program for 1976. This increase results from major scope additions (including a full-flow demineralizer building and equipment and a deep water intake for the emergency raw cooling water system), construction schedule delays, and other factors as follows: (1) increased craft labor requirements due to scope additions, schedule slippage, backfitting requirements, and higher wage rates to be encountered in later time period ($31.7 million); (2) additional equipment and materials costs resulting from price escalation, design revisions, and scope additions ($15.9 million); (3) higher general costs due to prolonged construction supervision, support activities, and overheads ($10.9 million); (4) additional interest during construction due to higher project expenditures and delayed operation of the units ($40.0 million); and (5) reduction in the contingency allowance ($-18.5 million).

RACCOON MOUNTAIN PUMPED-STORAGE PROJECT

	In Thousands
1975 actual	$50,929
1976 estimate	38,548
19TQ estimate	8,402
1977 estimate	34,398

Four identical reversible pump-turbine hydroelectric generating units totaling about 1,530,000-kW capacity are being installed at the Raccoon Mountain site, about six miles west of downtown Chattanooga, Tennessee. The plant is on the east bank of the Nickajack reservoir which will serve as the tailpond for Raccoon Mountain discharges. Construction began in July 1970.

The construction schedule has been delayed 26 months from the schedule reported in the Budget Program for 1976 due to scroll case failures during hydrostatic testing. Subsequently, it was decided that the scroll case stay rings for all four pump-turbines must be remanufactured because of serious metallurgical deficiencies. The first unit is scheduled for commercial operation in February 1978 and the other three units are scheduled to follow at two-month intervals.

Plans for 1977

Estimated obligations of $34.4 million will be applied as follows:

	In Thousands
Continue construction of power plant chamber, general yard improvements, and visitors building	$3,000
Complete road across main dam	400
Substantially complete construction of water conductors	1,200
Begin installation of pump/turbines and motor/generators and continue installation of accessory equipment	7,300
Continue transmission plant installations	4,100
Construction plant, equipment, and inventories (transfer of depreciation and use to work features)	-1,200
Interest capitalized during construction	16,200
Construction supervision and services	3,626
General engineering and design	1,000
General administration	110
Changes in unpaid undelivered orders	-1,338
Total	34,398

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$196,122
Estimate for fiscal year 1976	38,548
Estimate for transition quarter	8,402
Estimate for fiscal year 1977	34,398
Estimate to complete	22,530
Total	300,000

Status of Construction

	Estimated Percent Complete			Completion Date
	June 30, 1976	September 30, 1976	September 30, 1977	
Total project	80	82	90	May 1979
Land acquisition	100	100	100	June 1975
Powerhouse	75	77	85	May 1979
Dam	97	97	99	December 1977
Generating/pumping units and accessory equipment	50	55	75	August 1978
Transmission plant	70	75	90	June 1978

Cost Estimate. The estimated project cost of $300.0 million includes an increase of $60.0 million over the estimate reported in the Budget Program for 1976. The construction schedule has been extended 26 months because four key scroll case assemblies for the pump-turbines are defective and must be remanufactured. Increases resulting from this delay and other factors are as follows: (1) Increased craft labor requirements due to inefficiencies imposed by the rescheduling of remaining work and higher wage rates to be encountered in later years ($10.9 million); (2) additional construction materials, higher construction equipment usage charges, and prolonged use of construction facilities ($12.7 million); (3) additional interest during construction due to higher project expenditures and delayed operation of the unit ($37.0 million); and (4) contingency and other adjustments ($-0.6 million).

WATTS BAR NUCLEAR PLANT–UNITS 1-2

	In Thousands
1975 actual	$123,851
1976 estimate	120,000
19TQ estimate	25,000
1977 estimate	95,000

Two nuclear generating units with a total rating of 2,539,800 kW are being installed at the Watts Bar site near Spring City, Tennessee. Preliminary on-site work began in December 1972 and full-scale construction began following the granting of a construction permit by AEC on January 23, 1973. The two units are scheduled for commercial operation in November 1978 and August 1979 which is the same schedule reported in the Budget Program for 1976.

Plans for 1977

Estimated obligations of $95.0 million will be applied as follows:

	In Thousands
Continue construction of control, auxiliary, and turbine buildings; service buildings	$13,500
Continuation of contract payments and installation of reactor equipment	32,500
Substantially complete work on the circulating water systems and cooling towers; equipment contract payments; continue turbogenerator erection	6,500
Continuation of installation of accessory electric and miscellaneous equipment	8,200
Continuation of transmission plant construction	1,800
Construction plant, equipment, and inventories (transfer of depreciation and use to work features)	-5,100
Interest capitalized during construction	41,000
Construction supervision and services	13,263
General engineering and design	7,000
General administration	594
Changes in unpaid undelivered orders	-24,257
Total	95,000

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$436,594
Estimate for fiscal year 1976	120,000
Estimate for transition quarter	25,000
Estimate for fiscal year 1977	95,000
Estimate to complete	128,406
Total	805,000

Status of Construction

	Estimated Percent Complete			Completion Date
	June 30, 1975	September 30, 1976	September 30, 1977	
Total project	45	50	75	June 1980
Land acquisition	100	100	100	June 1973
Structures and improvements	50	55	80	June 1980
Reactor plant equipment	40	45	70	August 1979
Turbogenerator units	30	35	65	August 1979
Transmission plant	50	60	90	March 1979

Cost Estimate. The estimated project cost of $805.0 million is unchanged from that reported in the Budget Program for 1976.

BELLEFONTE NUCLEAR PLANT—UNITS 1-2

	In Thousands
1975 actual	$122,810
1976 estimate	140,000
19TQ estimate	55,000
1977 estimate	150,000

Two nuclear fueled generating units with a total rating of approximately 2,664,000 kW are being installed at the Bellefonte site in northern Alabama, about seven miles northeast of Scottsboro. The site is on the Guntersville reservoir which will serve as the source of cooling water.

Construction of permanent structures began upon receipt of the Nuclear Regulatory Commission permit December 24, 1974. The two units are scheduled for commercial operation in June 1980 and March 1981. These dates reflect delays of 6 months each from the schedules reported in the Budget Program for 1976. The delays are necessary to avoid nonoptimum peaking of construction manpower in critical crafts during the construction period.

Plans for 1977

Estimated obligations of $150.0 million will be applied as follows:

	In Thousands
Continue construction of reactor, auxiliary, control, turbine, and service buildings	$37,900
Continuation of progress payments and installation of reactor equipment	48,200
Continuation of progress payments on turbogenerators and construction of cooling towers; begin erection of turbogenerators	26,300
Continue contract payments and begin installation of accessory electric and miscellaneous equipment	18,400
Continue construction of transmission plant	7,700
Construction plant and equipment	4,300
Interest capitalized during construction	34,000
Construction supervision and services	14,843
General engineering and design	13,000
General administration	1,250
Changes in unpaid undelivered orders	-55,893
Total	150,000

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Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$309,460
Estimate for fiscal year 1976	140,000
Estimate for transition quarter	55,000
Estimate for fiscal year 1977	150,000
Estimate to complete	345,540
Total	1,000,000

Status of Construction

	Estimated Percent Complete			Completion Date
	June 30, 1976	September 30, 1976	September 30, 1977	
Total project	15	20	45	March 1982
Structures and improvements	20	25	50	March 1982
Reactor plant equipment	5	7	25	March 1981
Turbogenerator units	-	2	15	March 1981
Transmission plant	5	7	30	September 1980

Cost Estimate. The estimated project cost of $1.0 billion is unchanged from that reported in the Budget Program for 1976 and is based on operating dates reported in that program. The construction schedule has tentatively been delayed six months; however, the estimate has not been revised pending establishment of a firmer schedule and further appraisal of future price escalation and interest rate assumptions.

HARTSVILLE NUCLEAR PLANT–UNITS 1-4

	In Thousands
1975 actual	$-263,559
1976 estimate	281,680
19TQ estimate	455,547
1977 estimate	214,886

Four nuclear fueled generating units with a total rating of 5,148,000 kW are proposed to be installed for commercial operation in December 1981, December 1982, June 1982, and June 1983, respectively. This schedule reflects delays of 12 months for each unit from the schedule reported in the Budget Program for 1976, primarily because of expected delays in receipt of construction permits from the Nuclear Regulatory Commission. The site is located on Old Hickory reservoir about 10 miles northwest of Carthage, Tennessee. Contracts have been awarded for the nuclear steam supply systems and for the turbogenerator units. The final environmental statement has been issued and construction is expected to begin during fiscal year 1976 upon receipt of a permit from the NRC.

Plans for 1977

Estimated obligations of $214.9 million will be applied as follows:

	In Thousands
Continue concreting for the reactor, auxiliary, control, office, and turbine buildings	$104,000
Continue progress payments and begin installation of reactor equipment	64,000
Begin progress payments on turbogenerator equipment and continue construction of circulating water facilities	25,600
Continue contract payments for accessory electric equipment	7,700
Continue contract payments and begin construction of transmission plant	12,800
Construction plant, equipment, and inventories	2,100
Interest capitalized during construction	19,000
Construction supervision and services	20,611
General engineering and design	19,000
General administration	1,675
Change in unpaid undelivered orders	-61,600
Total	214,886

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$114,338
Estimate for fiscal year 1976	281,680
Estimate for transition quarter	455,547
Estimate for fiscal year 1977	214,886
Estimate to complete	1,433,549
Total	2,500,000

Status of Construction

	Estimated Percent Complete			Completion Date
	June 30, 1976	September 30, 1976	September 30, 1977	
Total project	1	2	10	June 1984
Structures and improvements	-	5	35	June 1984
Reactor equipment	-	-	5	June 1983
Turbogenerator equipment	-	-	-	June 1983
Transmission plant	-	-	5	December 1982

Cost Estimate. The estimated project cost of $2.5 billion is unchanged from that reported in the Budget Program for 1976 and is based on operating dates reported in that program. The construction shcedule has tentatively been delayed by 12 months; however, the estimate has not been revised pending establishment of a firmer schedule and further appraisal of future price escalation and interest rate assumptions.

PHIPPS BEND NUCLEAR PLANT--UNITS 1 AND 2

	In Thousands
1975 actual	$8,373
1976 estimate	176,356
19TQ estimate	230,208
1977 estimate	106,816

Two nuclear fueled generating units with a total rating of approximately 2,574,000 kW are to be installed for commercial operation in March 1983 and March 1984. A possible site is at Phipps Bend located on the Cherokee reservoir near Surgoinsville, Tennessee. Environmental analyses necessary for final site determination are in process. Contracts have been awarded for the nuclear steam supply systems and for the turbogenerator units. Construction is scheduled to begin in fiscal year 1977 upon receipt of a permit from the Nuclear Regulatory Commission.

Plans for 1977

Estimated obligations of $106.8 million will be applied as follows:

	In Thousands
Begin mobilization and erection of construction plant facilities	$2,000
Continue progress payments on containment vessels and begin excavation and concreting for structures	12,400
Continue progress payments for reactor equipment	26,500
Interest capitalized during construction	4,200
Construction supervision and services	4,866
General engineering and design	9,300
General administration	350
Changes in unpaid undelivered orders	47,200
Total	106,816

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$8,835
Estimate for fiscal year 1976	176,356
Estimate for transition quarter	230,208
Estimate for fiscal year 1977	106,816
Estimate to complete	1,077,785
Total	1,600,000

Status of Construction

	Estimated Percent Complete			Completion Date
	June 30, 1976	September 30, 1976	September 30, 1977	
Total project	-	-	2	March 1985
Structures and improvements	-	-	1	March 1985
Reactor equipment	-	-	-	March 1984

Cost Estimate. The estimated project cost of $1.6 billion is unchanged from that reported in the Budget Program for 1976, as a part of additional nuclear generating capacity, and is based on operating dates reported in that program. The construction schedule has tentatively been delayed by 11 months due primarily to expected delays in receipt of construction permits from the Nuclear Regulatory Commission. However, the estimate has not been revised pending establishment of a firmer schedule and further appraisal of future price escalation and interest rate assumptions.

YELLOW CREEK NUCLEAR PLANT–UNITS 1-2

	In Thousands
1975 actual	$2,620
1976 estimate	168,315
19TQ estimate	203,438
1977 estimate	116,493

Two nuclear fueled generating units with a total rating of approximately 2,814,000 kW are to be installed for commercial operation in June 1983 and June 1984. A possible site is Yellow Creek on the Pickwick reservoir about 15 miles east of Corinth, Mississippi. Environmental analyses necessary for final site determination are in process. A contract has been awarded for the nuclear steam supply systems, and award of a contract for the turbogenerator units is planned for 1976. On-site construction is scheduled to begin in 1977 upon receipt of a permit from the Nuclear Regulatory Commission.

Plans for 1977

The estimated obligations of $116.5 million will be applied as follows:

	In Thousands
Begin mobilization and erection of construction plant facilities	$3,400
Begin excavation for structures	5,000
Continue progress payments for reactor equipment	13,000
Interest capitalized during construction	2,450
Construction supervision and services	1,593
General engineering and design	15,800
General administration	250
Changes in unpaid undelivered orders	75,000
Total	116,493

Summarized Financial Data

	In Thousands
Actual to June 30, 1975	$3,332
Estimate for fiscal year 1976	168,315
Estimate for transition quarter	203,438
Estimate for fiscal year 1977	116,493
Estimate to complete	1,408,422
Total	1,900,000

Status of Construction

	Estimated Percent Complete			Completion Date
	June 30, 1976	September 30, 1976	September 30, 1977	
Total project	-	-	1	June 1985
Structures and improvements	-	-	1	June 1985
Reactor equipment	-	-	-	June 1984

Cost Estimate. The estimated project cost of $1.9 billion is unchanged from the estimate included in the Budget Program for 1976 as part of additional nuclear generating capacity.

ADDITIONAL GENERATING CAPACITY

	In Thousands
1975 actual	-
1976 estimate	-
19TQ estimate	-
1977 estimate	$146,585

Additional generating capacity of approximately 2,600,000 kW is planned to meet forecasts of load requirements for 1985 and 1986. The planning and design will be under way in fiscal year 1977 with orders for steam supply systems and for turbogenerator units to be placed in fiscal years 1977 and 1978, respectively. On-site construction is tentatively scheduled to start in fiscal year 1980.

The tentative estimated cost of this additional capacity is $2.2 billion which includes an increase of $200.0 million over the estimate included in the Budget Program for 1976, as a part of additional nuclear generating capacity. The operating dates have been delayed by 24 months to reflect revised forecasts of future power loads, and the estimate includes an allowance for higher prices expected to prevail during the deferred construction period.

GAS TURBINE PLANTS

	In Thousands	
	Johnsonville Gas Turbine Plant Units 1-16	Gallatin Gas Turbine Plant Units 1-4
Actual obligations to 6-30-74	$53,461	-
1975 actual	39,264	$31,536
1976 estimate	2,820	2,464
19TQ estimate	-	-
1977 estimate	-	-
Estimate to complete	-45	-
Total	95,500	34,000
Generating capacity	1,088,000 kW	325,200 kW

Additional generating capacity of 1,413,200 kW has been provided by gas turbine unit installations at the existing Johnsonville and Gallatin steam plants. The units were accepted for commercial operation in June and July 1975, respectively. The estimates shown for 1976 provide for final contract payments and cleanup items. The total estimated cost of the two installations is $129.5 million, a decrease of $7.5 million under the estimate reported in the Budget Program for 1976.

TRANSMISSION SYSTEM FACILITIES

	In Thousands
1975 actual	$87,398
1976 estimate	94,908
19TQ estimate	19,773
1977 estimate	100,553

TVA energy sales, excluding sales to Federal agencies, are expected to increase from 101.1 billion kWh in 1977 to 168.9 billion kWh in 1985, an average annual increase of about 6-1/2 percent. Sales to Federal agencies are expected to increase from 27.7 billion kWh in 1977 to 40.8 billion kWh in 1985, an average annual rate of about 5 percent.

To supply the increasing electric energy requirements, TVA is expanding its extensive networks of extra high voltage (500-kV) transmission facilities and supplementing its lower voltage network. The extension and reinforcement of the transmission network will connect new generating plants into the system, improve reliability of power supply to growing area loads, and maintain system efficiency. New interconnections with neighboring utilities will provide improved system stability and economy by limiting the need for additional capacity. Delivery of power to ultimate consumers, except for a few directly served industrial and Federal agency customers, is accomplished over distribution systems owned and operated by the municipalities and cooperatives which TVA serves.

The selection of voltage levels for a complex transmission system such as TVA's is a function of the quantities of power to be transmitted, the distance of transmission, and cost. The essential function of transmission substations is to change the voltage level by means of transformers to properly match the voltage to the particular transmission functions required, or to a level suitable for delivery to a customer. The higher the voltage at which electric power is transmitted, the less the energy waste in the transmission process. However, higher voltage transmission demands greater initial investment for individual power lines and substations, but in relation to the lower voltage facilities which would otherwise be required, high voltage systems produce overall economies.

Capacity for load growth in the distributors' service areas will be provided at some locations by the installation of higher rated equipment in existing subtransmission substations. Transformer changes and equipment improvements will be initiated at eight locations, will continue at one location, and be completed at ten locations in fiscal year 1977. These changes will require expenditures of $2.2 million in fiscal year 1977.

To further increase delivery of power for the growing loads, subtransmission lines are uprated through installation of larger conductors. The uprating of a subtransmission line will be initiated in fiscal year 1977 requiring $805 thousand.

Primary Transmission System Facilities

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
500-kV facilities	$22,532	$56,940	$11,310	$56,250
161-kV facilities	24,262	11,805	1,720	18,655
Total	46,794	68,745	13,030	74,905

500-kV Facilities

At the end of fiscal year 1975, a total of 1,530 miles of 500-kV transmission lines were in service. The acquisition of rights of way or construction will start on about 257 miles of transmission lines during fiscal year 1976 and 19TQ, and 911 miles in fiscal year 1977. The program for fiscal year 1977 requires $51.4 million to continue work on various projects including $14.5 million for the Roane, Tennessee, 500-kV substation; $12.6 million for the Volunteer, Tennessee, 500-kV substation; $10.4 million for the installation of 500-kV facilities at the Shawnee Steam Plant; $6.9 million for the Shelby, Tennessee, 500-kV substation; $5.5 million for the transmission line connections to the Watts Bar Nuclear Plant; $1.0 million for the transmission line connections to the Hartsville Nuclear Plant; $450 thousand for the transmission line connections to the Bellefonte Nuclear Plant; and $50 thousand for the installation of 161-kV shunt capacitors at the Cordova, Tennessee, 500-kV substation.

The program also includes $4.9 million for new starts during fiscal year 1977. They are the Browns Ferry-Union-Cordova, Maury-Shelby, and West Point-Miller transmission lines; the Murphy Hill, Alabama, Union, Mississippi and Montgomery, Tennessee, 500-kV substations; increasing the capacity of the Sullivan, Tennessee, 500-kV substation; installing 161-kV shunt capacitors at the Weakley, Tennessee, 500-kV substation; and installing fast-switching facilities at the West Point, Mississippi, and Wilson, Tennessee, 500-kV substations.

161-kV Facilities

To meet the growing demand for power in the TVA service area, $5.2 million is required in fiscal year 1977 for construction of additional 161-kV lines. As loads grow, the capacities of transmission lines supplying substations are approached. In other instances there are risks that, if for some reason one supply line was temporarily out of service, the capacity of an alternate line would be exceeded. As these circumstances develop, new 161-kV connections are provided to insure adequate supply and reliability. Of the 14 lines under construction during fiscal year 1977, four will be completed and placed in service, and work will continue on the remaining 10 lines.

The program includes $9.3 million for additional 161-kV substations and connections in fiscal year 1977 to provide additional stepdown facilities for supplying the subtransmission system and serving new delivery points. Eight new substations will be started during fiscal year 1977, two substations under construction in fiscal year 1977 will be completed, and work will continue on five.

Plans also provide $4.0 million to initiate or continue capacity increases and improve service facilities at eight substations during fiscal year 1977. Similar work currently underway at three substations will be completed during fiscal year 1977.

Planning studies point to the need for additional new primary substations throughout the service area, and $140 thousand will provide for survey and acquisition of two sites and related transmission line rights of way during fiscal year 1977.

Subtransmission System Facilities

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
69-kV and 46-kV lines, substations, and improvements	$5,367	$5,485	$1,220	$4,015

When load growth in a distributor's service area approaches the capacity of its 13-kV or 26-kV service lines, joint studies are undertaken to determine the appropriate location for a new 69-kV or 46-kV substation to provide adequate and economical power supply.

To strengthen or add to the power supply to distributors and directly served industrial power users, work will be started in fiscal year 1977 on three new subtransmission lines and work started in prior years will be completed on one other line. Also, construction of seven new subtransmission substations will begin in fiscal year 1977 with work being completed on two other similar substations started in prior years. Work on these lines and substations will require $990 thousand in fiscal year 1977.

Communication Facilities

	In Thousands
1975 actual	$441
1976 estimate	3,710
19TQ estimate	1,105
1977 estimate	2,045

The reliability of the electric energy supply of a power system is dependent upon the effectiveness of the communication network which controls it. TVA power facilities are located in an area embracing portions of seven states and the extensive area served requires a similarly extensive communication network. A communication network consisting of voice dispatching, power-flow telemetering, protective relaying, and supervisory control circuits must extend into the far reaches of the system to provide dependable and uninterrupted transmission of voice and electronic signals between central and area dispatching and operating locations and the generating plants, substations, and operating and maintenance personnel. At the close of fiscal year 1975, TVA had in operation 62 generating plants, 644 substations, 16,762 miles of transmission lines, and numerous interconnections with other utility systems. Constant expansion and improvement to the communication system is required as new substations, transmission lines, generating plants or units, and remote or supervisory control installations are added to the system. Installation will continue during fiscal year 1977 on a Power System Area Dispatching and Control Plan which will lead eventually to automatic control of all major substations and many generating plants from five area dispatching offices. This program will further increase power supply reliability by reducing human error to a minimum. The budget program includes $2.0 million in fiscal year 1977 for communication facilities.

Rehabilitation and Replacements of 69-kV and 46-kV Facilities and Miscellaneous Additions and Improvements

	In Thousands
1975 actual	$7,411
1976 estimate	10,035
19TQ estimate	2,830
1977 estimate	7,465

Replacement of transmission system facilities must continually be made following equipment failures, accidents, storm damage, and minor necessary equipment changes. This work is estimated to require $7.5 million in fiscal year 1977, including $3.9 million for miscellaneous minor replacements and improvements.

Installation of capacitors provides reactive power to improve voltage and increase the load-carrying capacity of transmission and subtransmission lines. Such installations often permit deferring for a time replacement of lines or adding transformer capacity at substations. Terms of the current standard wholesale power contract include a provision for holding delivery voltage to closer tolerance than in past years. To meet this contract requirement, installation of capacitors and voltage regulating equipment will continue for a number of years, requiring $1.5 million in fiscal year 1977.

TVA maintains a central service shop at Muscle Shoals and smaller repair facilities at numerous field locations where generating plant equipment, transformers, oil circuit breakers, and other power equipment are repaired and overhauled. A central electric and chemical laboratory at Chattanooga is used for testing and maintaining metering and electronic equipment and for performing chemical analyses and research on various materials. Shop and laboratory work requires a great variety of tools, operating equipment, specialized meters, and testing devices. To provide new and replacement items for the shops and laboratory, $560 thousand is required in fiscal year 1977.

At many locations power maintenance, construction, and stores personnel are quartered in obsolete buildings acquired years ago, or in rented facilities. Some of these facilities are unsatisfactory. Space for special mobile equipment is restricted, space for outdoor storage of bulky materials and supplies is limited, and indoor provisions for shops, stores items, tools, and equipment are inadequate. An improvement program was started some years ago and several new power service centers have been completed providing adequate office, shop, and storage space at various locations in the service area. New power service centers at Russellville, Kentucky; Philadelphia, Mississippi; and Scottsboro, Alabama; are expected to be completed in fiscal year 1976 along with initial design and construction of new power service centers at Columbia and Murfreesboro, Tennessee. Plans for fiscal year 1977 included the completion of the Columbia and Murfreesboro power service

centers. In addition, work continues on new power service centers for Cleveland, Morristown, and Winchester, Tennessee, and for a fire protection system at the Wilson power service shops. Work in this category will require $1.4 million in fiscal year 1977.

SUMMARY OF TRANSMISSION LINES IN SERVICE

	End of Fiscal Year			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Transmission lines (circuit miles):				
500 kilovolts	1,530	1,668	1,668	1,712
345 kilovolts	2	2	2	2
230 kilovolts	30	30	30	30
161 kilovolts	8,802	8,958	8,966	9,011
115 kilovolts	165	165	165	165
69 kilovolts	3,466	3,506	3,506	3,548
46 kilovolts	2,634	2,659	2,669	2,622
13 kilovolts	133	121	121	105
Total transmission lines (circuit miles)	16,762	17,109	17,127	17,195

SUMMARY OF TRANSMISSION SYSTEM FACILITIES[1]

	In Thousands					
	Actual to 6-30-75	Estimate 1976	19TQ	1977	To Complete	Total Cost
Primary transmission system facilities:						
500-kV facilities	$34,580	$56,940	$11,310	$56,250	$288,195	$447,275
161-kV lines	3,262	3,040	875	5,195	7,170	19,542
161-kV substations and connections	5,244	7,000	780	9,285	7,480	29,789
Capacity increases and changes at existing primary substations	5,545	1,355	60	4,035	5,370	16,365
Substation sites and transmission right of way for future use	81	410	5	140	55	691
Total	48,712	68,745	13,030	74,905	308,270	513,662
Subtransmission facilities:						
69-kV and 46-kV lines and substations	2,761	3,890	420	990	3,435	11,496
Capacity increases at existing subtransmission substations	1,170	1,425	710	2,220	1,130	6,655
Major rebuilding of existing subtransmission facilities	107	170	90	805	75	1,247
Total	4,038	5,485	1,220	4,015	4,640	19,398
Communication facilities	197	3,710	1,105	2,045	2,900	9,957
Rehabilitation and replacements of 69-kV and 46-kV facilities and miscellaneous additions and improvements:						
Minor line and substation replacements and improvements	1,215	5,495	560	3,930	10	11,210
Capacitor installations and low-voltage switches for service points	46	1,245	1,445	1,535	15	4,286
Tools and operating equipment	17	1,510	315	560	-	2,402
Power service centers, general buildings for construction and operating forces, and related equipment	6,133	1,785	510	1,440	425	10,293
Total	7,411	10,035	2,830	7,465	450	28,191
Total transmission facilities-direct	60,358	87,975	18,185	88,430	316,260	571,208
Engineering, design, and general expenses		5,335	1,370	5,605		
Distribution of administrative and general expenses		1,195	338	1,353		
Total expenditures		94,505	19,893	95,388		
Changes in unpaid undelivered orders		403	-120	5,165		
Total obligations		94,908	19,773	100,553		

1. Actual expenditures to June 30, 1975, estimated expenditures to complete, and total cost estimates relate only to facilities on which work is planned to be done during the period from July 1, 1975, through September 30, 1977.

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LAND AND LAND RIGHTS

	In Thousands
1975 actual	$18,315
1976 estimate	95,571
19TQ estimate	25,185
1977 estimate	94,843

Land and Rights for Future Fuel Supplies

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Coal land and rights	$-201	$73,994	$19,926	$74,690
Uranium mineral rights	16,890	17,826	4,508	17,150
Total	16,689	91,820	24,434	91,840

The coal shortage which threatened the TVA power supply in fiscal year 1975 highlighted how dependent our way of life is upon an adequate supply of electricity. Jobs and the availability and price of almost everything we purchase to sustain or improve our lives are dependent in one way or another upon both the availability and cost of electricity. In the TVA power service region the availability and cost of electricity are determined to a large degree by the availability and cost of coal. Seventy-five to eighty percent of TVA's electricity is generated from coal.

In order to ensure adequate, economical, and continuing coal supplies for its coal-fired steam plants, TVA began acquiring coal reserves in 1961 because TVA would continue to use coal for power generation for years to come, the use of coal by neighboring utility systems and others would increase substantially, and the supply of coal had not kept pace with the increased demand. The rate at which these reserves are developed by mining companies depends on the availability from the mining industry of coal in sufficient quantities and at reasonable prices to meet TVA's requirements.

In addition to the coal-fired plants, TVA now has seven nuclear power plants under construction or in the planning stage for operation by the middle 1980's, including one nuclear plant of three units in operation by the lattet part of fiscal year 1976. Initial fuel supplies and (in some cases) fuel for several years' operation are on order. Long-term fuel requirements for these plants ultimately will require five to six million pounds of uranium concentrates annually. Therefore to help assure future nuclear fuel supplies, TVA is buying interests in uranium properties and contracting for exploration of properties involved, the properties having proved and inferred reserves. TVA will have rights to most of the uranium developed on these properties.

An estimate of $92.1 million in fiscal year 1976, $24.5 million for the transition period, and $92.2 million for fiscal year 1977 provides for exploration and acquisition of additional coal and uranium mineral and mining rights, if suitable reserves are located and available for purchase. Partially offsetting these amounts are estimated credits of $256 thousand for fiscal year 1976, $74 thousand for transition period, and $310 thousand for fiscal year 1977 for depletion allowances for coal mined on reserves owned by TVA.

Land for Future Electric Generating Plant Sites

	In Thousands
1975 actual	$1,626
1976 estimate	3,751
19TQ estimate	751
1977 estimate	3,003

To ensure availability of sites for orderly and efficient expansion of the power system, it is prudent to develop and maintain an inventory of suitable sites for the location of future generating plants. Acquisition of six inventory sites will be completed by the end of fiscal year 1976. Four of these sites have been selected for nuclear power plant sites. In addition, plans include the acquisition of three sites in fiscal year 1976 and two sites in fiscal year 1977.

ADDITIONS AND IMPROVEMENTS AT POWER FACILITIES

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Modernization and installation of electrostatic precipitators and stacks	$35,450	$61,955	$71,401	$28,276
Nonthermal liquid discharge facilities	-	6,810	4,753	25,982
Installation of sulfur dioxide removal equipment– Widows Creek unit 8	11,579	14,854	3,376	7,789
Rehabilitation of Ocoee No. 1 Dam	3,089	1,452	-	-
Power production training center	3,952	4,508	265	-
Installation of air preheating coils at Paradise Steam Plant	907	2,508	-	-
Other additions and improvements at generating stations	28,539	41,470	5,477	20,827
Power system control center	610	183	-	-
Construction equipment pool	13,996	19,226	1,045	17,075
Other additions and improvements	2,482	5,395	652	2,488
Total	100,604	158,361	86,969	102,437

Modernization and Installation of Electrostatic Precipitators and Stacks

For a number of years TVA has been engaged in a program of upgrading air pollution control facilities at existing coal-fired generating stations. In January 1973, in response to new air quality requirements set by the states of Alabama, Kentucky, and Tennessee, the program was greatly expanded. The new program will provide for greater fly ash removal efficiencies and in some cases will provide taller stacks for dispersion of sulfur oxides at higher elevations to protect ambient air quality. The total past and current program is expected to cost approximately $350.0 million. Projects in the 1977 estimate include Johnsonville Steam Plant units 1-6, Widows Creek Steam Plant units 1-6, Shawnee Steam Plant units 1-10, Kingston Steam Plant units 1-9, Bull Run Steam Plant unit 1, and Gallatin Steam Plant units 1-4.

Nonthermal Liquid Discharge Facilities

In order to meet present Federal and state regulations for the discharging of chemical wastes into receiving waters, modifications at existing coal-fired plants are needed. The proposed modifications will group miscellaneous waste streams within the plant perimeter for the required treatment. This treatment procedure will be in accordance with the Environmental Protection Agency effluent guidelines. The total modification program will involve 12 steam plants at an estimated cost of $74.8 million, with a construction schedule that calls for completion of the modifications in fiscal year 1979. The $26.0 million estimate for 1977 will provide for completion of the modification work started in fiscal year 1976 on six steam plants.

Installation of Sulfur Dioxide Removal Equipment–Widows Creek Unit 8

Over a period of several years TVA has been involved in research on methods for removing sulfur dioxide from flue gases of coal-fired plants. Methods investigated include dry limestone injection, ammonia scrubbing, and limestone wet scrubbing, the last of which offers the most promising process for full-scale application to a large steam plant. Operations of a pilot-scale wet scrubber at TVA's Colbert Steam Plant during fiscal years 1971, 1972, and 1973 have provided information for use in the design of a full-scale unit and such a unit will be installed on the 550 megawatt unit 8 at Widows Creek Steam Plant. It is not contemplated at this time that the installation will include facilities for recovery of sulfur in a usable form. Obligations through fiscal year 1975 totaled $27.4 million. The $14.9 million estimate for fiscal year 1976 provides for continuing investigations, engineering and design, purchasing of equipment, and construction. Continuation of work including final design and engineering, and purchasing of equipment will require $7.8 million for fiscal year 1977. This facility is scheduled for completion in fiscal year 1977 at an estimated total cost of $54.0 million.

Rehabilitation of Ocoee No. 1 Dam

Ocoee No. 1 Dam was built by Eastern Tennessee Power Company between 1910 and 1914. It was acquired by TVA from Tennessee Electric Power Company in 1939. Concrete surfaces in the intakes are deteriorating and safety factors are below the standards dictated by modern criteria in the event that the maximum probable flood should occur at the site. Strengthening and resurfacing the dam is estimated to cost a total of $8.1 million, a decrease of $1.4 million from the estimate reported in the Budget Program for fiscal year 1976. The decrease is the result of lower than expected unit costs for spillway

concrete work and reductions in estimates for drilling and grouting and for the diversion and care of water. The 1976 estimate of $1.5 million will complete the project.

Power Production Training Center

To improve the reliability, operability, and safety of TVA's power plants, it is planned to construct a training center to provide the power plant operators and technicians with the highest quality training available. This will also allow centralization and optimization of power program training activities.

The training center will be located at the Sequoyah Nuclear Plant site and will consist of three simulators, classrooms, and office facilities.

These facilities will assure TVA of the availability of training facilities for fulfilling Nuclear Regulatory Commission's training and retraining requirements for licensing of nuclear plant operators. The inclusion of a fossil-fueled plant simulator will enable TVA to conduct a comprehensive fossil plant operator training program at this facility. The $4.5 million estimate for fiscal year 1976 provides for construction requirements and payments on a contract for the simulators. This facility is scheduled for completion in the transition quarter at a total cost estimate of $18.0 million.

Installation of Air Preheating Coils at Paradise Steam Plant

Heating coils are being installed in the air preheater inlet ducts on all three units at Paradise Steam Plant. Cool air entering the preheaters has caused corrosion in the tubes and damage to electrostatic precipitators resulting in excessive maintenance costs and load reductions on the generating units. Installation of heating coils is expected to eliminate these difficulties. The project will be completed in 1976 at a total cost of $4.2 million.

Other Additions and Improvements at Generating Stations

During 1977, additions and improvements at hydroelectric generating plants will include $846 thousand for installation of supervisory control of facilities at Norris, Cherokee, and Douglas hydro plants. This work will be completed in 1978 at a total estimated cost of $2.3 million. Replacement of generator stator windings at Douglas, Chickamauga, Wheeler and Apalachia will require $1.5 million in fiscal year 1977. Modifications to improve reliability of the thrust bearing assemblies for Wheeler units 1 and 2 will amount to $120 thousand in fiscal year 1977, bringing the total estimated cost to $490 thousand. Facilities at several plants are being upgraded to comply with the Water Control Act regarding discharges into the river and will amount to $200 thousand in fiscal year 1977 and $1.2 million upon completion in later years. Installation of oil-lift pumps on vertical hydro unit thrust bearings at various plants is estimated to be $122 thousand in fiscal year 1977 and $2.5 million when completed in later years. Other miscellaneous work and items at hydroelectric plants are estimated to be $664 thousand during fiscal year 1977.

Additions and improvements at steam-electric generating plants for fiscal year 1977 include an estimate of $950 thousand for modificatons to increase the energy peaking capacity at Kingston Steam Plant. This completes the program which started several years ago at several steam-electric plants, making the total estimated cost for this work $1.9 million.

The existing ash disposal ponds at various steam plants are filled to near designed capacity. Larger volumes of fly ash yielded by improved collection equipment require additions to existing fly-ash-handling systems. The program to provide additional ash disposal capacity will require $2.6 million in fiscal year 1977. Work includes raising height of dikes at Kingston, modification of ash removal system at Gallatin, and the provision of a new ash pond at John Sevier.

In order to minimize the possibility of turbine damage at various steam plants, a program was started in fiscal year 1976 to install devices for water-induction detection and monitoring of turbine temperatures. Work during fiscal year 1977 will amount to $336 thousand and upon completion in later years a total of $1.5 million.

During power outages due to turbine failure, the ready access to spare spindles and other spare turbine parts could greatly reduce outage time and insure adequate generating capability. During fiscal year 1977 spare spindles and other turbine parts will be purchased at an estimated cost of $5.6 million.

During fiscal year 1977, an estimate of $5.2 million is required for replacement of various boiler feedwater heater and condenser tubing, and other major components at various steam-electric generating plants.

Other miscellaneous work at steam-electric plants, including the installation of a permanent makeup demineralizer to provide an adequate makeup water supply to the Kingston Steam Plant, replacement of badly deteriorated telephone PAX

systems at Johnsonville, Gallatin, and Shawnee steam plants; and an additional air compressor for the large volume soot-blowers at Cumberland will require $2.5 million.

Power System Control Center

Completion of work which began in fiscal year 1970 on the Power System Control Center will require $183 thousand in fiscal year 1976. This facility on Chickamauga Dam reservation is scheduled for full operation in fiscal year 1976 at a total cost of approximately $13.0 million. The estimate included for fiscal year 1976 is for final testing and adjustment of communication and load control equipment.

Construction Equipment Pool

In order to achieve efficient utilization of construction equipment, major equipment is held in a single pool. Projects are charged a rental rate for equipment which reflects an appropriate allowance for depreciation. The estimated net obligation of $17.1 million for fiscal year 1977 reflects the excess of purchases over depreciation charges for that year.

Other Additions and Improvements

The estimate of $2.5 million for fiscal year 1977 includes $1.6 million for additional barge docking facilities, facilities for switching to low-sulfur coal at Cumberland Steam Plant, and $800 thousand for the purchase of environmental monitoring equipment for use at existing power plants and at future plant sites under investigation. The remainder of the estimate, $100 thousand, is required for miscellaneous additions and replacements at various power plants.

NUCLEAR FUEL

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Uranium ore and concentrates	$12,575	$4,407	$531	$17,318
Enrichment	13,630	17,906	3,780	3,702
Fabrication	24,284	66,855	14,556	71,240
Payments	50,489	89,168	18,867	92,260
Less fuel consumed	-11,355	-9,105	-10,567	-43,941
Total expenditures	39,134	80,063	8,300	48,319

Nuclear fuel estimates include progress payments to vendors for fabrication of fuel assemblies for various nuclear plants, advance payments to ERDA for enrichment services, purchase of uranium ore and concentrates, and related expenses. The objective of this program is to ensure an adequate and economical supply of fuel for nuclear power plants on the TVA system. Estimated expenditures for fiscal years 1976 and 1977 are $89.2 million and $92.3 million, respectively. After accounting for fuel consumed in commercial reactors, net expenditures for fiscal years 1976 and 1977 are estimated at $80.1 million and $48.3 million, respectively.

INVESTIGATIONS FOR FUTURE POWER FACILITIES

	In Thousands
1975 actual	$684
1976 estimate	1,472
19TQ estimate	410
1977 estimate	1,545

Increasing demands for power require that TVA constantly investigate and study sites for future generating plants. TVA will have to increase its generating capacity by more than 21,000 MW in order to meet the peak load projection for the 1980's. Numerous sites and plants are under consideration at any given time weighing the best balance of the economical and environmental factors related to the sequence of TVA's power system development.

Estimates of $1.5 million in each of fiscal years 1976 and 1977 reflect the growing number of sites to be investigated. Also site studies have become much more complicated and consequently more costly due primarily to added requirements for nuclear plants.

Schedule B-3. Power Operations
(In thousands of dollars)

	1975 actual		1976 estimate		19TQ estimate		1977 estimate	
Operating revenues								
Sales of electric energy:								
Municipalities and cooperatives	737,203		1,050,367		248,359		1,150,033	
Federal agencies	182,523		307,763		85,970		374,425	
Industries	227,637		317,836		83,266		400,280	
Electric utilities	1,541		3,157		698		3,873	
Total outside sales	1,148,904		1,679,123		418,293		1,928,611	
Interdivisional	6,663		10,469		2,405		6,515	
Total sales of electric energy		1,155,567		1,689,592		420,698		1,935,126
Rents and other revenues		20,723		21,495		6,247		26,045
Total operating revenues		1,176,290		1,711,087		426,945		1,961,171
Operating expenses								
Production	750,751		1,081,544		263,480		1,193,772	
Transmission	22,216		24,474		6,547		26,846	
Customer accounts	534		577		167		608	
Demonstration of power use	1,277		1,351		372		1,518	
Administrative and general	34,004		46,816		11,003		47,514	
Payments in lieu of taxes	36,847		48,372		17,152		68,081	
Social Security taxes	5,187		6,447		1,883		7,728	
Provision for depreciation	110,322		124,200		33,325		136,500	
Total operating expenses		961,138		1,333,781		333,929		1,482,567
Operating income		215,152		377,306		93,016		478,604
Other income and deductions								
Interest charged to construction	117,353		134,992		37,573		186,865	
Other	-169	117,184	250	135,242	-50	37,523	-300	186,565
Total income		332,336		512,548		130,539		665,169
Interest charges		228,976		307,900		90,700		417,900
Net income from power operations		103,360		204,648		39,839		247,269
Operating margin								
Net income from power operations		103,360		204.648		39,839		247,269
Treasury dividend (return on appropriation investment)		71,372		65,056		17,100		68,000
Operating margin		31,988		139,592		22,739		179,269

Reconciliation of Schedule B-3 with Budgeted Income and Expenses
(In thousands of dollars)

	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Budget income				
Operating revenues	1,176,290	1,711,087	426,945	1,961,171
Interchange power delivered	14,285	15,751	9,239	28,652
Other income	7,063	60	-	-
Interdivisional sales and rents	-6,820	-10,619	-2,442	-6,665
Total budgeted income	1,190,818	1,716,279	433,742	1,983,158
Budgeted expenses				
Operating expenses	961,138	1,333,781	333,929	1,482,567
Interest charges less other income and deductions	111,792	172,658	53,177	231,335
Interchange power delivered	14,285	15,751	9,239	28,652
Other income	7,063	60	-	-
Interdivisional sales and rents	-6,820	-10,619	-2,442	-6,665
Provision for depreciation	-110,322	-124,200	-33,325	-136,500
Total budgeted expenses	977,136	1,387,431	360,578	1,599,389

POWER SUPPLY AND USE
(OPERATING EXPENSES AND INCOME)

POWER OPERATIONS
(Schedule B-3)

Net income from power operations for fiscal year 1977 is estimated to be $247.3 million compared with $103.4 million in fiscal year 1975, $204.6 million in fiscal year 1976, and $39.8 million in the transition quarter. The adjustment of one mill per kilowatthour in the wholesale energy charge placed in effect January 2, 1975, will provide estimated revenues of about $111.5 million in 1976 and $128.8 million in 1977. The fuel adjustment addendum is expected to provide revenues of $593.2 million in 1976 and $587.3 million in 1977.

The TVA Act and TVA's basic bond resolution require the Board to charge rates sufficient in each year to cover current costs of operations plus all interest and principal payments on its debts and payments to the Treasury. The basic bond resolution also requires an alternate computation of interest which substitutes annual debt service if it is higher than actual interest payments. In addition to covering current charges and payments, rates must also provide a margin for reinvestment in power system assets.

This margin has become one of the more significant aspects in the continuing ability of TVA to meet the growing power needs of the consumers of the region. New power generating facilities require capital investments of five or six times the amounts required a few years ago and take about twice as long to build.

This comes at a time when TVA has financed new construction almost exclusively from debt over the past 15 years and has made borrowed money by far the dominant source of total capitalization. At June 30, 1975, debt accounted for about two-thirds of total capital. To maintain the ability of TVA to continue to borrow on a large scale and to prevent future rate payers from being saddled with exorbitant interest costs current customers should pay a significantly larger share of expansion costs. Even after the measurable improvement in projected 1976 net income, this budget estimates that borrowings this year will be $1.0 billion. In order to stop the growth in debt at about three-fourths of total capitalization and provide reasonable protection to the lenders who have in the past and will continue in the future to furnish the majority of funds for growth of the system, net income after the required Treasury dividend will have to be 15 to 20 percent of total operating costs. Rates have not been set to produce such a margin in 1976 because of the additional burden it would place on consumers in the current economic climate. Rate adjustments will be required later in fiscal year 1976 or in fiscal year 1977 to cover rising interest and other costs not included in the fuel adjustment addendum and to establish the margin at an adequate level.

Power Revenues

Power revenues are expected to be $1.7 billion in fiscal year 1976, an increase of $500.0 million or 45 percent from the $1.2 billion in fiscal year 1975. The increase is a result of a 5 percent increase in loads; the January 2, 1975, Adjustment Addendum in effect 12 months in 1976 compared to only 6 months in 1975; and an increase in the average mills per kWh rate of the fuel and purchased power portion of the January 2, 1975, Adjustment Addendum from 1.49 mills per kWh in 1975 to 5.32 mills per kWh in 1976.

Revenues in the transition quarter between fiscal year 1976, which ends June 30, and the fiscal year 1977, which begins October 1, are expected to be $426.9 million.

Fiscal year 1977 revenues are expected to be $2.0 billion an increase of $250.1 million or about 15 percent over fiscal year 1976, primarily due to load growth. Details are shown on the following table.

	1975 Actual			1976 Estimate			19TQ Estimate			1977 Estimate		
	Million kWh	Thousands	Mills/kWh	Million kWh	Thousands	Mills/kWh	Million kWh	Thousands	Mills/kWh	Million kWh	Thousands	Mills/kWh
Municipalities	47,465	$536,436	11.30	48,610	$763,662	15.71	13,106	$186,376	14.22	53,890	$838,956	15.57
Cooperatives	17,003	200,767	11.81	17,845	286,705	16.07	4,272	61,983	14.51	19,455	311,077	15.99
Federal agencies:												
AEDC	627	8,709	13.89	860	15,146	17.61	217	3,511	16.18	860	15,095	17.55
ERDA	18,190	166,988	9.18	20,800	281,260	13.52	6,478	79,563	12.28	25,700	347,775	13.53
Other	572	6,826	11.93	710	11,357	16.00	200	2,896	14.48	730	11,555	15.83
Total	19,389	182,523	9.41	22,370	307,763	13.76	6,895	85,970	12.47	27,290	374,425	13.72
Commercial and industrial:												
Aluminum	9,228	96,533	10.46	7,350	106,553	14.50	2,290	30,183	13.18	10,000	144,595	14.46
Chemicals	8,046	82,555	10.26	9,020	130,627	14.48	2,435	31,683	13.01	10,150	146,585	14.44
Ferroalloys	2,397	24,682	10.30	2,535	37,404	14.76	680	9,126	13.42	2,720	40,115	14.75
Other	2,151	23,867	11.10	2,855	43,252	15.15	900	12,274	13.64	4,640	68,985	14.87
Total	21,822	227,637	10.43	21,760	317,836	14.61	6,305	83,266	13.21	27,510	400,280	14.55
Electric utilities	116	1,541	13.29	190	3,157	16.62	47	698	14.85	240	3,873	16.14
Total outside sales	105,795	1,148,904	10.86	110,775	1,679,123	15.16	30,625	418,293	13.66	128,385	1,928,611	15.02
Interdivisional	638	6,663	10.44	695	10,469	15.06	175	2,405	13.74	425	6,515	15.33
Total sales	106,433	1,155,567	10.86	111,470	1,689,592	15.16	30,800	420,698	13.66	128,810	1,935,126	15.02
Rent from electric property and other revenues		20,723			21,495			6,247			26,045	
Total revenues		1,176,290	11.05		1,711,087	15.35		426,945	13.86		1,961,171	15.23

Revenues from sales to municipal and cooperative distributors are expected to be $313.2 million more in 1976 than 1975, an increase of 43 percent. This increase is a result of an estimated load growth of 3 percent in the distributors' loads; the January 2, 1975, Adjustment Addendum which will be in effect for the full fiscal year in 1976; and the increase in the fuel and purchased power portion of the January 2, 1975, Adjustment Addendum in 1976 over 1975. Load growth during 1976 is expected to be about half the normal rate as the effects of the most severe recession since the 1930's continue into the year. During the three-month transition quarter between fiscal years 1976 and 1977, the revenues from sales to municipal and cooperative distributors are expected to be about the same level as those of the last quarter of 1976. Revenues from sales to distributors in 1977 are estimated to increase $99.7 million over those of 1976, an increase of about 9 percent. Loads in this period are expected to increase 10 percent, reflecting recovery from the recession as well as normal growth. The percent increase in revenues is slightly less than that of the loads as the fuel and purchased power cost adjustments begin to reflect stabilizing coal prices and increased generation of the nuclear units.

Residential load growth is based on continued growth in number of households and increased use of electricity. The average number of residential customers is expected to increase by 140,000 from 1975 to 1977 or about 3 percent per year. Following World War II, there was a rapid increase in the birth rate and the children born in that period have now reached the age when most form households. In addition, one-third of the people in the region are now below 20 years of age and will be forming households in the future. The increase in residential customers is due to these factors and to the expected net immigration into the TVA service area. Average annual use by residential customers is expected to increase by 500 kWh from 1975 to 1977. This reflects a slowing of the growth which has been evident in the past few years. The slower growth is a result of recent price increases and conservation programs. However, as availability of other fuels decreases, it is expected that use of electricity will increase. The following table shows several years of comparison of residential average annual use and cost per kWh in the TVA area and the United States.

12 Months Ended	United States[1]		TVA	
	kWh Use	Avg. Price Per kWh (¢)	kWh Use	Avg. Price Per kWh (¢)
June 1965	4,814	2.28	10,381	0.92
June 1966	5,072	2.22	11,294	0.90
June 1967	5,434	2.18	11,680	0.89
June 1968	5,788	2.14	12,668	0.93
June 1969	6,259	2.11	13,600	0.95
June 1970	6,810	2.09	14,560	1.03
June 1971	7,243	2.14	14,400	1.22
June 1972	7,496	2.25	14,040	1.28
June 1973	7,882	2.32	15,080	1.30
June 1974	8,019	2.54	14,480	1.45
June 1975	N/A	N/A	14,540	1.76

1. Total electric utility industry.

Growth in business and industry loads served by distributors is based on growth of the service-type business to meet the demands created by a growing population, record levels of announcements of new and expanded industries in calendar years 1973 and 1974, the fact that new industries continued to come on-stream in the depth of the recession, and the price-conservation effect being more than offset by substitution of electricity for scarce and more expensive fossil fuels.

Revenues from direct sales to Federal agencies in 1977 are estimated to be $374.4 million, an increase of $191.9 million from the actual for fiscal year 1975. The increase primarily results from expanding power needs of the Energy Research and Development Administration to meet the demand for nuclear materials and from the effect of rate adjustments made during 1975. ERDA loads are expected to increase from 18.2 billion kWh in fiscal year 1975 to 25.7 billion kWh in fiscal year 1977, an increase of 41 percent.

Revenues from direct sales by TVA to industrial customers are expected to be $400.3 million in fiscal year 1977, an increase of $172.6 million or 76 percent from the actual of 1975. This results from an increase of 26 percent in loads reflecting recoyery from the recession and expected normal growth and the effect of rate adjustments made during 1975. Existing and new industries will use more electricity in facilities to meet stringent environmental regulations. A substantial amount of new loads should result from recent announcements by industry. No significant substitution of electricity for fossil fuel is expected for these loads because they are highly electricity intensive. The price-conservation effect is expected to be more than offset by the increased power use for pollution control.

Revenues from sales to electric utilities are expected to be $3.9 million in fiscal year 1977, an increase of $2.3 million over 1975. Only sales to Nantahala Power & Light are included in this category as the tight power supply situation continues to limit commitments for firm power sales to utilities.

Revenues from interdivisional sales are expected to be $10.5 million in 1976, $3.8 million more than 1975. The 57 percent increase is due to a 9 percent increase in loads and the rate adjustments. Revenues and loads for 1977 are expected to be $4.0 million and 270 million kWh less, respectively, than in 1976. The decrease results from the expected conversion of the chemical plant facilities to a production process requiring less electrical power.

Estimated rent from electric property and other revenues in fiscal year 1977 totals $26.0 million, an increase of $5.3 million over the 1975 level. Most of the increase is due to growth in facilities rental charges to municipalities and cooperatives under the TVA wholesale rate schedules and to directly served customers under the TVA general power rate schedule. Both schedules are designed for delivery at not less than 161 kilovolts. When deliveries are made at lower voltages, the wholesale rate schedules provide for a charge based upon the highest hourly demand during the past 12 months. The general power rates provide for a charge to the directly served customers based on their contract demand. As loads grow, the facilities rental charges increase.

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Power Expenses

Production Expense

Total energy requirements for fiscal year 1977 are estimated to be 139.7 billion kWh, an increase of 23.7 billion kWh over the actual for fiscal year 1975 and 17.4 billion kWh more than estimated for fiscal year 1976. The estimate for the transition quarter is 34.9 billion kWh, about 25 percent of the amount estimated for fiscal year 1977. With above normal rainfall and streamflow conditions in fiscal year 1975, hydro generation was 22.9 billion kWh, about 5.0 billion kWh above normal. This coupled with larger than normal power imports resulted in lower than normal generation by the fuel-fired plants. About normal hydroelectric generation is assumed for fiscal year 1976 through fiscal year 1977. Power imports are estimated to be greater in fiscal year 1976 than 1975, but are expected to be decreasing in fiscal year 1977 to a level below that of the 1976 estimates. Thermal generation, including that from gas turbines, is estimated to be 89.4 billion kWh for fiscal year 1976, and increasing to 112.3 billion kWh for fiscal year 1977, reflecting an increase of 9.8 billion kWh in 1976 over the actual for fiscal year 1975 and 22.9 billion kWh or about 26 percent more in 1977 than estimated for fiscal year 1976. The following tables provide a summary of the source and disposition of energy and the expenses for production.

Source and Disposition of Energy

	Million kWh			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Input				
Hydroelectric generation:				
TVA hydro and pumped-storage	17,176	13,190	3,578	13,519
Cumberland	3,381	2,115	260	2,005
ALCOA	2,393	1,975	510	1,975
Total hydroelectric generation	22,950	17,280	4,348	17,499
Steam-electric generation:				
Coal-fired	71,699	84,142	24,582	91,931
Nuclear	7,429	4,252	4,769	19,160
Total steam-electric generation	79,128	88,394	29,351	111,091
Gas turbine generation	507	1,044	235	1,264
Total generation	102,585	106,718	33,934	129,854
Purchased power	5,277	2,330	-	-
Interchange and exchange receipts from other utilities:				
Seasonal	2,799	2,799	-	2,799
Other	3,304	8,540	479	5,087
Concurrent and inadvertent	2,047	2,000	500	2,000
Total interchange and exchange	8,150	13,339	979	9,886
Total input	116,012	122,387	34,913	139,740
Output				
Sales:				
Municipalities	47,465	48,610	13,106	53,890
Cooperatives	17,003	17,845	4,272	19,455
Total municipalities and cooperatives	64,468	66,455	17,378	73,345
Other electric utilities	116	190	47	240
Commercial and industries	21,822	21,760	6,305	27,510
Federal agencies	19,389	22,370	6,895	27,290
Interdivisional	638	695	175	425
Total sales	106,433	111,470	30,800	128,810
Interchange and exchange delivered to other utilities:				
Seasonal	2,827	2,799	2,084	2,799
Other	226	331	89	351
Concurrent and inadvertent	1,685	2,502	500	2,000
Total interchange and exchange	4,738	5,632	2,673	5,150
Deliveries to Aluminum Company of America—ALCOA agreement	1,719	1,890	475	1,885
Transmission losses and shop use	3,122	3,395	965	3,895
Total output	116,012	122,387	34,913	139,740

Production Expenses before Depreciation

	1975 Actual			1976 Estimate			19TQ Estimate			1977 Estimate		
	Million kWh	Thousands	Mills/kWh	Million kWh	Thousands	Mills/kWh	Million kWh	Thousands	Mills/kWh	Million kWh	Thousands	Mills/kWh
Hydroelectric:												
TVA hydro and pumped-storage	17,176	$8,668	.50	13,190	$9,440	.72	3,578	$2,266	.63	13,519	$10,154	.75
Cumberland	3,381	12,446	3.68	2,115	8,097	3.83	260	950	3.65	2,005	7,320	3.65
ALCOA	(2,393)[a]	-	-	(1,975)[a]	-	-	(510)[a]	-	-	(1,975)[a]	-	-
Total	20,557	21,114	1.03	15,305	17,537	1.15	3,838	3,216	.84	15,524	17,474	1.13
Steam-electric and gas turbine:												
Coal-fired fuel	71,699	435,158	6.07	84,142	690,842	8.21	24,582	209,184	8.51	91,931	830,232	9.03
Nuclear fuel	4,663	7,109	1.52	3,742	7,871	2.10	4,769	10,600	2.22	18,052	40,799	2.26
Gas turbine fuel	507	13,117	25.87	1,044	32,229	30.87	235	7,602	32.35	1,264	44,802	35.44
Subtotal	76,869	455,384	5.92	88,928	730,942	8.22	29,586	227,386	7.68	111,247	915,833	8.23
Other expenses	-	106,893	1.39	-	127,003	1.43	-	25,999	.88	-	137,568	1.24
Total	76,869	562,277	7.31	88,928	857,945	9.65	29,586	253,385	8.56	111,247	1,053,401	9.47
Purchased power	5,277	90,399	17.13	2,330	32,280	13.85	-	-	-	-	-	-
Interchange receipts:												
Seasonal	2,799	10,497[b]	3.75	2,799	10,497[b]	3.75	-	-	-	2,799	23,036[b]	8.23
Other	3,304	48,708	14.74	8,540	142,961	16.74	479	7,664	16.00	5,087	81,392	16.00
Concurrent and inadvertent	(2,047)[c]	-	-	(2,000)[c]	-	-	(500)[c]	-	-	(2,000)[c]	-	-
Total	6,103	59,205	9.70	11,339	153,458	13.53	479	7,664	16.00	7,886	104,428	13.24
Interchange deliveries:												
Seasonal	-2,827	-10,611[b]	-3.75	-2,799	-10,497[b]	-3.75	-2,084[b]	-7,815	-3.75	-2,799	-23,036[b]	-8.23
Other	-226	-3,673	-16.25	-331	-5,254	-15.87	-89	-1,424	-16.00	-351	-5,616	-16.00
Concurrent and inadvertent	(-1,685)[c]	-	-	(-2,502)[c]	-	-	(-500)[c]	-	-	(-2,000)[c]	-	-
Total	-3,053	-14,284	-4.68	-3,130	-15,751	-5.03	-2,173	-9,239	-4.25	-3,150	-28,652	-9.10
Other production expense:												
LMFBR contributions and other R&D expenses		10,278			11,437			3,090			12,951	
Production administration		5,400		-	7,936			2,244			9,576	
Employee training		2,015			2,970			1,100			5,093	
Engineering studies and other		-5,279			2,649			524			2,235	
Preliminary operations:												
Browns Ferry	2,766	6,680		510	2,261		-	-		-	-	
Sequoyah		1,503			2,617			600		1,108	6,726	
Watts Bar		-			114			47			629	
Bellefonte		-			-			-			114	
Raccoon Mountain		45			90			25			264	
Value of initial power credited to construction		14,216			4,182			-			9,972	
Amount charged to construction		-6,142			-1,961			-			-4,400	
Net preliminary operations	2,766	16,302		510	7,303		-	672		1,108	13,305	
Total other production expense	2,766	28,716		510	32,295		-	7,630		1,108	43,160	
Allocation of multipurpose reservoir operations		3,324			3,780			824			3,961	
Total production expenses before depreciation	108,519	750,751	6.92	115,282	1,081,544	9.38	31,730	263,480	8.30	132,615	1,193,772	9.00
Thousand tons of coal burned (including inventory adjustments)		33,970			38,786			11,322			42,295	
Fuel expenses as percent of total steam-electric and gas turbine expense		81.0			85.2			89.7			86.9	

a. Not included in expenses as this power is exchanged under terms of ALCOA agreement.

b. No payments are made for seasonal interchange and the amounts of deliveries and receipts are balanced out in time. The dollars shown represent values for accounting purposes. As the seasonal exchange begins in November of each year, and the new fiscal year begins in October 1976, the values placed on the power are adjusted for 1977 to reflect expected fuel cost.

c. Not included in expenses as no money is involved and the receipts and deliveries balance out.

Steam-electric generation and gas turbine costs, which represent about 90 percent of total production expense, are estimated to increase from $562.3 million in fiscal year 1975 to $857.9 million in fiscal year 1976 and to $1.1 billion in fiscal year 1977. These expenses reflect an 87 percent increase over the actual amount for fiscal year 1975 with generation by these facilities increasing by 45 percent. The increase in costs would have been much greater without the Browns Ferry Nuclear Plant. Fiscal year 1977 reflects a full year's operation for the whole plant compared with partial year's operation during 1975 and 1976. Nuclear generation and fuel expense are increasing from 4.7 billion kWh and $7.1 million for fiscal year 1975 to 18.1 billion kWh and $40.8 million for fiscal year 1977. Estimated cost per kWh generated by nuclear fuel for fiscal year 1976 is 2.10 mills and is expected to increase to 2.26 mills for fiscal year 1977. Coal prices which have been rising for several years took on a sharp increase during fiscal year 1975. During the winter of 1974-1975 some coal prices increased to more than $30 per ton compared with about $9 per ton earlier in the fiscal year. Coal burned during fiscal year 1974 averaged about $8.61 rising to an average of $12.99 per ton for fiscal year 1975, or an increase of 51 percent. Coal prices are expected to increase over the periods reflected in this budget. Coal burned for fiscal year 1976 is estimated at $17.50 per ton, increasing to $19.40 per ton burned in fiscal year 1977, reflecting about a 50 percent increase over the actual for fiscal year 1975. These higher costs result in fuel expense for coal of 9.03 mills per kWh in fiscal year 1977 and 8.21 mills per kWh in fiscal year 1976 compared with 6.07 mills per kWh in 1975. Fuel expense for gas turbine generation is also expected to increase, reflecting increased oil prices. Other expenses for steam-electric and gas turbine generation are expected to decrease from 1.39 mills per kWh generated in fiscal year 1975 to 1.24 mills per kWh generated in fiscal year 1977, reflecting slight improvement in operation and maintenance of the generating plants.

Hydroelectric expenses vary from year to year, depending primarily upon streamflow conditions for the Cumberland plants and maintenance requirements for the TVA plants. Fiscal year 1977 total hydroelectric expense is estimated to be $17.5 million compared with $17.5 million estimated for fiscal year 1976 and $21.1 million actual for fiscal year 1975. Payments for power from the Cumberland River projects during fiscal year 1977 are estimated to decrease $5.1 million from the actual for fiscal year 1975. The reductions primarily reflect deviations in streamflow and amount of power retained by Southeastern Power Administration for its other customers. Operations and maintenance costs for TVA hydro plants are estimated to increase from $9.4 million in fiscal year 1976 to $10.2 million for fiscal year 1977, primarily reflecting rising costs for labor, materials, and supplies.

The estimate for purchased power and net interchange power from other utilities for fiscal year 1977 is $75.8 million compared with $170.0 million for fiscal year 1976 and $135.3 million for fiscal year 1975. During fiscal year 1975 the power supply situation became very critical. During the first half of the fiscal year coal inventories dwindled to critically low levels reaching a 34-day supply near the middle of December 1975. Power supply was further aggravated by unit outages for units 1 and 2 for the Browns Ferry Nuclear Plant beginning in late March 1975 and increased unit outages for maintenance for the coal-fired generating plants. As a result of these conditions generation by fuel-fired plants was well below normal. In order to conserve the coal supply during the miner's strike and to meet the area power demands for the year, TVA increased purchased and interchange power receipts. Purchased power and net interchange continue to be rather large in fiscal years 1976 and 1977. The decrease of $94.2 million between the 1976 and 1977 estimates reflects a full year of operation of the three Browns Ferry nuclear units, one month of operation for unit 1 of Sequoyah Nuclear Plant, and an increase in generation from the existing major coal-fired units.

Excluding expenditures for preliminary operations, other production expenses are expected to increase from $25.0 million in fiscal year 1976 to $29.9 million in fiscal year 1977. The increase reflects rising expenditures for research and development activities, increased training activities to provide generating plant operators, craft employees, engineering, and administrative employees to compensate for attrition and manning for new plants. Additional staffing for production administration is needed to meet the needs of the growing power system. Other cost elements of this category reflect small changes with the exception of preliminary operations. These expenses vary considerably from year to year, depending upon the number of new plant units being staffed before commercial operations and the timing of initial generation of the units during a fiscal year. All costs incurred for new units before commercial operation are charged to other production expense. For that portion of the preliminary operation period between initial generation for coal-fired units or fuel loading for nuclear units and commercial operating dates, all operation and maintenance expenses are transferred to construction costs and the value of power generated during initial generation is charged to other production and credited to construction costs. For fiscal year 1977 net preliminary operations reflect a $6.0 million increase over the estimate for 1976.

Transmission Expense

	1975 Actual		1976 Estimate		19TQ Estimate		1977 Estimate	
	Thousands	Mills/kWh Sales	Thousands	Mills/kWh Sales	Thousands	Mills/kWh Sales	Thousands	Mills/kWh Sales
Supervision and administration	$3,668	.034	$3,970	.036	$1,113	.036	$4,378	.034
Substation operations and maintenance	7,861	.074	8,581	.077	2,227	.073	9,265	.072
Line operations and maintenance	2,677	.025	2,735	.024	739	.024	3,010	.023
Dispatching and protection	2,204	.021	2,401	.022	645	.021	2,667	.021
Right-of-way clearing	1,569	.015	1,612	.015	404	.013	1,658	.013
Other transmission expense	2,976	.028	3,157	.028	866	.028	3,536	.027
Subtotal	20,955	.197	22,456	.202	5,994	.195	24,514	.190
Research and development activities	1,261	.012	2,018	.018	553	.018	2,332	.018
Total transmission	22,216	.209	24,474	.220	6,547	.213	26,846	.208

Transmission expense encompasses a broad program for the operation, maintenance, testing, and rehabilitation of the transmission and communication systems under both normal and emergency conditions in order to provide optimum continuity of power supply to TVA's customers. Continuing efforts are directed toward reducing costs through reductions in manpower requirements without sacrificing reliability in the efficient operation and maintenance of the transmission and communications systems. In order to accomplish the desired reductions in manpower requirements, close attention is given to better manpower utilization through the elimination of nonessential functions, keeping abreast of new technology, simplificaton of procedures, and increased productivity.

The increases in transmission expense, exclusive of research and development activities, reflect increased costs of salaries, materials, transportation, and related expenses associated with the operation and maintenance of the growing transmission system. Increases in research and development costs represent higher distributions of TVA's contributions to the Electric Power Research Institute for its work which is related to transmission expense.

When related to power sales, expenses before research and development costs show a slight increase for fiscal year 1976 over fiscal year 1975 on a unit basis. This results primarily from lower than normal load growth forecasts for fiscal year 1976 because of the economic recession. Expenses for the transition quarter and fiscal year 1977 show a decline from fiscal year 1976 on a unit basis.

Customer Accounts Expense

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Total	$534	$577	$167	$608

TVA delivers power to about 850 different metering points to TVA power distributors, directly served industries, Federal agencies, and neighboring utilities with which TVA has interchange agreements. From the metering points, information is gathered, analyzed, and processed monthly for the purpose of sending invoices to TVA power customers. The increases from year to year reflect rising costs of services and materials used in this activity.

Demonstration of Power Use

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Gross expenses	$1,741	$1,821	$501	$2,033
Reimbursement	-464	-470	-129	-515
Net expenses	1,277	1,351	372	1,518

Estimates for demonstration of power use provide for studies, research, experiments, and demonstration programs which help the users of electricity accomplish better and more economical applications of electric power for agricultural and domestic use and for production processes by small industries. These activities are carried out in cooperation with agricultural extension services, vocational education departments, state universities, state and county health departments, and distributors of TVA power. Technical and advisory services are provided for distributors of TVA power on a reimbursable basis because many distributors are not large enough to maintain complete technical staffs and the cooperative approach provides these services economically. TVA provides such services to about 126 of the 160 distributors served. The amount of reimbursement is determined by contract. The estimated increases in net expenses for 1976 and 1977, over the actual expenses for 1975, reflect general cost trends, primarily increasing costs for labor and materials.

Administrative and General Expenses

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Executive administration and central management	$5,654	$6,548	$1,655	$6,810
Workers' Compensation Benefits	1,616	7,900	887	4,275
Power research related activities	1,105	1,314	355	1,448
Other general supervision and administration	12,578	14,884	3,593	15,843
Subtotal	20,953	30,646	6,490	28,376
Fringe benefits:				
Welfare funds	1,075	1,200	250	1,300
FEGLI	374	527	150	630
Hospitalization	3,136	4,054	1,150	4,835
Retirement plan	8,466	10,389	2,963	12,373
Subtotal fringe benefits	13,051	16,170	4,513	19,138
Total administrative and general expenses	34,004	46,816	11,003	47,514

Administrative and general expenses consist of costs of an administrative, supervisory, or general nature incurred in conducting the TVA power program. Actual expenses for 1975 were $34.0 million. Estimated expenses for 1976 are $46.8 million and rising to $47.5 million for 1977. About 73 percent of the increase in expenses for 1976 reflects increases in employee fringe benefits and payments for Workers' Compensation Benefits, which includes estimated payments for three years and brings the compensation benefit payments up to date. In the past these payments have been made to the Department of Labor two years in arrears but recently the Bureau of Employee Compensation has required those agencies that are authorized to spend revenues to make these payments on a current basis. Payments for this fund for 1977 reflect the estimated benefits for 1977. Excluding Workers' Compensation Benefits, about 54 percent of the increase from 1975 through 1977 reflects increases in employee fringe benefits. The remainder results from increases in other administrative and general expenses, reflecting rising salaries and wages, coupled with slightly higher requirements for manpower, office supplies and materials, and other related items.

The increased expenses for fringe benefits primarily reflect larger employee benefits resulting from wage and salary negotiations. TVA contributes to union pension and welfare funds on behalf of hourly employees, the amount of payment depending upon classification of work, and the union involved. Increases in contributions to the Federal Employees Group Life Insurance plan reflect increase in rates and additional insurance coverage resulting from increasing salaries and wages. The increase in TVA's payments for hospitalization coverage for annual salary policy and annual trades and labor employees reflects changes in amounts of payments for each employee as negotiated in salary and wage negotiations as well as coverage for additional employees in power operations. Retirement plan expenses reflect continuing increases in salaries, as well as additional manpower requirements needed in operating and maintaining the expanding power system. Based on actuarial studies, TVA's contributions to the retirement system is based on a rate of about 9.95 percent of straight-time earnings of employees in the retirement system.

Payments in Lieu of Taxes

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Payment based on 5 percent of revenues[1]	$36,837	$48,334	$17,142	$68,043
Tax replacement payments	10	38	10	38
Total payments in lieu of taxes	36,847	48,372	17,152	68,081

	1974 Actual	1975 Actual	1976 Estimate	19TQ Estimate
1. Revenues subject to 5 percent payment				
Sales of electric energy:				
Municipalities and cooperatives	$556,167	$737,203	$1,050,367	$248,359
Electric utilities	1,166	1,541	3,157	698
Industrials	179,767	227,637	317,836	83,266
Customers' forfeited discounts and penalties	-352	292	8	2
Total	736,748	966,673	1,371,368	332,325

Estimates of payments in lieu of taxes are based on revenues from the sale of electricity, exclusive of deliveries to Federal agencies and minimum tax replacement payments on properties held by TVA in accordance with provisions of Section 13 of the TVA Act. The payments for a particular year represent 5 percent of such revenues for the preceding fiscal year. Payments for fiscal year 1976 are based on actual revenues from the sale of electricity in fiscal year 1975 plus minimum tax replacement payments related to coal and uranium properties in Illinois and South Dakota. Since the introduction of the transition quarter, an evaluated base is used in determining the estimated payments for the transition quarter and fiscal year 1977. In addition, expected revenues and tax replacement payments during the applicable periods are used in determining these estimates.

Social Security Taxes

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Total	$5,187	$6,447	$1,883	$7,728

Social Security tax payments are estimated to be $6.4 million for fiscal year 1976 and $7.7 million for fiscal year 1977 compared with $5.2 million actual for fiscal year 1975. The estimate of $1.9 million for the transition quarter is based on level of expenditures expected at the end of fiscal year 1976. Changes from fiscal year 1975 reflect increases in manpower requirements needed in the operation and maintenance of the power system, increase in salary or wage base, and tax rate as determined by the tax law. The tax rate and wage base, effective January 1, 1976, are 5.85 percent and $15,300, respectively, with the base subject to automatic changes based on increases in wage levels and benefits. Currently the maximum Social Security tax per employee per year is $895.05.

Provision for Depreciation

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Hydro plants	$7,505	$7,667	$1,910	$7,675
Steam plants	60,330	62,200	15,815	65,000
Gas turbines	2,647	6,144	1,535	6,144
Nuclear plants	9,801	15,330	5,640	22,560
Transmission facilities and other electric plant	30,039	32,859	8,425	35,121
Total provision for depreciation	110,322	124,200	33,325	136,500

The allowance for depreciation expense is based on the amount of completed plant utilized in the power program. As of the end of fiscal year 1975, this completed plant amounted to $4.8 billion and is expected to reach about $5.3 billion by the end of fiscal year 1976 and $5.5 billion by the end of fiscal year 1977. The increases in depreciation provision reflect additions in completed plant of approximately $0.7 billion. Major additions include Browns Ferry Nuclear Plant unit 3; Gallatin Gas Turbine units 1-4; additions to the transmission facilities, primarily transmission lines and substations; and other additions and improvements at generating plants, including such facilities as ash ponds, electrostatic precipitators, plant stacks, power system control center, power production training center, limestone scrubbers at Widows Creek, and other miscellaneous additions and improvements.

Interest Charges

Interest on borrowed funds is one of the most rapidly rising elements of cost in the TVA power program. The details of interest on outstanding and new borrowings are shown below. The increase reflects both growth in borrowings outstanding and increases in the effective rate of interest.

	1975 Actual		1976 Estimate		19TQ Estimate		1977 Estimate	
	Interest (Thousands)	Rate (Percent)	Interest (Thousands)	Rate (Percent)	Interest (Thousands)	Rate (Percent)	Interest (Thousands)	Rate (Percent)
Interest on debt outstanding at beginning of fiscal year								
Long-term debt	$156,658	7.38	$219,497	7.63	$76,423	7.89	$326,945	7.93
Short-term notes	13,901	10.25	-	-	-	-	-	-
Federal Financing Bank notes	-	-	5,624	5.77	9,811	7.50	8,791	7.50
Total	170,559	7.55	225,121	7.57	86,234	7.84	335,736	7.91
Interest on additional borrowings during fiscal year								
Long-term debt	27,516	8.39	45,350	8.50	-	-	45,350	8.50
Short-term notes:								
Payable to public	1,587	9.50	-	-	-	-	-	-
Payable to U.S. Treasury	3,489	8.17	4,977	7.00	1,307	7.00	4,947	7.00
Payable to Federal Financing Bank	25,739	7.01	32,371	7.50	3,139	7.50	31,788	7.50
Total	58,331	7.73	82,698	7.98	4,446	7.35	82,085	7.98
Interest on coal land reclamation	48		45		11		45	
Interest on Memphis pipeline	38		36		9		34	
Total interest charges	228,976	7.60	307,900	7.68	90,700	7.82	417,900	7.93
Summary of interest charges								
Long-term debt	184,174	7.52	264,847	7.77	76,423	7.89	372,295	7.99
Short-term notes:								
Payable to public	15,488	10.17	-	-	-	-	-	-
Payable to U.S. Treasury	3,489	8.17	4,977	7.00	1,307	7.00	4,947	7.00
Payable to Federal Financing Bank	25,739	7.01	37,995	7.18	12,950	7.50	40,579	7.50
Memphis pipeline	38		45		11		45	
Interest on coal land reclamation	48		36		9		34	
Total interest charges	228,976	7.60	307,900	7.68	90,700	7.82	417,900	7.93

BORROWINGS

Proceeds from borrowings during 1977 are estimated to be $1.0 billion, compared with $865.0 million in 1975 and $1.0 billion in 1976. These proceeds are required to finance that portion of capital outlay in excess of available net power proceeds, after interest to operations, Treasury payments, and changes in working capital.

	In Thousands			
	1975	1976	19TQ	1977
Obligations for capital outlay	$594,896	$1,472,078	$1,136,079	$1,278,787
Changes in unpaid undelivered orders	333,086	-329,175	-871,437	-66,952
Expenditures for capital outlay	927,982	1,142,903	264,642	1,211,835
Power operations:				
Income	1,190,818	1,716,279	433,742	1,983,158
Expenditures	-977,136	-1,387,431	-360,578	-1,599,389
Net	213,682	328,848	73,164	383,769
Income from sale of facilities and miscellaneous	2,203	3,038	372	1,563
Total	215,885	331,886	73,536	385,332
Changes in power inventories	-144,558	-49,879	11,495	-497
Changes in deferred items	12,788	-41,072	-5,095	-26,670
Changes in working capital	70,239	-12,976	-93,194	-58,330
Balance	154,354	227,959	-13.258	299,835
Payments to the Treasury	-91,372	-85,056	-22,100	-88,000
Remainder available	62,982	142,903	-35,358	211,835
Borrowings	865,000	1,000,000	300,000	1,000,000

Section 15d of the TVA Act authorizes TVA to issue bonds, notes, and other evidences of indebtedness to assist in financing its power program. The amount authorized to be outstanding at any one time is $15.0 billion. At the end of fiscal year 1977 this indebtedness is estimated to be $5.96 billion.

	In Thousands							
	1975 Actual		1976 Estimate		19TQ Estimate		1977 Estimate	
Borrowings outstanding								
Beginning of fiscal year:								
Long-term debt:								
Payable to public	$2,125,000		$2,075,000		$1,975,000		$1,975,000	
Payable to Federal Financing Bank	-		800,000		1,900,000		2,200,000	
Short-term notes:								
Payable to public	570,000		-		-		-	
Payable to U.S. Treasury	100,000		150,000		150,000		150,000	
Payable to Federal Financing Bank	-		635,000		635,000		635,000	
Total		$2,795,000		$3,660,000		$4,660,000		$4,960,000
Changes in borrowings								
During fiscal year:								
Long-term debt:								
Payable to public-Issues	-		-		-		-	
Payable to public-Refunded	-50,000		-100,000		-		-	
Payable to Federal Financing Bank-Issues	800,000		1,100,000		300,000		1,000,000	
Short-term notes:								
Payable to public	-570,000		-		-		-	
Payable to Federal Financing Bank	635,000		-		-		-	
Payable to U.S. Treasury	50,000		-		-		-	
Total		865,000		1,000,000		300,000		1,000,000
Borrowings outstanding								
End of fiscal year:								
Long-term debt:								
Payable to public	2,075,000		1,975,000		1,975,000		1,975,000	
Payable to Federal Financing Bank	800,000		1,900,000		2,200,000		3,200,000	
Short-term notes:								
Payable to public	-		-		-		-	
Payable to U.S. Treasury	150,000		150,000		150,000		150,000	
Payable to Federal Financing Bank	635,000		635,000		635,000		635,000	
Total		3,660,000		4,660,000		4,960,000		5,960,000

POWER INVENTORIES AND DEFERRED ITEMS

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Power inventories:				
Coal	$123,285	$29,394	$-14,068	$-8,113
Fuel oil	1,704	11,550	418	2,182
Supplies and materials	19,569	8,935	2,155	6,428
Total power inventories	144,558	49,879	-11,495	497
Unamortized bond discount and premium	-475	-510	-116	-464
Unamortized discount on notes payable to public	-13,901	-	-	-
Unamortized prepayments:				
Development of coal reserves	798	39,792	3,743	19,332
Development of uranium reserves	895	2,350	1,475	7,850
Writeoff of Memphis pipeline	-47	-506	-	-
Total unamortized prepayments	1,646	41,636	5,218	27,182
Unamortized debt expense	-58	-54	-7	-48
Total inventories and deferred items	131,770	90,951	-6,400	27,167

Power inventories are expected to increase by a net of $497 thousand in 1977, reflecting a decrease in coal inventories, an increase in fuel oil, and an increase in supplies and materials.

Coal stockpiles at steam electric generating plants were near normal levels at the end of fiscal year 1975, reflecting improved deliveries of coal during the last half of the fiscal year plus an unexpected low level of coal consumption. During

fiscal year 1976 coal receipts are expected to exceed coal consumption but at a much lower rate than for 1975. Coal prices are expected to continue to rise. For the transition quarter and fiscal year 1977 coal consumption is expected to slightly exceed coal receipts with coal prices increasing at a lower rate than for the previous fiscal year. The estimated value of coal inventories is expected to decrease by $8.1 million during 1977.

Fuel oil inventories are expected to increase by $2.2 million in fiscal year 1977 due primarily to inventory buildup to the level needed for meeting gas turbine requirements.

General storeroom supplies and materials for operating, maintenance, and construction activities are expected to increase in fiscal year 1977 by $6.4 million. This increase reflects a stabilizing inventory level in 1977 as compared to larger inventory additions in previous years. Additional spare parts for gas and steam turbines, generators, precipitators, wet-limestone scrubbers, and general inventory buildup for commercial operation of Sequoyah Nuclear Plant account for the greater portion of the estimated increase.

Reductions of $464 thousand in unamortized bond discount and premium balances and $48 thousand in unamortized debt expense are estimated in 1977. These credits reflect writeoffs of bond discount, premium, and debt expenses incurred in prior years in excess of the bond issue expense estimated for fiscal year 1977.

The increase of $27.2 million in unamortized prepayments in 1977 includes estimates for mine and mill development expenditures related to the acquisition of reserves of coal ($19.3 million) and uranium ($7.9 million). These amounts will be written off to coal inventory and nuclear fuel accounts as coal and uranium ore are recovered.

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PAYMENTS TO THE TREASURY

Payments to the Treasury for fiscal year 1977 are estimated at $88.0 million. As shown in the following summary, this will bring total cumulative payments from TVA to the Treasury to $1.5 billion, of which $1.4 billion is from power proceeds and $41.7 million is from nonpower proceeds.

	In Thousands
Payments under 1959 amendment, Section 15d of the TVA Act:	
Return (dividend) on appropriation investment, 1961 through 1977	$907,937
Reduction of appropriation investment in power facilities, 1961 through 1977	270,000
Total under provisions of Section 15d of the TVA Act	1,177,937
Other payments to general fund:	
Repayment of appropriation investment in power facilities, 1946 through 1958 ($185.0 million); and redemption of bonds sold by TVA to the Treasury prior to 1942 ($65.1 million)	250,131
Total from power proceeds	1,428,068
Payments from nonpower proceeds, 1946 through 1977	41,704
Total payments through 1977	1,469,772

PAYMENTS FROM POWER PROCEEDS

Prior to August 6, 1959, payments to the Treasury from power proceeds were made pursuant to Section 26 of the TVA Act and Title II of the Government Corporations Appropriation Act, 1948. Under this legislation, payments totaling $250.1 million were made toward reduction of the Treasury's investment in TVA power facilities. Of these payments, $185.0 million represented reduction of the appropriation investment in power facilities and $65.1 million represented retirement of bonds sold by TVA to the Treasury prior to 1942 under Sections 15, 15a, and 15c of the TVA Act.

As amended on August 6, 1959, the Tennessee Valley Authority Act provides for payments, beginning in fiscal year 1961, of stipulated minimum annual amounts as reductions of the appropriation investment in TVA power facilities until a total of $1.0 billion, in addition to previous payments, shall have been repaid. The amended act also provides for payments to the Treasury of a return on the unrepaid appropriation investment at the computed average interest rate payable by the Treasury upon its total marketable public obligations as of the beginning of each fiscal year. Actual for prior years and estimated payments for fiscal year 1977 from power proceeds total $1.4 billion and are presented in the following table:

PAYMENTS TO THE TREASURY FROM POWER PROCEEDS
(In thousands of dollars)

Fiscal Year	Appropriation Investment End of Year		Return (Dividend) on the Unrepaid Appropriation Investment		Reduction of Appropriation Investment	Total Payments
	Repayable	Unrepaid	Average Interest Rate	Amount		
1960	1,000,000	1,201,287				
1961	990,000	1,193,002	3.449%	41,432	10,000	51,432
1962	980,000	1,183,396	3.063%	36,542	10,000	46,542
1963	970,000	1,173,910	3.285%	38,875	10,000	48,875
1964	960,000	1,164,252	3.425%	40,206	10,000	50,206
1965	950,000	1,154,555	3.659%	42,600	10,000	52,600
1966	935,000	1,139,936	3.800%	43,873	15,000	58,873
1967	920,000	1,125,136	4.134%	47,125	15,000	62,125
1968	905,000	1,115,876	4.165%	46,862	15,000	61,862
1969	890,000	1,101,850	4.757%	53,082	15,000	68,082
1970	875,000	1,088,315	5.232%	57,649	15,000	72,649
1971	855,000	1,071,217	5.986%	65,146	20,000	85,146
1972	835,000	1,054,804	5.210%	55,810	20,000	75,810
1973	815,000	1,034,789	5.099%	53,785	20,000	73,785
1974	795,000	1,015,248	6.129%	63,422	20,000	83,422
1975	775,000	995,800	7.030%	71,372	20,000	91,372
1976	755,000	975,800	6.533%	65,056	20,000	85,056
19TQ[a]	750,000	970,800	7.000%	17,100	5,000	22,100
1977[a]	730,000	950,800	7.000%	68,000	20,000	88,000
Subtotal, payments under provisions of Section 15d of the TVA Act				907,937	270,000	1,177,937
1946-1958: Reduction of appropriation investment					185,059	185,059
Retirement of bonds sold by TVA to Treasury prior to 1942						65,072
Total cumulative payments from power proceeds 1946-1977					455,059	1,428,068

a. Estimated.

GENERAL SERVICE ACTIVITIES

General service activities include (1) general facilities used in all TVA programs, (2) valley mapping and remote sensing which serve all TVA programs, (3) facilities for regional observance of the National Bicentennial, (4) participation in US-USSR cooperative energy program, (5) miscellaneous expenses, (6) reimbursable services, and (7) administrative and general expenses. These are described in the following sections.

GENERAL FACILITIES

General facilities include capital outlays for office facilities and equipment, transportation facilities and equipment, and other general-use facilities and equipment. Acquisitions of general facilities are financed largely from power funds since the power program is the principal user.

Summary of General Facilities

	In Thousands							
	1975 Actual and Financing		1976 Estimates and Financing		19TQ Estimates and Financing		1977 Estimates and Financing	
	Appr.	Power Proceeds	Appr.	Power Proceeds	Appr.	Power Proceeds	Appr.	Power Proceeds
Office facilities and equipment	$379	$1,934	$233	$2,788	$177	$896	$202	$4,507
Transportation facilities and equipment	444	3,555	912	3,506	277	1,001	1,152	3,005
Other general facilities and equipment	1,593	-	1,719	-	173	-	2,129	-
Subtotal obligations	2,416	5,489	2,864	6,294	627	1,897	3,483	7,512
Less depreciation[1]	2,108	1,899	1,750	2,100	440	550	1,550	2,400
Total obligations	308	3,590	1,114	4,194	187	1,347	1,933	5,112
Changes in unpaid undelivered orders	-49	1,937	377	70	10	-	-	-
Total expenditures	259	5,527	1,491	4,264	197	1,347	1,933	5,112

1. See note on page 216.

Office Facilities and Equipment

	In Thousands							
	1975 Actual and Financing		1976 Estimates and Financing		19TQ Estimates and Financing		1977 Estimates and Financing	
	Appr.	Power Proceeds	Appr.	Power Proceeds	Appr.	Power Proceeds	Appr.	Power Proceeds
Electronic computing equipment	-	$849	-	$1,275	-	$280	-	$3,345
Other office facilities and equipment	$379	1,085	$233	1,513	$177	616	$202	1,162
Subtotal obligations	379	1,934	233	2,788	177	896	202	4,507
Less depreciation[1]	508	691	500	750	125	200	500	950
Total obligations	-129	1,243	-267	2,038	52	696	-298	3,557
Changes in unpaid undelivered orders	-223	1,110	200	70	-	-	-	-
Total expenditures	-352	2,353	-67	2,108	52	696	-298	3,557

1. See note on page 216.

The $3.3 million estimate for electronic computing equipment includes $2.0 million for a high-precision computing facility, $685 thousand for computer support and expansion equipment, $200 thousand for remote processors, $200 thousand for a communications controller, $160 thousand for automated drafting and design equipment, and $100 thousand for miscellaneous equipment.

The computations associated with nuclear power plant engineering and design must be carried out to an unusually high degree of precision or number of significant figures on computers which are specifically designed for highly accurate calculations. To meet current needs TVA has been contracting access to a high-precision computer for over three years and now the volume of nuclear computations is projected at a level that makes purchase of a high-precision computer economically feasible. Expansion of the disk and channel capacity of the TVA-owned IBM 370/165 computing system is needed to meet anticipated workload demands in the areas of remote processing and search and display. Increased utilization of advanced management techniques for construction work on nuclear power plants requires the installation of three additional remote processors which provide access to the central computing facility through a communications hookup. The expansion of remote processor systems throughout TVA requires additional communications control equipment on the large-scale IBM 370/165 computing system to handle and control remote access entry into the central system. Additional time-sharing and search and display terminals are needed as user requirements increase with the application of manpower saving devices which bring the computer closer to the individual work stations. Expansions are proposed in the automated drafting and design equipment used to prepare and correct engineering drawings.

The $1.4 million estimate for other office facilities and equipment provides $1.0 million for replacing worn-out or obsolete furniture and equipment and the acquisition of additional equipment and furniture. TVA owns approximately 104,000 pieces of office furniture and equipment having an original investment value in excess of $9.0 million. Continued use of old and worn-out equipment results in inefficiency, excessive costs for repair and maintenance, and excessive downtime. Equipment breakdowns and related production losses are costly. At least 32 percent of TVA's furniture and equipment is over 20 years old and far beyond its normal useful life. All furniture to be replaced meets or exceeds GSA standards for retirement. Timely replacement of equipment with modern machines having automated functions is needed for the efficient and economical performance of many activities within TVA. Many of the new machines are designed to conserve energy through automatic cutoff switches and have grounding circuitry which meets Occupational Safety and Health Act standards.

In addition to usual office furniture and equipment requirements, a $360 thousand estimate provides for replacements and additions of specialized equipment used in reproduction shops and for additional building and shop equipment and facilities such as air-conditioning equipment, stokers, boilers, fire-protective devices, power tools, pumps, motors, vacuum cleaners, and similar equipment.

The $4.7 million estimate for office facilities and equipment is partially offset by a $1.4 million depreciation credit leaving net budget requirements of $3.3 million.

Transportation Facilities and Equipment

	In Thousands							
	1975 Actual and Financing		1976 Estimates and Financing		19TQ Estimates and Financing		1977 Estimates and Financing	
	Appr.	Power Proceeds	Appr.	Power Proceeds	Appr.	Power Proceeds	Appr.	Power Proceeds
Trucks, trailers, and construction machines	$308	$2,411	$825	$2,518	$250	$950	$1,060	$2,085
Passenger vehicles	-	717	-	687	-	-	-	658
Aircraft	-	1	-	85	-	-	-	52
Shop work and equipment	136	426	87	216	27	51	92	210
Subtotal obligations	444	3,555	912	3,506	277	1,001	1,152	3,005
Less depreciation[1]	1,345	1,208	1,000	1,350	250	350	800	1,450
Total obligatons	-901	2,347	-88	2,156	27	651	352	1,555
Changes in unpaid undelivered orders	-	827	-	-	-	-	-	-
Total expenditures	-901	3,174	-88	2,156	27	651	352	1,555

1. See note on page 216.

An estimate of $3.1 million provides for replacements only of trucks, trailers, and construction machines for use in rough off-highway operating, maintenance, and construction activities. In 1977 a total of 397 units which are worn beyond economical repair will be replaced. Use of worn units results in equipment failures which tie up work crews, thus causing job delays and expensive repairs to units with a limited remaining service life. All units to be replaced for which a GSA retirement standard exists will meet or exceed those standards. Much of the replacement equipment will be more versatile, incorporating new designs that provide more production per unit, lower manpower costs, and include safety features not available when existing equipment was manufactured.

The $658 thousand estimate provides for the replacement of 200 passenger sedans. These units will meet or exceed GSA retirement standards and will have reached the point where replacement is more economical than the cost of repairs required for continued use. The replacements will be compact models equipped with fuel-conserving 6-cylinder engines and radial tires and will replace intermediate and standard-size sedans equipped with V-8 engines. With the replacement of 200 sedans in 1977, ninety-five percent of the sedan fleet will be compacts.

	Actual	Estimate	
	1975	1976	1977
Passenger vehicles:			
Acquisitions (sedans)	224	235	200
Disposals (sedans)	224	235	200
Net additions	0	0	0
Total fleet	942	942	942

The $52 thousand estimate for aircraft provides for the replacement of a 34-year-old Beechcraft airplane used for aerial photography and two additional aircraft—a single-engine fixed-wing airplane and one helicopter. The Beechcraft airplane to be replaced was modified in 1973 to meet FAA safety requirements and requires frequent X-ray examinations and will require further expensive modifications. Its replacement will be a military surplus light twin-engine aircraft powered with super-charged or turbine engines to permit higher altitude photography. The fixed-wing aircraft addition is a deHavilland Beaver on loan to TVA from the Army since 1974. This aircraft is equipped with special instruments and is used for air quality monitoring at the coal-fired steam plants. The additional helicopter will be acquired from military surplus as a reserve helicopter. The number of small Bell helicopters, which are used for transmission line patrol and construction, herbicidal and larvicidal spraying, etc., has been reduced by three in recent years; and a reserve helicopter is needed to permit replacement of helicopters during periods of scheduled maintenance.

A $302 thousand estimate for shop work and equipment covers installation of bodies, winches, and other special equipment to equip new fleet units; replacement of worn-out shop equipment: and the purchase of additional garage equipment.

The foregoing estimates for transportation facilities and equipment which total $4.2 million are partly offset by a $2.3 million depreciation credit on facilities in service, leaving net budget requirements of $1.9 million.

Other General Facilities and Equipment

	Appropriation Financed (In Thousands)
1975 actual	$1,593
1976 estimate	1,719
19TQ estimate	173
1977 estimate	2,129

The 1977 estimate of $2.1 million for other general facilities and equipment includes $68 thousand for analytical equipment to assure improved water quality standards; $22 thousand for air quality equipment; $95 thousand for equipment for the biothermal research facility adjacent to the Browns Ferry Nuclear Plant; $30 thousand for mapping and surveying equipment; $250 thousand for medical facilities and equipment; $50 thousand for facilities for reproduction and blueprint work; $75 thousand for a storage building at Norris; $115 thousand for environmental education facilities; and $624 thousand for many small items for use in geologic and soils work, hydrology work, property protection, and engineering testing.

Also included in the 1977 estimate is $800 thousand to complete construction of facilities to research and demonstrate the use of heated water in production of vegetable crops. This facility is located near the Browns Ferry Nuclear Plant and is in cooperation with EPA.

These items totaling $2.1 million are partly offset by a depreciation credit[1] of $250 thousand, leaving a net estimate of $1.9 million to be financed.

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1. In the interest of economy and efficiency, TVA general facilities and equipment are "pooled" and made available to programs and projects on a rental basis. The rental rates include appropriate provision for depreciation; therefore, budget requirements for each program and project include charges for depreciation. Since depreciation is a type of expense not requiring current outlay of funds, the total depreciation charges must be deducted to avoid overstatement of fund requirements. The credits estimated for fiscal year 1977 of $1.4 million for office facilities and equipment, $2.3 million for transportation facilities and equipment, and $250 thousand for other general facilities and equipment offset total charges included in program and project estimates as depreciation on TVA pooled general facilities.

VALLEY MAPPING AND REMOTE SENSING

	In Thousands
1975 actual	$439
1976 estimate	498
19TQ estimate	150
1977 estimate	534

To aid in planning and executing resource development programs, TVA, in cooperation with other agencies and organizations, provides topographic maps of the Valley. Also, the applicability of remote sensing techniques to resource activities is under continuing development.

Valley Mapping

	In Thousands
1975 actual	$340
1976 estimate	396
19TQ estimate	125
1977 estimate	418

In 1962 TVA completed the 775 topographic quadrangles covering the Valley using the national map series standards. Rapid changes due to population transiency, industrial mobility, and growth in general have brought about the need for a quick and economical method of map revision. In 1967 an interim revision program was initiated to accomplish these objectives. This economical and fast revision method involves the overprinting on existing maps of up-to-date information from recent aerial photographs, but can only be used once for a quadrangle and still remain legible. Therefore, a part of the continuing revision effort has to be accomplished by the more costly standard method of complete revision.

Although the interim method has facilitated the procedure, both internal and external demands for updated topographic maps continue to exceed the current rate of revision. This ever-increasing demand comes from a wide variety of organizations such as Federal and state agencies, engineering firms, industrial organizations, private individuals, and recently the

newly formed public and quasi-public development groups. Application of up-to-date maps by these organizations includes a variety of uses such as flood plain zoning and insurance, water and sewer systems and network planning, rural refuse collections system planning and operation, sanitary landfill planning, land-use planning, and industrial and recreational development evaluation.

Recognizing the need and value of the planned utilization of revised maps, TVA recently completed an in-depth review of the map revision program to determine if a method could be developed to increase the number of quadrangles revised within available funds and to establish an appropriate revision schedule. Based on this review, a plan has been adopted which will consist of a seven-year revision cycle. Each year, one-seventh of the 775 Valley topographic maps will be reviewed relative to their degree of obsolescence. Maps will be either marked to show that the review indicated a revision is not needed at the present time or updated by one of the two revision methods. High-altitude photography covering an entire quadrangle in one exposure will be utilized to determine efficiently and quickly which maps require revision first.

A total of 37 quadrangles are scheduled to be revised during 1977—25 by the interim or overprinting method and 12 by the standard method.

Remote Sensing

	In Thousands
1975 actual	$99
1976 estimate	102
19TQ estimate	25
1977 estimate	116

TVA continues to increase its knowledge, expertise, and capability in those aspects of remote sensing that give promise of practical application to areas of TVA responsibility. Once operational, the productive application of a procedure and the use of the remote sensing equipment is funded by the user.

Remote sensing includes detection, recognition, or evaluation of objects or phenomena by means of distant sensing or recording devices. Each area of investigation requires its own specialized sensors. Magnetometers, seismometers, thermometers, spectrometers, radiometers, radar, and thermal scanners, are examples of sensors currently in use.

Recent technological advances have maintained aerial photography as a viable form of remote sensing. During 1974 hyper-altitude color infrared photography and satellite imagery were shown to be sources of information for many of the traditional uses of photography. Their use in land cover mapping is now widespread. Applications to be further developed and demonstrated include archaeology, environmental impact studies, forestry management, agricultural, geology, hydrology, surveillance of surface mining, and pollution control.

Airborne thermal scanning for water surface temperature determination is now operational and is proving to be an important tool for monitoring conditions relevant to the solution of the problem of meeting Federal and state water quality standards. While the demonstration and productive work TVA has done in this area has been effective and has received national attention, its applications to the study of the effluents from generating plants into streams and into and from ash ponds will be further developed, refined, and demonstrated during 1977. In addition, TVA will continue to serve as an Earth Resources Observation System (EROS) Regional Browse File.

JOINT BICENTENNIAL DEMONSTRATION CARAVAN

	In Thousands
1975 actual	-
1976 estimate	$350
19TQ estimate	75
1977 estimate	125

TVA will participate in the American Revolution Bicentennial observance by organizing and managing a mobile exhibit to be called Tennessee Valley Bicentennial South, which will tour the Tennessee Valley states. The project involves the sponsorship and participation of state and local governments in eight states. The mobile exhibit, including five specially equipped 45-foot trailers, will include unique national, state, and local historic artifacts, documents, and photographs. The unifying threads tying the exhibit together will be the honoring of past and present cultures with a view of recognizing and understanding the relationship of our natural resource heritage to our past accomplishments and our future progress. All objects for display will be selected with these unifying threads or themes in mind.

The caravan will be scheduled for both one-day and longer showings at some 168 locations in eight states. It will open in Muscle Shoals, Alabama, January 2, 1976, and will end its tour in Corinth, Mississippi, in late November 1976. Upon arriving at an exhibition site, the five trailers will be connected in a modular arrangement. The caravan trailers will create a walk-through exhibit featuring Indian, colonial and antebellum cultures, the Civil War period, the industrial revolution, and the modern South—present and future.

Retired TVA employees have volunteered to serve as exhibit guides. A small, full-time staff of TVA personnel will also accompany the caravan to provide management and continuity as the exhibit moves from location to location and from state to state. National Guard units in the several states will provide semitractors, power supply, drivers, and exhibit setup service. Local promotion will be a coordinated activity of field personnel of TVA and the state and local bicentennial organizations.

The total cost of the caravan and its operation during fiscal periods 1976, 19TQ, and 1977 is estimated at $700 thousand. The states' contributions will approximate $150 thousand and TVA's share is estimated at $550 thousand. The estimate of $125 thousand for 1977 is needed for the operation of the caravan during the first quarter of the fiscal year, dismantling the trailer units, returning artifacts to owners, and disposing of exhibit equipment.

SCIENTIFIC AND TECHNICAL COOPERATION

	In Thousands
1975 actual	-
1976 estimate	$20
19TQ estimate	13
1977 estimate	20

An estimate of $20 thousand in fiscal year 1977 is for TVA's participation in a scientific and technical cooperative program between the United States and USSR concerning energy.

Under the terms of an agreement of May 24, 1972, between the United States and the USSR, scientific and technical personnel of the two nations are holding joint meetings from time to time to explore and exchange information in the field of energy. United States participants in this cooperative enterprise include representatives of Federal agencies and of private industry. The Department of State expects each participating agency or company to bear a share of the cost of arrangements for the USSR delegates while they are in this country for conferences, exclusive of transportation, lodging, and similar individual expenses. TVA has been asked to serve as the lead Federal agency for the working subgroup on electric power stations and power transmission.

OTHER EXPENSES

	In Thousands
1975 actual	$82
1976 estimate	200
19TQ estimate	56
1977 estimate	275

The Tennessee Valley Authority has important emergency preparedness assignments in the area of logistic support for the military services and for the civilian economy. Fallout shelter space has been prepared at selected points in the TVA service area under a reimbursable arrangement with the Department of Defense. These installations must have certain equipment and supplies on hand at all times, including office and communications equipment, medical supplies, food and water, bedding, lockers, and washing and drying machines. An estimate of $50 thousand provides $12 thousand for continuing maintenance of these items and $38 thousand for restocking these installations with dehydrated foods.

Pursuant to Public Law 79-561 (23 U.S.C., sec. 320), five bridges financed by the Bureau of Public Roads have been constructed across TVA's Kentucky, Chickamauga, Watts Bar, Fort Loudoun, and Pickwick Landing dams. The public law provides that bridges so constructed become a part of the dam structure with responsibility for maintenance of the bridges being assigned to the agency having custody of the dams. The law further provides for separate accounting of expenditures in connection with the maintenance of such bridges with no portion thereof being charged or allocated to other programs of the agency. A $225 thousand estimate provides for needed maintenance of the five bridges in 1977.

REIMBURSABLE SERVICES

This category includes (1) services which TVA performs at the request and expense of other agencies, and (2) the recovery of indirect expenses by income received from others. All expenses included in the category are offset by income and there is no net cost to TVA.

	In Thousands			
	1975 Actual	1976 Estimate	19TQ Estimate	1977 Estimate
Mapping work for other Federal, state, and local agencies	$373	$460	$118	$477
Providing employment opportunities in cooperation with Federal and state agencies	-	2,899	-	-
Environmental research and development in cooperation with the Environmental Protection Agency to construct and operate the biothermal research facilities at Browns Ferry Nuclear Plant	530	100	25	100
Energy and environmental research in cooperation with Environmental Protection Agency including studies to measure the effects of power plant emissions on air and water quality, and continuation of studies to develop and evaluate technology for removing sulfur oxides from power plant stack gases	3,060	12,041	2,922	10,243
Plan, design, and construct the liquid metal fast breeder reactor demonstration plant	1,007	1,410	393	1,658
Continuing cooperation with AID and other foreign assistance program agencies for which TVA's fertilizer program personnel provide training, research, and technical advisory services	1,003	723	180	552
Maintaining in standby service the Phosphate Development Works at Muscle Shoals, Alabama, for the Department of Defense	98	101	27	104
Miscellaneous reimbursements and recoveries of expenses:				
Back charges to contractors for assistance furnished by TVA	2,559	1,995	215	1,470
Technical advisory assistance for power distributors	464	470	129	515
Financial and accounting services to TVA Retirement System	364	380	94	371
Other miscellaneous reimbursements and recoveries of expenses	2,457	3,133	744	2,889
Total reimbursable services	11,915	23,712	4,847	18,379

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Schedule B-4. Administrative and General Expenses
(In thousands of dollars)

	1975 actual	1976 estimate	19TQ estimate	1977 estimate
Executive direction	266	275	69	275
General management	477	499	125	499
Planning and budgeting	472	495	124	495
Equal employment opportunity activities	423	525	131	525
Technical library and information services	1,297	1,456	356	1,581
Personnel services	3,287	3,900	975	3,900
Fiscal and accounting services	2,395	3,015	754	3,181
Legal services	1,925	2,500	625	2,610
Medical and safety services	1,685	1,950	488	2,050
Office and electronic computing services	1,354	1,375	344	1,475
Other services	227	236	105	199
Total administrative and general expenses	13,808	16,226	4,096	16,790

Distribution of Administrative and General Expenses
(In thousands of dollars)

	1975 actual		1976 estimate		19TQ estimate		1977 estimate	
	Appropriations	Proceeds	Appropriations	Proceeds	Appropriations	Proceeds	Appropriations	Proceeds
REGIONAL DEVELOPMENT PROGRAM								
Water resources development								
Capital outlay	385	-	490	-	125	-	510	-
Expenses	414	112	479	130	120	33	498	135
General resources development								
Expenses	362	-	419	-	107	-	435	-
Land Between The Lakes								
Capital outlay	78	-	55	-	24	-	93	-
Expenses	61	-	71	-	17	-	74	-
FERTILIZER DEVELOPMENT								
Capital outlay	38	16	34	29	7	9	65	-
Expenses	283	560	328	649	83	164	340	675
POWER SUPPLY AND USE								
Capital outlay	-	5,682	-	6,593	-	1,658	-	6,822
Expenses	-	5,542	-	6,418	-	1,622	-	6,675
GENERAL SERVICE ACTIVITIES								
Capital outlay	44	6	31	9	5	2	30	7
Expenses	14	211	16	475	5	115	16	415
Total distribution by funds	1,679	12,129	1,923	14,303	493	3,603	2,061	14,729
Total distribution	13,808		16,226		4,096		16,790	

ADMINISTRATIVE AND GENERAL EXPENSES
(Schedule B-4)

The 1977 estimate for administrative and general expenses is $16.8 million. This amount is less than one percent of the estimated total TVA expenditures for 1977.

Administrative and general expenses include the cost of executive direction and general management including the supporting activities of planning, budgeting, and providing equal employment opportunities. They include also the cost of providing the centralized services that are required for all projects and programs; these services are listed in schedule B-4.

Administrative and general expenses are distributed to all TVA projects and programs so that the entire cost of each activity may be reported accurately. Distribution is primarily on a direction of effort basis. The distribution is summarized at the bottom of schedule B-4, and the amounts distributed are included as an indirect expense in estimates for each project and program throughout this budget.

The activities and services included as administrative and general expenses are described below.

Executive direction is provided by a three-man Board of Directors created by the Tennessee Valley Authority Act. The Board is a full-time governing body appointed by the President and approved by the Senate. The Board establishes general policies and programs and reviews and appraises progress and results. It establishes the basic organization through which policies and programs are carried out. The 1977 estimate for executive direction is $275 thousand, the same as for 1976.

General management activities provide for the administrative supervision of TVA. They provide also for carrying out the objectives, policies, and directives of the Board of Directors and for coordinating all TVA projects and programs. They include also the providing of liaison between TVA and the Executive Office of the President, the Congress, and the Federal departments and agencies in the Washington area. The 1977 estimate for general management is $499 thousand, the same as for 1976.

Planning and budgeting activities assist management in developing program plans, evaluating program accomplishments, and administratively controlling funds. These activities include the development and implementation of the TVA system of corporate planning. They include also the preparation and continual review of the TVA budget program and the computerization of the budget system. The estimate for planning and budgeting activities in 1977 is $495 thousand. the same as for 1976.

Equal employment opportunity activities assist management in implementing TVA's equal employment opportunity policy by providing leadership and guidance in the development and execution of an effective equal employment opportunity program. These activities provide also for counseling employees and qualified employment applicants who claim discrimination because of race, color, religion, sex, national origin, or age, and for handling formal complaints of discrimination. They also provide for assisting women and minority group employees in their efforts to advance to higher level positions, administering civil rights compliance in TVA contracts, and enforcing nondiscrimination in TVA-assisted programs. The 1977 estimate for equal employment opportunity activities is $525 thousand, the same as for 1976.

Technical library and information services provide technical library services at Chattanooga and Knoxville, Tennessee; supervise technical library services at TVA's National Fertilizer Development Center at Muscle Shoals, Alabama, and at Norris, Tennessee; arrange schedules for official visitors and trainees; and supply information about TVA and its activities.

The four technical libraries provide the information needed by managers, engineers, scientists, and other professional people in the daily operations of TVA. This information is located and supplied by trained librarians, thus saving the time of the higher paid specialists. The libraries provide library research on technical and scientific problems. They keep TVA employees informed of research and studies conducted elsewhere so that full advantage may be taken of the results of projects conducted outside of TVA.

Each of the four technical libraries specializes in the materials needed by the employees in the area it serves. The library at Chattanooga specializes in power engineering, environmental, medical, and safety materials; the library at Knoxville specializes in management and engineering materials; the library at Muscle Shoals specializes in fertilizer and agricultural materials; and the library at Norris, Tennessee, specializes in forestry, fisheries, and wildlife materials. The TVA technical libraries are augmented by exchange arrangements with the Library of Congress and with the libraries of universities and colleges in the states where TVA operates.

Schedules and programs are arranged for official visitors who wish to consult with TVA staff members and inspect TVA projects. Training schedules are prepared for official trainees who wish to spend a longer period of time studying TVA and its operations. For fiscal year 1975, the total number of foreign official visitors was 1,527, and these came from 94 countries. The number of official United States visitors was 6,470. In addition, 46 trainees from 19 foreign countries spent two weeks or more training with TVA. The number of official visitors and trainees for 1976 and 1977 is expected to remain at the 1975 level.

Information services provide responses to requests for information about TVA and its activities. These requests number about 20,000 each year and come from members of the Congress, other public officials and agencies, the press, and the general public. Information services include also a variety of communication systems through which management keeps employees informed about TVA activities.

The 1977 estimate for technical library and information services is $1.6 million. The increase over the 1976 estimate is needed to meet the increasing workload of the technical libraries and information services.

Personnel services include (1) recruitment, selection, classification, compensation, and training and development of employees; (2) union-management relations; (3) employee-management relations; (4) organization, staffing, and administrative studies and analyses; (5) improving the productivity and effectiveness of TVA operations; and (6) rehabilitation and placement of handicapped individuals.

TVA has over 29,000 employees of many specialties and skills scattered over an area of 80,000 square miles. More than one-third are craftsmen hired on temporary appointments of a few days to a year for work on the various TVA construction projects. Thus, the hiring, termination, and rehiring of these employees require individual and detailed personnel action.

Centralized employment services recruit, examine, and maintain registers of qualified applicants; and from these registers, appointments are made on the basis of merit and efficiency. There is no political test or qualification and no discrimination because of sex, race, creed, color, age, or national origin. Since TVA construction work is done mostly by force account, registers must include an adequate supply of trades and labor employees. An automated personnel management information system is used to record, retrieve, and report personnel data and information. A program to integrate and automate the functions of the applicant occupational registers, the employee personal history records systems, and the personnel management information system is being developed.

Training and development of employees is carried out by informing employees of agency programs and objectives, helping employees obtain or improve skills for job assignments, and helping employees become qualified for future jobs.

Union-management relations are provided by collective bargaining agreements with the unions that represent TVA employees. Trades and labor (blue collar) employees are represented by the Tennessee Valley Trades and Labor Council, composed of 16 international craft unions. Salary policy (white collar) employees are represented by the Salary Policy Employee Panel, composed of three international and two independent unions. The agreements with these bodies establish procedures to determine rates of pay, hours of work, working conditions, and adjustment of grievances.

Employee-management relations are an important part of TVA's personnel services. They are carried out through a program that involves 90 cooperative groups comprised of employee and management representatives. These groups meet regularly to consider ways to improve communications between employees and management; conserve manpower, materials, and supplies; improve quality of workmanship and services; promote education and training; correct conditions making for grievances and misunderstandings; prevent hazards to life and property; improve working conditions; and encourage good public relations.

Organization, staffing, and administrative studies and analyses are performed on a continuing basis to assure optimum use of employees and to provide an organization best suited for efficient operations. Personnel policies, standards, and procedures are modified as changing needs require.

The application of industrial engineering techniques assists in improving TVA's productivity and operational effectiveness. These techniques are used to develop TVA-wide system projects and selected projects in offices and divisions.

TVA hires, places, and advances individuals who have a disability that results in a substantial handicap to employment. TVA undertakes this through rehabilitation placement and career counseling.

The 1977 estimate for personnel services is $3.9 million, the same as for 1976.

Fiscal and accounting services include keeping general accounting records; preparation, audit, certification, and payment of vouchers payable and payrolls; making audits of accounting records, financial statements, expenditures, and revenues; maintaining custody of and disbursing TVA funds; making management audits and reviews; maintaining a system of internal control; and auditing records of contractors who perform work for TVA to determine that adequate records are maintained, accumulation of costs is reasonable, and billings are within the terms and conditions of the particular contract.

Monthly and annual financial statements and reports are prepared so that management will know how much was spent and for what, and how this compares with budget estimates. Final cost reports are prepared on all completed plant facilities.

TVA has a single integrated system of financial control which was installed 37 years ago. At the same time, accrual accounting and cost-based budgetary practices were installed. An integrated program structure is used for budgeting, accounting, reporting, and control; this structure assures that all costs are charged to appropriate program elements and budget classifications.

The General Accounting Office each year audits TVA accounts and reviews the system of internal control and financial reporting. Annual audits are made also by a national firm of certified public accountants.

The 1977 estimate for fiscal and accounting services is $3.2 million. The increase over the 1976 estimate is needed to handle the increased workload, principally in contract audits.

Legal services include the defense of all suits brought against TVA; the filing and prosecution of suits by TVA when necessary to protect its interest; the review of Federal and State legislation; the preparation of contracts, deeds, bills of sale, leases, and other legal documents; the participation in proceedings before the Energy Research and Development Administration to obtain licenses for the construction and operation of nuclear power plants; the work of complying with environmental laws and regulations; the protection of TVA's inventions; and the providing of legal advice on every phase of TVA activities.

The 1977 estimate for legal services is $2.6 million. The increase over the 1976 estimate is needed for growth in general litigation work and in legal work related to the regulation of TVA programs concerned with nuclear and environmental matters.

Medical and safety services protect the health of employees and reduce service-connected injuries and illness. These services help to control costs by reducing the number of man-hours lost by illness or accidents and by reducing employee compensation costs arising from on-the-job injuries.

Occupational medical services are designed to contribute to employee health and productivity. Individual health evaluations help match the applicants to specific jobs within their capacity. Interviews, physical examinations, and health testing procedures are used to assess and monitor employee health and ability. Initial assessment and treatment are provided for work-related injuries and illnesses and for minor or emergency conditions occurring at work. Health education and counseling are provided to enable employees to assume increased responsibility for their own health. Rehabilitation counseling and referral services facilitate return to work following work-related injury or illness. Assistance is provided to other TVA organizations in the reduction and control of health hazards in work environments. Other activities include developing standards and procedures for protecting the health of TVA employees and systematic monitoring of employee health.

TVA medical area offices are located at Chattanooga, Knoxville, and Nashville, Tennessee, and at Muscle Shoals, Alabama, where there are large concentrations of employees. At most major operating steam-electric plants, health stations are staffed with a resident nurse under the professional supervision of physicians at one of the area medical offices. Mobile health stations bring health services to selected groups of employees in locations distant from TVA fixed medical facilities. Medical facilities are established at major construction projects for the duration of the construction phase with the cost of operating each facility charged to that construction project. A mobile health clinic and a miniclinic provide thorough health monitoring services to employees in locations remote from area and construction medical offices.

TVA provides a safe and healthful work environment by developing and implementing safety and health standards and requirements. It emphasizes hazard control in design, purchasing, construction, maintenance, and operating activities. TVA conducts both on-the-job and off-the-job safety programs. In addition, a vehicular safety program is conducted among TVA employees, and a water safety program is conducted among users of TVA lakes. Safety activities at construction projects are charged directly to the projects, and safety activities for principal operating programs are charged to the operating programs.

TVA's disabling injury severity rate for fiscal year 1975 was 59 percent below the rate for the past 10-year period. TVA's vehicular accident frequency rate for fiscal year 1975 was 5.33 per million miles driven, the lowest since fiscal year 1967 when it was also 5.33. The only lower fiscal year on record was 1956 with a rate of 5.28. Four National Safety Council awards were earned: two for construction activities, one for power production activities, and one for overall TVA activities.

The estimate for 1977 is $2.1 million. The increase over the 1976 estimate is needed for expanding medical services to take care of the increasing number of employees and for the hazard control program.

Office and electronic computing services include centralized stenographic and clerical pools, maintenance and disposal of records, and assistance in improving office management and methods. In addition, office training is conducted at principal office locations, special office training is given to minority group members, and preassignment training is given to potential employees who have little or no experience to qualify them for TVA stenographic and clerical positions.

Technical assistance in the use of TVA's automatic data processing equipment is provided. This assistance includes system analyses and programming services.

The 1977 estimate for office and electronic computing services is $1.5 million. The increase over the 1976 estimate is primarily for the development of a computer-based text processing system that will expedite and reduce the cost of preparing and editing highly technical documents, such as specifications for nuclear power plants.

Other services include the cost of annual audits by the General Accounting Office and by an independent firm of certified public accountants, the cost of office space and other services provided to employee credit unions, and the cost of the TVA U.S. Savings Bond promotion program. The 1977 estimate for other services is $199 thousand, slightly less than the 1976 estimate.

Mr. WHITTEN. I wonder if you would yield.

Mr. EVINS. I yield to Mr. Whitten.

Mr. WHITTEN. Mr. Chairman, I am glad to have this opportunity to speak on the record with these people before us. We all appreciate the very fine job that Joe Evins has done, not just in the TVA area but for the whole country.

Having sat beside Joe through the years and having been actively interested in the TVA too, I just wanted to reaffirm the fact that Joe Evins—and I am going to add another name—Bob Jones—there have been many, many years where I know they carried the load and others got the limelight, newsstories. As I think of the TVA, and I go back to 1941, I think you were very lucky to have a man like Lilienthal with the vision that he had to come up with the concept which was adopted by the Congress.

Lilienthal with his visionary look was succeeded by Gordon Clapp. He was a down-to-earth person. He made it work.

Mr. Wagner, I can compliment you too on the fine job you have done. Through the years when we had the Tims Ford fight and had to whip two U.S. Senators to look after my chairman, we did it. We might have had to differ with some TVA people. I wish there was a list here of the many fine things that Joe Evins has done for the area, which wasn't always accomplished with ease, but with hard work.

I agree with him about the effect of the rate system and the increases that we have. I also recognize, however, with a little background in economics, that a big part of our trouble in the United States is that our money has got nothing behind it and it gets cheaper and cheaper. So, as you figure any valuable commodity in terms of cheaper and cheaper money, it comes out at a higher and higher price.

I think the foreign aid program is a big factor in it. We give them our money. We give them our goods to get our money back. We get the goods. They have the money. It is bound to be inflationary. That is the reason I voted against it.

I had the Secretary of the Treasury put in the record this year—and I am seeing that it is printed—do you realize we have got over 4,000 military bases in the United States? I doubt if you need half of them. We have got over 1,700 overseas. Many of them you couldn't defend 24 hours. I am for defense. I am for defending this country.

That is the reason I hate to see them dissipate the money involved in maintaining needless bases instead of spending it on the military that is mobile and a reserve and guard where they contribute to the economy during the week, and when they are called out.

That is beside the point.

I wish, Mr. Chairman, you would let me ask the staff of this committee to bring together and place in the record the accomplishments in the TVA area in which you played a prominent part. You would hesitate to do that. I ask the privilege of doing it. I think it ought to be here.

When Joe Evins returns to Tennessee, we are going to miss him; the country is going to miss him. Around him will be a great section of the country that he did as much to develop as all the Chairmen of the TVA Board we have had put together. They came up with the idea, but he saw that the funds were available to carry the ideas out.

Mr. Chairman, we wish you God's speed wherever you go, but

wherever you go there will be evidence all around you of your contribution to our country.

Mr. EVINS. Thank you, Mr. Whitten.

Mr. Myers?

Mr. MYERS. I am a relative newcomer to this committee compared to the experience of my colleagues. Long before I became a member of this committee I recognized where the power was in the committee, and the TVA program is one of the many accomplishments that our chairman, Joe Evins, has made in his service here in this Congress and on this committee.

There are many. The TVA is one as are the programs of the Appalachian Regional Commission. I think the tribute that we pay this morning is inadequate because you cannot really measure what the chairman of this subcommittee has done for your area.

There are many things that have been done. I think the TVA is one of the finest.

It is very true what Mr. Whitten has said. His district certainly is going to miss him, as well as the entire seven-State TVA area. But most importantly our country and this committee will miss Joe Evins, because he has been a champion for those things that make America a better place to live in, better place to raise our children and grandchildren. Because of that we are all going to miss the services of our chairman, Joe Evins.

Mr. EVINS. Mr. Myers, the Wabash River is going to be developed.

Mr. MYERS. I was hoping you would stick around and help me do it.

Mr. EVINS. Mr. Bevill?

Mr. BEVILL. If I may join my colleagues, I wish to take advantage of this opportunity to pay tribute to my distinguished chairman. I personally and frankly feel—I have said this many times—that you are the most outstanding chairman in this Congress. I have served on many committees during my 10 years and have never been impressed any more with the accomplishments and the manner in which you have conducted this committee, and I can see why you are known as the builder of America, because this has given you the opportunity to play such an important role in building America.

I was just looking at a list of things in which you played a leading role—building dams, reservoirs, roads, bridges, highways, post offices, Federal buildings, hospitals, community centers, libraries, vocational schools, rural electrification, telephone lines.

Mr. EVINS. I don't know where the gentleman did his research.

Mr. BEVILL. And in revitalizing the cities and communities. I think that certainly accounts for the report that you are compared to Hadrian, who was the great Roman builder, because you have done such an outstanding job. I can see why he was compared to Estes Kefauver, James Polk, and you will go down in history as one of the greats.

I share what my colleague from Mississippi said. I think the country will suffer a real loss in your retirement in your leaving this committee and this Congress.

Mr. EVINS. Thank you, gentlemen.

Mr. BURGENER. Mr. Chairman, I am not the youngest member of the committee, but I am the newest. I want to associate myself with the remarks of my colleagues. I have thoroughly enjoyed your leadership.

The people of Tennessee are to be commended in their good judgment in sending you here so long. I wish you every success in your well-deserved retirement.

Mr. EVINS. Thank you. It has been a pleasure to work with you all. It has been a pleasure to see TVA make progress and go forward. We know they will do so in the next 40 years.

I have looked over your budget, Mr. Chairman. It is good, well prepared, one of the largest in your history. I will have questions later. We will hear you now. You may proceed.

GENERAL STATEMENT

Mr. WAGNER. Thank you, Mr. Chairman.

Let me say it is with genuine regret we learned several days ago of this decision of yours. It has been widely recognized and we recognize that you have been a firm supporter and solid supporter of TVA and its activities. I feel through that support you have really been working in the interest of our people, the people of the Tennessee Valley and the people of the Nation.

Building takes first an idea and then an execution, but if funds aren't available, nothing happens. This committee, through your leadership, has certainly funded a great many worthwhile things in the Tennessee Valley.

I have been appearing before this committee in one capacity or another more than 20 years now. Most of those 20 years have been before you as chairman of this subcommittee, and certainly when you have been critical of us we have deserved it. This matter of electric rates I will talk about in a minute. We are as concerned about it as you are. We pledge to you as you leave the Congress that we will do everything in our power to hold those rates as low as we possibly can, and I would expect that, although you are no longer in the Congress, we will hear from you from time to time.

It is not far from your home to the headquarters and we would hope to have the benefit of your advice for many years.

We too feel that your leaving will create a void here which will not be filled for some time, and we regret your decision, but we recognize your right to years of relaxation and leisure.

Mr. EVINS. Mr. Chairman, we have been told that the Tellico Dam is probably TVA's last power dam. TVA is now going nuclear. Nuclear is also very controversial. Is it true that TVA has developed the Tennessee River, developed most of the tributaries and Tellico Dam is probably the last major power dam to be built by TVA, to be built in the foreseeable future.

Mr. WAGNER. It probably is the last one in the foreseeable future. There may be others that come up as the economy changes.

Mr. EVINS. Will the next 40 years see an increase in the use of nuclear power in the TVA area?

Mr. WAGNER. We will still build coal-burning plants. If it looks like we can provide the current for less money in an environmentally acceptable fashion with the nuclear, we would do that. If it looks like coal is the best bet, we will do that. There may be other technologies developed in the future.

We will always go for the best and lowest cost.

Mr. Chairman, we welcome the opportunity to meet with this subcommittee to present our programs and plans for fiscal year 1977 and to discuss our appropriation request. We will be glad to describe our budget programs in such detail as you may wish. However, at the outset, I would like to bring the Subcommittee up to date on one aspect of the overall TVA program which has a direct effect on the lives and livelihood of more than 6 million Tennessee Valley residents—the TVA electric power program. I do so because of this subcommittee's interest and concern over the complex energy problems facing our Nation today, and because TVA, as the country's largest power supplier, must continually address itself to these same problems. If I may, I would now like briefly to discuss this area of national concern before moving on to our budget program for fiscal year 1977.

FUEL COST AND ELECTRIC RATES

In the past couple of years millions of Americans have been shocked and confused by threatened shortages and increased costs of energy. I think you could fairly include electric power suppliers in the list of unhappy consumers, because the costs of oil and gas and coal to run electric powerplants all increased by 100 percent or more within 2 years after the oil embargo.

The members of the public most severely affected by these skyrocketing energy costs are people on low or fixed incomes. Each of us is painfully aware of the hardships faced by low-income families who cannot pay today's living costs, and their problems are compounded when high winter heating costs come on top of the rising bills they must face throughout the year for food, shelter, clothing, and other necessities. We have had many letters, Mr. Chairman. We have met with people. We are concerned about the plight of these low-income people and will do something about it. They are frustrated and angry, and the many letters you and we have received are indicative of the tremendous impact that high energy costs are having on the lives of not only Tennessee Valley residents, but citizens throughout the country.

The public is asking us why energy costs have gone up and what can be done about them. The answers to these questions are complex, but the heart of the problem for TVA, as it is for the electric utility industry nationwide, is today's higher cost of fuels required for power generation.

As the members of this subcommittee know, most of TVA's power supply is generated from coal—some 34 to 38 million tons annually. In 1969 the average cost of coal burned in TVA powerplants was about $4.50 a ton. As of mid-1974 it had doubled to $9 a ton, and then in less than a year it doubled again to $18 a ton. It has continued at about that level in recent months. We have paid up to $35 for individual purchases. The prices we are talking about here are average prices. As a result TVA's fuel costs have increased from about $150 million in calendar year 1969 to $612 million in calendar year 1975. That is an increase of over $450 million in fuel costs alone in a 6-year period. This is by no means the only area of rapid cost increases TVA has faced, but it is certainly the largest.

With the stabilization somewhat in recent months of coal costs, there has been some positive news for power consumers in the Tennessee Valley region. Electric rates have gone down in 5 of the last 6 months after reaching a peak last September. Since then we have had five decreases and one small increase. This leveling off has certainly been a gratifying trend after the sharp increases earlier, and we are working daily to hold the line.

Just as electricity isn't the only part of the energy problem, electric rates are not the only part of our efforts to make electricity affordable to the consumer. People pay electric bills, not electric rates, so our efforts are directed at holding down bills as well as holding down rates. I'd like to describe some of the actions we are taking in both areas.

In terms of rates, I am happy to report that the gap between the national average residential electric rate and the lower average in the Tennessee Valley region is still being maintained. In 1975 the national average was 3.2 cents per kilowatt-hour of electricity used, while it was 2.1 cents in the Tennessee Valley. Year after year TVA and its distributors have kept the cost of power production and distribution much lower than the average for utility companies nationwide. According to Federal Power Commission reports, these basic costs totaled about $1,120 million in the TVA region during fiscal 1975. That's $700 million less than what this cost would have been at the higher national average. While some of this difference is due to economies of sizes, we think it is also a measure of the efficiency of the TVA power system—efficiency which helped save our power consumers $700 million last year.

TVA COAL RESERVES

TVA is continuing to expand its coal reserves and production from those reserves. Development of additional mining on the Camp Breckinridge reserves, which will mean a 30-percent increase in scheduled deliveries from that source, is on target with production expected to begin in the fall of 1977. Smaller new mines are being developed on the Koppers reserves, with one mine in production and another due to begin production shortly. Last year TVA leased additional reserves adjoining the Breckinridge property, and preliminary engineering work for development of mining there is underway now. TVA also is actively looking into other reserves that might be acquired.

NUCLEAR PLANTS

As a further means of stabilizing energy costs, we are moving ahead as rapidly as possible to get our nuclear plants constructed and on line without sacrificing safety standards. Like other power suppliers, TVA has faced serious obstacles in this work, including changes in regulations that have required extensive design changes in nuclear powerplants already under construction. As you know, efforts are being made at the national level to permit more standardization and reduce this problem in nuclear plant design and construction.

TVA's first nuclear plant, Browns Ferry, has been out of service since the fire there nearly a year ago, because of the complex job of

planning and carrying out acceptable repairs and modifications to the control cable system there. Fuel costs at Browns Ferry are far below those at our coal-fired powerplants, and the replacement of its economical power from other sources has meant added costs. To give you a figure on the fuel cost, our average cost of coal is $18 a ton; fuel costs of nuclear fuel are equivalent to $3 a ton. So there is a substantial saving. This will also mean a savings when the first two Browns Ferry units return to service and when construction is completed on a third unit there. Most of the new generating capacity under construction for the TVA system is nuclear, as studies have continued to indicate that nuclear would be the more economical and environmentally acceptable choice for our system. Obviously, however, it is going to take both coal and uranium to fuel a growing amount of our Nation's energy needs. As new generating capacity is required, we will continue to analyze the economic and environmental considerations on a case-by-case basis to insure the lowest possible cost to the consumer.

ELECTRIC RATE STRUCTURES

In addition to these operational efforts to help power consumers, we are also taking a hard look at electric rate structures. We have designated a staff in our Power Utilization Division to analyze the effects of alternative rate structures in the TVA area. We have also begun a special power load metering project at Chattanooga to help provide additional information for evaluating rate design concepts. These are special meterings to check the effect of peak loads on our system and see whether it would be economical in toto to go to a peak load pricing system. But we want the data first. Our concern, however, is to make sure any changes are equitable and are, in fact, improvements.

Some approaches to altering rate design are based on the premise that the lower the income, the smaller the use of electricity. Following this theory, it would seem that if one reduced rates to the smallest users of electricity and increased them to the larger users, low income people would be helped. But this approach is based on a false premise. For example, TVA's analysis of electric bills following January's extremely cold weather confirmed once again that many of the low-income families in our region live in energy wasteful homes. Many lack adequate insulation or weatherproofing and use very large quantities of electricity during the winter heating season.

You mentioned, Mr. Chairman, a woman with a social security income of $130 a month and an electric bill of $105 a month. That is a low-income person. One hundred five dollars is roughly 5,000 kilowatt hours. That is a high user. If we would provide low rates for low use and high amounts for higher use, we would hurt and not help the woman.

We had a number of similar cases brought to us by citizens of LaFollette, Tenn., and we have had some from Chattanooga.

Mr. EVINS. I can never see how lowering rates would hurt anybody, Mr. Chairman. You said it would hurt her. I can't see how it would hurt.

Mr. WAGNER. The proposal is, you lower the rates for low blocks of usage and you would then have to increase them for higher blocks of usage to stay in the black. Otherwise you would lose money.

Mr. EVINS. You may proceed.

Mr. WAGNER. Thank you.

We don't want to do anything to penalize the people who have faced the biggest increases in electric bills and the biggest hardships in paying them. The remedy must be based on individual need, something the electric meter doesn't show.

HOLDING DOWN ENERGY COSTS

With the increase in income levels that has occurred over the years in the Tennessee Valley, electric bills still are a small part of living costs for most families—about 3 percent on the average in 1975. That is the average. This doesn't go to the question of the low-income electric users you mentioned. But averages can mask exceptions, such as the low-income families, and these are the people we are trying most to help.

Many do not know they can make significant savings on heating bills by weatherproofing their homes at minimum cost. Some are renters and have no strong incentive to make permanent improvements. We are working intensively with local electric power distributors. Federal and State energy agencies, social welfare agencies, and others to attack these problems on an individual basis.

TVA and the distributors have had underway for some time an intensive campaign to inform consumers about energy efficiency. This effort not only fosters the wise use of our energy resources, but provides dollars and cents help in holding down power consumption. We are also helping train conservation specialists for local power systems, since the families we are talking about are their customers, and we are looking at the feasibility of training welfare agency workers to give assistance in conservation measures as part of their visits to low-income families.

In cooperation with the power distributors, TVA has just launched a super saver energy home program which, with the help of homebuilders, will be implemented on a valleywide basis. In this program we have developed detailed specifications for the ultimate in weatherproofing and insulation to be installed during construction. Building these homes in different locations should provide several demonstrations of dramatic savings in a home's use of energy, and the lessons learned should be valuable whether the heating source is electricity, a fossil fuel, or some other means.

Mr. EVINS. Mr. Chairman, if I might interrupt, that is a primary function of the Federal Power Commission, to talk conservation, practice conservation, and teach conservation to our children. I have heard the FPC Chairman say, "Make conservation a way of life." It is good to talk about conservation, but it is very difficult to have humble people with modest incomes rebuild their houses. What they are interested in is low rates.

You are just giving us a lot of rhetoric here. We have heard that before. You may proceed.

Mr. WAGNER. I should say that, for instance, many low-income homes may have a fireplace they don't use and the chimney isn't stopped up. We have found leaks in ductwork that carry the heat. Those things can be repaired at very low cost and they are within the financial

means of the low-income families. That is the kind of thing we are trying to do, Mr. Chairman.

We are continuing our efforts to encourage use of the heat pump as an energy saver. It is at least in part a form of solar energy. We estimate that the 60,000 Tennessee Valley homes now using heat pumps are saving about 420 million kilowatt-hours of electricity and more than $7 million on electric bills this winter.

To find a better way of identifying energy inefficiency on a large scale, we will conduct an experiment this November involving TVA, the Energy Research and Development Administration, our Athens, Tenn., power distributor, and the U.S. Army. An aircraft equipped with sensitive heat detecting equipment will fly over approximately one-third of the city of Athens. This sensing equipment will detect heat loss from homes and businesses. Our plan would then be to contact the individuals who own the structures to let them know that significant energy savings might be obtained through an investment in insulation or other weatherproofing techniques. This program may have valleywide or national implications if it proves successful and practical.

The roots of the problem of high energy costs run deep, and can only be solved in the long run by concerted national action. In the Tennessee Valley, we are working closely with the public to explain why their costs for power have increased and what we and they can do to help alleviate the problem.

I would like to thank the subcommittee for giving me this time to present pertinent information about the TVA power system. Now, if I may, I would like to highlight our appropriation request for fiscal year 1977.

WATER RESOURCES DEVELOPMENT

Mr. Chairman, you commented on the fact that last Thursday marked the 40th anniversary of the completion of TVA's first major water resources development project—Norris Dam and Reservoir, on the Clinch River in east Tennessee.

In looking back over the history of Norris Dam, we can see in microcosm the contributions that projects such as this have made to the quality of life for all the valley's people.

As the largest of TVA's tributary river storage reservoirs, Norris has played a key role in reducing the threat of floods which once ravaged the region. Its turbines have combined with those in other TVA dams to churn out billions of kilowatt-hours of low-cost hydroelectric power. Its regulation of streamflows has helped to maintain a year-round navigation channel on the Tennessee River that has been a major factor in attracting billions of dollars in industrial development to the region, creating tens of thousands of new jobs. Around its shores have sprung up numerous parks and recreation areas, while its waters and surrounding woodlands abound with fish and wildlife for all to enjoy.

A large percentage of the appropriations request before you today is for water resources development projects which are underway now. As is true of Norris Dam, these projects will provide both immediate and long-term benefits for the people of the Tennessee Valley region.

TELLICO PROJECT

The Tellico Dam and Reservoir Project on the Little Tennessee River, first funded by the Congress in 1967, is continuing on schedule. As the subcommittee instructed us last year, we are pushing to begin filling the reservoir in January 1977, with project completion in December 1977. As you know, this project will extend navigation some 30 miles up the Little Tennessee, creating a water and shoreline resource with great potential for industrial, homesite, and recreational development in an area that has been marked by a general lack of economic opportunity.

The project will also add an average of 200 million kilowatt-hours a year of pollution-free, low-cost hydroelectric power to meet the region's energy needs without requiring construction of a powerhouse. It will also provide an additional 126,000 acre-feet of flood storage. Most of the flood control benefits will be downstream at Chattanooga, where damage in a 1973 flood could have been further reduced by at least $15 million if this additional floodwater storage had been available.

THE DUCK RIVER PROJECT

I am happy to report to the subcommittee that the first of two dams comprising the Duck River project in middle Tennessee—Normandy—was closed in January and the reservoir is being filled as rapidly as rainfall will permit.

With the approaching completion of all work at Normandy, the main construction effort is being shifted to the Columbia damsite downstream, where preliminary work has been underway since 1973. When Columbia Dam is completed in 1980, the two reservoirs will provide a combined total of about 340,000 acre-feet of storage volume for flood control, resulting in substantial flood protection for nearly 10,000 acres of agricultural and potential industrial land downstream from the dams.

I might add that the Sixth U.S. Circuit Court of Appeals recently upheld a lower court's decision on the adequacy of TVA's environmental impact statement for the project.

THE BEAR CREEK PROJECT

A significant portion of our appropriation request for water resources development is for the Bear Creek multipurpose water control system in northwest Alabama and northeast Mississippi. As you may recall, this project consists of four small dams which will provide flood relief for agricultural lands, recreational opportunities, and a resource for meeting the water supply needs of an area experiencing considerable industrial growth.

Bear Creek Dam and floodway, which was completed in 1970, has already yielded substantial benefits for farmers in the area by reducing the frequency and extent of crop-season flooding. TVA agricultural economists, comparing crop and acreage information both before and after the completion of Bear Creek Dam, estimate that farmers in the area are realizing an average annual benefit of nearly $114,000 from

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construction of the dam and floodway. We recently closed Little Bear Dam, and we expect to complete the last two dams in the system in 1978.

FERTILIZER DEVELOPMENT

I have spoken briefly of the agricultural benefits resulting from the completion of one unit of the Bear Creek project. Let me turn now for a moment to a program which has had a far greater impact on agriculture both in the Tennessee Valley and throughout the Nation—TVA's fertilizer-agriculture research and development activities.

Primarily through the introduction and widespread use of new fertilizers and innovative agricultural practices, the United States is one of the best fed nations in the world. Yet we also manage to supply huge quantities of food to others—both for humanitarian reasons and as commercial sales. This extraordinary capability depends heavily on the technology TVA has developed in the manufacture and introduction of new fertilizers.

TVA's National Fertilizer Development Center at Muscle Shoals, Ala., is the basic source of new fertilizer technology for the United States and, to a growing extent, for the entire world. In fact, most of the fertilizers made in this country are manufactured under TVA patents or with the aid of TVA-developed processes. Partially because of this highly developed fertilizer technology and its availability to manufacturers and the public, the United States is able to produce nearly 18 percent of the world's cereals and 70 percent of the world's grain exports.

Although the past accomplishments of the National Fertilizer Development Center have been many, much remains to be done. Of particular concern at this time is the development of technology to make better use of phosphate reserves, and to make it practical to utilize lower grade deposits. We are also beginning work on developing new alternatives for the production of ammonia, the building block for all nitrogen fertilizers, in light of our dwindling supplies of natural gas, historically the prime feedstock for manufacturing ammonia. Additional effort will go into developing new technology for using wet-process phosphoric acid more effectively in fertilizer production. Work will also be accelerated on developing and introducing less energy-intensive manufacturing processes.

I might add that TVA has recently developed a process for manufacturing ammonium phosphate fertilizer which we estimate could save as much as 700,000 barrels of oil or about 4.5 billion cubic feet of natural gas per year if adopted by the fertilizer industry nationwide. Another energy-saving and pollution-reducing process developed recently is specially well-suited for use in granulation plants that make mixed fertilizer grades.

OTHER PROJECTS

As the subcommittee is aware, funding was added by the Congress to our budget request for fiscal year 1976 and the transition quarter for three significant projects. As we have not had the opportunity to discuss these projects with you previously, I would like to do so now.

The first of these projects is located in the Lower Elk River valley of middle Tennessee and north Alabama, where TVA and local officials

have been working for some time on plans to demonstrate an alternative to the growing national problem of rural sprawl in strips along country roads. By applying innovative concepts in regional planning, the project will demonstrate how a planned community in a rural area can meet the demand for services generated by increased population growth while preserving much of the open space and forested land usually associated with a rural setting.

The first of these planned communities—or rural villages as they are called—will be located near the existing town of Elkmont in Limestone County, Ala. With technical assistance from TVA, the Alabama Elk River Development Agency will develop the project. The fiscal year 1977 allowance will fully finance TVA's part of the program. Proceeds from the sale of land and fees from utilities at Elkmont will furnish the revenues needed to finance future villages at other locations.

I am also pleased to report that we are moving rapidly ahead toward beginning construction late this summer on a flood protection project for South Chickamauga Creek near Chattanooga. In March 1973, extreme rainfall caused South Chickamauga Creek to reach record levels, resulting in serious flood damages in this densely populated area. Had TVA's flood protection plan for South Chickamauga Creek been completed in time for this flood, an estimated $10 million in flood damages caused by the creek would have been averted. This project, which is a cooperative effort between TVA and the city of Chattanooga, will involve construction of a series of levees, internal drainage systems, and channel widening and relocation.

Finally, TVA and four State governments recently announced that work would begin this spring on a demonstration program to reclaim abandoned "orphan" coal strip mines in portions of Kentucky, Tennessee, Alabama, and Virginia. These are lands that were mined and abandoned before effective reclamation laws were enacted, and this program is the first multistate attempt at correcting this problem.

Mr. Chairman, we are grateful for the time and attention you have given our opening statement. Now, with your permission, I will ask Mr. Seeber to provide more detail on our budget request for fiscal 1977.

Mr. EVINS. Mr. Seeber, we have looked over your budget. You may proceed.

Mr. SEEBER. Mr. Chairman, our appropriations request for fiscal year 1977 is $121,185,00. We do not expect any unobligated balance to carry over from 1976 or the transitional quarter.

The budget request includes $52 million in Water Resources Development capital outlays. The largest of those figures is for the Duck River project, $17 million; for the Bear Creek, $16 million; for the Tellico project, $9.7 million; for the South Chickamauga Creek project, $3.7 million; for the Decatur Bridge, $2.5 million.

The budget provides $2.7 million for use in constructing the demonstration rural village near Elkmont, Ala. TVA's Land Between the Lakes project would have a capital investment of $1.8 million to expand and improve recreation and conservation education facilities.

Also on the capital outlays side is $12.7 million for chemical facilities for the National Fertilizer Development Center at Muscle Shoals, Ala. On the operating side of the budget, the total expenses there is $50 million. This includes $12.8 million for our operating the water resources development program, $20.5 million for the fertilizer de-

velopment program, $3 million for operation of Land Between the Lakes, and $12.7 million for our general resources development program, including agriculture, forestry, stripmine reclamation, tributary area development, community improvement and human resources development.

That is a summary.

Mr. EVINS. Thank you, Mr. Seeber, and Mr. Chairman.

The appropriation for last year was $100,025,000. Next year you are asking for $121,185,000, which is a $21,160,000 increase.

We have a breakdown of the various projects which Mr. Seeber has just mentioned. I wanted to make three general observations without going into a lot of detail.

FOREIGN PURCHASES

It has been called to my attention from some of my colleagues, and I don't know how extensive it is, that TVA is presently purchasing its generators or generating equipment abroad rather than from domestic manufacturers. When you purchase abroad that contributes to our balance-of-payments situation. To what extent are you purchasing from domestic sources today?

Mr. WAGNER. Most are from domestic sources. The last purchase was from a Swiss firm.

Mr. EVINS. The present policy is to purchase from domestic suppliers wherever possible?

Mr. WAGNER. Yes, sir. We buy in accordance with the Buy American Act and the Executive orders and policies issued under it. These provide specifics under which we compare bids from abroad, and domestically. The great bulk of the purchase of our electrical equipment has been in this country also.

Mr. EVINS. I haven't seen anything in your budget about that. It was called to my attention by some of my colleagues.

Please elaborate for the record what TVA proposes to do about escalating power rates. You said this is a national problem. TVA has always prided itself in its great flexibility; and its being able to operate on its own without interference from outside sources.

I think TVA can solve the problem if it will. We want you to supply for the record specifically what you propose to do about trying to bring these rates down.

Mr. WAGNER. I will be glad to do that.

[The information requested follows:]

TVA is committed to the production and transmission of electricity at the lowest feasible cost consistent with reliable service and environmental quality. We are continuously taking actions to reduce cost of operation at existing facilities and to plan for meeting the region's future power requirements in the most efficient manner available to us. Our continuing efforts range from actions that may save several millions of dollars to those that may save only a few hundred. For example, we have made some changes in the way work crews are made up and how overtime is scheduled which has resulted in a reduction of maintenance expenses by at least $1.5 million per year. We have been able to increase use of automated control equipment. We have made numerous small changes to powerplants which will simplify and speed up maintenance duties. All these actions reduce costs and help hold down rates. In the immediate future the supply of power from TVA's Browns Ferry nuclear plant will help stabilize TVA's costs of generation. Following a rise in fuel costs from 5.92 mills per kilowatt-hour to 8.22 mills per kilowatt-hour in fiscal year 1976, fuel costs are estimated at only

8.23 mills per kilowatt-hour in fiscal year 1977 reflecting the influence of this plant's low fuel costs. In the longer range we expect that major cost and supply benefits will result from increases in the mining of our own coal reserves and from our efforts to locate and reserve nuclear raw materials. By mining our own coal we can help offset sudden increases in the cost of coal such as the Nation experienced last year. The same stabilizing influence will be brought to TVA's nuclear fuel generation costs by TVA's nuclear fuel supply program.

Again, however, the problems of energy supply and cost are national in scope, and only concerted national actions can provide total solutions.

COST INCREASES

Mr. EVINS. What does TVA propose to do about the cost overruns occurring in its nuclear powerplants?

However, I was pleased and gratified that one project shows no cost overruns. In about five or six you had large cost overruns. How were you able to be so successful in the one and not in the others?

You can supply the details of that answer for the record.

[The information requested follows:]

At the time the Watts Bar nuclear plant project estimates were reviewed, it was determined that no adjustment in the cost estimate for this plan was necessary. However, the same factors which have affected other plant costs are at work at Watts Bar and a later review of the cost estimate may show that an increase in the estimate is necessary. The magnitude of any increase is not known at this time.

Mr. EVINS. Normandy Dam is completed but percentagewise how far along is the Columbia Dam?

Mr. KIMMONS. At the end of this fiscal year 1977 budget, about 50 percent complete.

BEAR CREEK PROJECT

Mr. EVINS. Tell us in a few words why the Bear Creek project has increased $3 million. For the past 2 or 3 years you have been increasing it over your previous estimates. It shows your estimates are not accurate at the time.

Mr. WAGNER. The cost increase we have had, Mr. Chairman, has been due to a number of things. One of them is poor foundation conditions that we discovered during construction of Little Bear Dam. We explore foundations ahead of time. We find cavities in between drill holes that require taking care of and so there was an increase in the cost of foundation at Little Bear Dam. This situation has required more excavation and fill than expected. Our concrete costs have been higher than they should have been because we had bad weather during the Little Bear construction program. There also have been some increased design costs and archeological investigations for Upper Bear Dam.

Mr. EVINS. If you can hold down these escalating costs, you might be able to hold down on your rates.

Mr. WAGNER. We are hoping to do that.

CHICKAMAUGA CREEK PROJECT

Mr. EVINS. Last year the committee provided funds for initiation of the Chickamauga Creek project. This year we note the cost goes up substantially over previous estimates. What have you found out in the

past year that caused prices to go up? How much are the local people contributing toward the project?

Mr. WAGNER. The people locally, through the city, are contributing about $4.5 million, which is about 28 percent of the total project cost. The prices have gone up there, costs have gone up generally, because the project has been delayed from when we initially planned to build it. Inflation caused prices to rise.

Mr. EVINS. There is substantial local contributions?

Mr. WAGNER. About $4.5 million.

Mr. EVINS. Explain for the record what TVA is doing in providing assistance to TVA communities in connection with the Tennessee-Tombigbee project.

TOMBIGBEE AREA HELP

Mr. WAGNER. In general we are working with the communities in their efforts to set aside and develop waterfront lands that might be available for industrial use and to accommodate other changes which the waterway will bring.

This work does not duplicate but builds on the planning activities of the States and other agencies. It is the same as the assistance provided to States and communities in all of the Tennessee Valley region. However, because of the major changes to be expected from the Tennessee-Tombigbee project, there are more requests from that area.

We can give you something more on that for the record.

Mr. EVINS. Very good. Supply some additional information for the record.

[The information requested follows:]

At the request of the North Mississippi Industrial Development Association and the Mississippi Research and Development Center, TVA has conducted a study to identify areas along the Tennessee-Tombigbee Waterway and in nearby communities which have the potential for industrial development.

Industrial opportunities were identified most strongly at four towns along the waterway. As a result of the study, seven communities have asked for our assistance in determining industrial development opportunities resulting from the construction of the waterway. Studies are now underway for two of the communities to jointly develop a port facility and related industrial park. Similar studies will soon be started for the other communities.

Mr. EVINS. Tell us what you are doing in connection with ERDA regarding solar research.

Mr. WAGNER. We are cooperating with ERDA and the University of Tennessee in building a solar home near Knoxville as an experimental demonstration.

Mr. EVINS. Is this all from appropriations from ERDA or is it all from appropriations from TVA?

Mr. WAGNER. We are putting some TVA money in that.

Mr. EVINS. How much? You didn't supply that in your budget.

Mr. WAGNER. About $50,000 in that project to date, and we expect to spend an additional $25,000 in fiscal 1977. You asked about our cooperation with ERDA. We also are supporting research on solar energy through our contributions to the Electric Power Research Institute. Over the next four years EPRI will spend more than $15 million on solar research and development.

Mr. EVINS. Last year the committee provided substantial funding for the initiation of stripmining reclamation projects by TVA. How many acres are expected to be reclaimed in fiscal year 1977?

Mr. WAGNER. The total program is 87,000 acres, Mr. Chairman.

Mr. EVINS. 87,000 acres?

Mr. WAGNER. That is right. That would not all be in 1977. I don't have the figure for 1977 specifically, but the program would involve parts of the four participating states and includes between 35 and 40 counties in the Tennessee Valley region.

Mr. EVINS. How many reclamation projects are currently underway?

Mr. WAGNER. On this program we are just beginning.

Mr. EVINS. You are still planning?

Mr. WAGNER. The States are planning and getting set. We are organizing and are about ready to go.

Mr. EVINS. Nothing has been accomplished with current year funds other than planning?

Mr. WAGNER. The appropriation was released to us in January of this year.

Mr. EVINS. That is a very important program, stripmining and reclamation, and we encourage you to go forward with it.

How many years do you envision it will take?

Mr. WAGNER. We have planned a 5-year program. It would depend on the way in which it is funded. I should say we are very grateful to Congress and the administration for having made this program available. These are orphan lands. They have been an eyesore for a long time. We have been interested in seeing them reclaimed on a rather large-scale demonstration for some time. This would do it.

Mr. EVINS. Your justifications note that TVA "will work cooperatively with landowners, State and Federal resource and regulatory agencies, coal surface mine operators, equipment manufacturers, and others" in both development and application of this program. Explain the cooperative efforts with State and Federal agencies.

Mr. WAGNER. The abandoned mine reclamation demonstration will be conducted by the State reclamation agencies with technical supervision and oversight by TVA. In some demonstration programs, the states are active participants. On reclamation projects involving active stripping the States approve variances in their reclamation requirements for test and demonstration of advanced mining and reclamation techniques.

The Departments of Agriculture and Interior assisted in the development of the abandoned mine reclamation proposal. Various Federal agencies will provide advisory assistance to States in conduct of the program. Reclamation of abandoned mines on Federal properties, such as National Forests and Corps of Engineers projects, are fully coordinated with the agency concerned. The Departments of Agriculture and Interior and TVA have initiated a cooperative research project in Breathitt County, Ky., to analyze the environmental effects and costs involved in three methods of mining—present Kentucky law, back-to-

contour, and modified back-to-contour. The Department of Agriculture is assisting in the monitoring of hydrologic data on TVA's multiple seam back-to-contour mining demonstration in east Tennessee.

Mr. EVINS. Do the landowners and mine operators reimburse TVA for reclamation demonstrations on their property?

Mr. WAGNER. Landowners and mine operators do not reimburse TVA for reclamation demonstrations on their property. Our demonstrations are primarily aimed at providing off-site benefits by controlling siltation and acid drainage as well as improving the aesthetics. Direct benefits to the landowners are nominal, at best. Moreover, in the abandoned mine demonstration project, landowners must allow public access for recreational use, agree not to remine the area for 5 years after treatment, and protect the reclamation work for 10 years. Each owner will be asked, but not required, to contribute equipment, labor, or materials to the reclamation effort. Preliminary contacts indicate a willingness on the part of many owners to contribute in some way to the reclamation.

Mr. EVINS. What impact will these demonstrations have on the land reclaimed?

Mr. WAGNER. The reclamation effort involves some grading by earthmoving equipment, construction of silt traps or settling basins, sowing grass, and tree and shrub planting. This is the minimum level of work necessary to correct problems of surface water flow, erosion, and acid water drainage to eliminate off-site damages. Elimination of off-site damages is the chief purpose of the program.

Mr. EVINS. What is your total capability in fiscal year 1977?

Mr. WAGNER. About $5.5 million, Mr. Chairman.

PROGRESS ON HARTSVILLE

Mr. EVINS. What is the current status of the Hartsville nuclear powerplant? What is holding up the project?

Mr. WAGNER. We are waiting for a limited work authorization from NRC. We would hope that would be forthcoming pretty soon and construction would begin.

TOWNLIFT

Mr. EVINS. You mentioned the Lower Elk community that we provided funds for. How many townlift projects has TVA completed? How many are underway? How many do you envision?

Mr. WAGNER. We are working in 35 communities in the townlift program, Mr. Chairman, and it is a little difficult to say how many you do each year, because these towns in the townlift program will adopt different programs. One may be for improvement in the appearance of the downtown area; another one may be a program for improving their water supply; or another one for the flow of traffic patterns through the city. So each city may have a number of projects, and I think normally we are completing about 55 to 60 projects a year in these 35 communities.

POWER RATES

Mr. EVINS. TVA's electric power rates have escalated rapidly over the past few years, particularly since 1967. The committee has noted in some press reports that TVA rates have actually increased faster

than those charged by private utilities, causing TVA to be in danger of losing its low-cost power yardstick image. Beginning in 1967, how many rate increases has TVA imposed on the people of the Tennessee Valley region, and how much is the accumulated revenue from these rate increases?

Mr. WAGNER. Increases in electric rates since 1967 have been brought about primarily by increases in the price of fuels of all types. When fuel prices rise the impact on production costs of all electric utilities tends to be rather uniform. Such price increases of recent years have contributed to about a 1 cent/kWh change in the price of electricity sold by TVA, about the same as they have added to electric bills across the country. However, since TVA's previous rates were very low, the same 1 cent/kWh increase results in a much different percentage rate of change for TVA than for the Nation. Since 1967 TVA's wholesale rates have been modified 7 times including the adoption of the fuel adjustment provision in August 1974 and the modification of that provision to include imported power in January 1975; 11 upward and 8 downward adjustments have occurred since August 1974 due to the application of the fuel and purchased power adjustment provisions. The accumulated revenues through June 30, 1976, are expected to be about $3.2 billion. Of this amount $2.1 billion results from general rate modifications and $1.1 billion results from the operation of fuel and purchased power escalators.

Mr. EVINS. Why have TVA rates risen faster than those charged by private utilities?

Mr. WAGNER. Since TVA rates were much lower to begin with, naturally the rate of increase would be greater. Since 1967 all electric rates have risen significantly, even so, the average TVA residential rate today is less than the national average residential rate was in 1967. Both rates have increased in about the same amounts, TVA's from 0.9 cent per kilowatt-hour in 1967 to 2.1 cents in 1975; the national average from 2.2 cents to 3.2 cents.

Mr. EVINS. The TVA Annual Report for 1975 states that the primary cause of escalating power rates is the price of coal. What is your current average cost of coal per ton and how has this changed over the past year?

Mr. WAGNER. TVA's current average cost of coal burned is $18.63 per ton. This amounts to 215 percent of the $8.61 per ton average for the 12 months ending June 1974, and is 149 percent of the $12.49 per ton cost for January 1975.

Mr. EVINS. The committee last year urged you to investigate and take appropriate action against coal companies that might be in violation of antitrust laws. What have you done in this regard?

Mr. WAGNER. Following the hearings last spring before the Public Works Subcommittee of the House Appropriations Committee on TVA's 1976 appropriations, TVA's former General Counsel, Robert H. Marquis, together with his first assistant, Herbert S. Sanger, Jr., our present General Counsel, met with officials of the Antitrust Division of the Department of Justice and the Federal Trade Commission to discuss the possibility of antitrust action related to increases in prices TVA has had to pay for coal. We expressed particular concern about the effects on coal purchasers of oil companies' acquisition of coal companies. We restated TVA's view that a full investigation

should be conducted and offered our full cooperation in supplying any information available to us which might be useful in connection with such action. The officials concerned indicated interest but did not commit their agencies to any particular course of action. We understand that the Department of Justice has found no evidence of a conspiracy to drive up coal prices although it is continuing to review the coal industry.

I testified before the Senate Judiciary Committee's Subcommittee on Antitrust and Monopoly on June 19, 1975, giving that subcommittee the benefit of TVA's experience with coal prices and coal availability before and after conglomerate ownership of our coal suppliers. I also gave testimony to the Subcommittee on Energy of the Joint Economic Committee on December 8, 1975. Members of the TVA staff also met with the House Judiciary Committee at its request on June 18, 1975, to discuss the coal industry and coal prices.

Beginning in October 1975, TVA staff assisted the FTC Bureau of Competition during the FTC's consideration of the proposed merger of Falcon Seaboard, Inc., and MAPCO, Inc., both major TVA coal suppliers. This included assisting FTC's staff in preparing document requests, supplying FTC with data concerning TVA's contracts with these companies and concerning TVA's coal suppliers and coal company ownership generally. The MAPCO-Falcon merger could have had a substantial, direct effect on TVA, as Falcon supplies us with more than 9 percent of our coal receipts and MAPCO's Webster County Coal Corp. supplies us with about 3.5 percent of our coal. The MAPCO-Falcon merger was dropped by the companies before they responded to the FTC request.

On March 1, 1976, TVA representatives testified at a nonpublic proceeding before the Federal Trade Commission with respect to Kennecott Copper Corp.'s compliance with the FTC order to divest itself of Peabody. TVA made its files and top management available to the FTC staff in this matter.

In the area of the application of the antitrust laws to the energy companies, we recognize, as have others, including members of Congress, that investigation and enforcement in such a complex field is too large a task for any single, corporate agency such as TVA, which itself has no investigatory, regulatory, or subpena powers. For example, the Congressional Record for October 23, 1975, after referring to several unsuccessful congressional bills to limit or prohibit oil firms from investing in alternative energy sources and the length of time involved in an FTC judicial effort, stated on page H10291 that "The Congress must take action to put the cords binding the petroleum companies together." Nevertheless, using the resources which we do have, we have taken several steps which will result in positive benefits to TVA. Our General Counsel's staff has begun an independent effort to determine the possibility of private antitrust causes of action in the coal industry with emphasis on those aspects of industry operations that have the greatest impact on TVA. This effort is in progress.

During the period since the 1975 appropriation hearings, TVA has continued to aggressively enforce its coal contracts in other ways. For example, during the last year, TVA suspended deliveries under 44 coal contracts and terminated the contractors' right to make further deliveries under eight contracts for violations of contract provisions.

Such violation included failure to deliver coal, failure of the coal delivered to meet quality requirements, failure to perform required reclamation, and deliveries from unauthorized sources. In addition, since December 1975, TVA has cooperated with the Department of Justice and the FBI in an investigation of possible improper actions by certain TVA coal suppliers. Results of this investigation were recently presented to the Federal Grand Jury in Knoxville; the Department of Justice is continuing to investigate this matter.

Mr. EVINS. TVA has imposed monthly fuel escalators on the already overburdened power consumer of the Tennessee Valley region. Tell the committee how often this escalator has increased in the past year.

Mr. WAGNER. During the past 12 months TVA's fuel adjustment addendum increased 7 months and decreased 5 months.

Mr. EVINS. How long do you plan to maintain fuel escalators?

Mr. WAGNER. We believe that the escalation provision should remain in effect until fuel prices stabilize to such an extent that we can project future fuel costs with reasonable accuracy. The only alternative to maintaining the escalation provision would be to raise our rates sufficiently high to allow for considerable margin of error in estimating future fuel costs. We do not believe that this alternative would enable us to maintain our rates at the lowest feasible level.

Mr. EVINS. How significant an impact have the environmental considerations had on your power rates?

Mr. WAGNER. Although significant amounts are being invested each year in the construction of facilities to protect the quality of air and water—for example, $180 million in fiscal year 1975—up to now, as a result of the accounting for such expenditures, environmental costs have had a relatively minor impact on TVA power rates. In looking at the annual operating expenditures that are considered in reviewing rates, we estimate that in fiscal year 1975, annual operations expenditures for environmental control, including depreciation, interest, and operating and maintenance expenses, amounted to some $43 million. This was 3.6 percent of TVA's total expenses for the year.

Clearly, the full impact of environmental expenditures on power rates is still ahead of us. TVA's program to improve environmental protection at our existing or planned steam generating plants was only about 10 percent complete by the end of fiscal year 1975. By the time the committed program is completed, we estimate TVA's total investment in air and water pollution control facilities will be about $1 billion. The program includes measures necessary to control fly ash emissions to levels required by the Environmental Protection Agency and the States, as well as to control sulfur dioxide emissions, chemical effluents, and heated water discharges from all our plants to the extent needed to adequately protect the environment. Of course, the costs associated with the uncompleted portion of this program will not be reflected in our operating costs nor in our charges for power until they have been completed and placed in service.

However, our main concern about costs of compliance with environmental requirements is that certain requirements now being proposed, in addition to those I just mentioned could increase these annual costs many times, without corresponding environmental benefits.

Mr. EVINS. Do you believe that any current environmental requirements are unnecessary?

Mr. WAGNER. There are several current environmental requirements which we believe are unnecessary and in addition there are proposals before Congress at this time which would, if enacted, add to the list.

In the area of water pollution control, TVA feels cooling towers have been required where they are not necessary to protect the acquatic biota. Facilities TVA is being required to install for chemical effluent control at steam electric generating plants will result in minimal environmental benefit, considering the substantial costs involved.

In the area of air pollution control, the major requirement which we believe to be unnecessary is the one which would require existing coal-fired powerplants to use constant emission reduction measures, such as scrubbers, when less expensive methods would protect the public health and welfare.

The Clean Air Act Amendments of 1970 require that sulfur dioxide emissions must be controlled to the extent necessary to protect the public health and welfare from adverse effects of sulfur dioxide. There is no quarrel, of course, with this requirement. The problem is that in implementing this requirement, we believe the Environmental Protection Agency has chosen to unnecessarily restrict the alternatives available to meet the requirement. In TVA's case, the most economical, reliable, and effective way to meet the requirement at most plants is through the construction of tall stacks and the installation of intermittent emission control systems. This method of SO_2 control can fully protect public health and welfare from all known adverse effects for about one-tenth the cost of constant control methods such as scrubbers, low-sulfur coal, and massive coal washing required by EPA.

It has been TVA's contention that EPA has illegally restricted the use of TVA's alternate control methods. The issue is now before the U.S. Supreme Court in a case filed by TVA. Proposals are now being considered by Congress to enact into law an amendment to the Act which would prohibit these methods of SO_2 control. If these proposals are adopted the annual cost of operating our coal-fired plants will be increased by some $300 million per year.

Mr. EVINS. How would your rates have been affected if you could have eliminated some unnecessary environmental requirements?

Mr. WAGNER. As I have indicated, we do not believe that the cooling towers at Browns Ferry and Sequoyah nuclear plants or the expenditures for chemical effluent control are necessary to protect the environment. However, we have committed $100 million to the construction of cooling towers at Browns Ferry and Sequoyah and $75 million to chemical effluent control at existing coal-fired plants. Annual operating expenses are estimated at $14 million and $12 million respectively. If the more stringent SO_2 emission standards and thermal water quality standards which are now being advocated are required, the annual costs would be increased from the level of $26 million to over $350 million, including some $300 million for meeting SO_2 standards at existing coal-fired plants. Power rates will have to be increased to produce $26 million per year to cover these unnecessary expenses already committed and increased to produce over $350 million if the additional unnecessary investments are required.

Mr. EVINS. What impact have these huge increases in operating expenses had on consumer power rates?

Mr. WAGNER. The increase in operating expenses from 1975 to 1976 will require an increase in the average revenue from consumers of

0.293 cent per kilowatt-hour, or 27 percent. Projected operating expenses for 1977 will result in a decrease of 0.045 cent per kilowatt-hour, or 3 percent, as a result of increased sales.

Mr. EVINS. The Congress has increased TVA's debt ceiling from $5 billion to $15 billion. Tell the committee why this massive increase in borrowing authority was needed.

Mr. WAGNER. TVA's total of bonds and notes outstanding under this borrowing authority exceed $4 billion and commitments for equipment on order but not yet delivered would have totally exhausted the remainder of the $5 billion borrowing authority. The additional borrowing authority was needed to provide us with the capability to finance necessary power generating facilities to meet the increasing power needs of the area for which TVA is required to provide an ample supply of electric power.

Mr. EVINS. Your budget justifications show that you plan to borrow $1 billion in fiscal year 1977. Explain why this is needed.

Mr. WAGNER. The $1 billion of borrowing for fiscal year 1977 is required to provide the major portion of capital expenditures for power facilities, or that portion not provided for from current earnings. These capital expenditures are necessary to continue in that year the construction program which will meet the power needs of the TVA region.

Mr. EVINS. It is shown in your justifications that your interest charges have risen from $228,976,000 in fiscal year 1975 to $307,900,000 in fiscal year 1976 and on to $417,900,000 in fiscal year 1977. How have these increases in interest charges affected consumer power rates?

Mr. WAGNER. TVA charges interest to construction on the funds used for capital purposes prior to the time these projects are completed and placed in service. I would like to supply a tabulation which shows total interest charges, the amount of this interest charged to construction, and the remaining amount of interest charged to operations.

[The information follows:]

[In millions of dollars; fiscal years]

	1975	1976	1977
Total interest charges	$229.0	$307.9	$417.9
Interest charged to construction	−117.4	−135.0	−186.9
Interest charged to operations	111.6	172.9	231.0

The $61.3 million increase in interest charged to operations from 1975 to 1976 will require an increase in total revenue of 0.05 cent per kilowatt-hour, or 4 percent. The additional $58.1 million in 1977 will require 0.025 cent per kilowatt-hour increase, or 2 percent.

GENERATING CAPACITY ADDITIONS

Mr. EVINS. Your budget justifications state that your system loads are expected to increase from 18,633 megawatts in January 1975 to about 31,250 megawatts by the winter of 1981–82 and to further increase to about 40,550 megawatts by the winter of 1986–87. Tell the committee how these load estimates are determined.

Mr. WAGNER. Forecasting total area requirements for the next 10 years is a process consisting of a series of major steps beginning with

the collection of data on past loads and the economic and population factors affecting demand for electricity. National and regional economic forecasts are utilized to provide a set of economic forecast assumptions. Loads are grouped for analysis by broad classes of consumers. Business and industrial consumers are further divided by size of demand. There are about 180 business and industry loads with demands of 5,000 kilowatts or more. Forecasts of these loads are based on contract demands, historical loads, stated plans of the firms, and the expected future markets for products. Forecasts are also prepared for loads under 5,000 kilowatts utilizing various statistical methods including time series analysis and extrapolation techniques. Econometric and appliance saturation techniques are also used. The large Federal and industrial directly served loads are studied and forecast on an individual basis. The results of these forecasts taken together produce the forecast for the total TVA power system.

Mr. EVINS. Your budget justifications show that your operating margin amounted to $31,988,000 in fiscal year 1975, took an incredible jump in fiscal year 1976 to $139,592,000 and takes another leap in fiscal year 1977 to $179,269,000. Tell the committee why such massive increases are needed in the operating margin.

Mr. WAGNER. The operating margin for 1975 amounted to only 2.8 percent over costs of $1,144 million. After required accounting adjustments to cover interest charged to capital, there was $5 million available to meet system capital requirements of $870 million. The remainder was provided from borrowings. On this basis, each of the years 1976 and 1977 will produce $109 million, only 10 percent of the $1,100 million necessary for system expansion. We anticipate borrowing $1 billion in each of those years.

Mr. EVINS. How does TVA's operating margin compare to those of private utilities?

Mr. WAGNER. Investor-owned utilities do not report an amount called operating margin. Operating margin is used by TVA to mean earnings remaining after the payment of the return on the appropriation investment. A comparable figure reported by private utilities is their net income. According to Moody's Public Utility Manual 1974, net income of all privately owned class A and B electric utilities averaged 15.3 percent of operating revenues for the 15-year period ending December 31, 1972. TVA's operating margin for fiscal year 1975 and projections for fiscal years 1976 and 1977 amount to 2.7 percent, 8.2 percent, and 9.2 percent, respectively, of operating revenues.

Mr. EVINS. How have these massive increases in the operating margin affected consumer power rates?

Mr. WAGNER. The increase in TVA's operating margin from $32 million in fiscal year 1975 to the projected $139.6 million in fiscal year 1976 will add about $1 per 1,000 kWh of residential usage. The total bill this month for a thousand kWh will be about $24. The projected increase of $40 million between fiscal year 1976 and fiscal year 1977 amounts to about another 15 cents to this bill.

Mr. EVINS. Your operating expenses have risen from $961,138,000 in fiscal year 1975 to $1,333,781,000 in fiscal year 1976, and then to $1,482,567,000 in fiscal year 1977. Why are your operating expenses increasing at such a rapid rate?

Mr. WAGNER. The increases in TVA's operating expenses have been primarily attributable to rapidly escalating coal costs during the last

few years. Approximately 70 percent of the power supplied by TVA is generated by coal-fired generating plants which now consume about 35 million to 40 million tons of coal per year. Thus a $1 increase per ton increases TVA's annual operating costs by $35 million to $40 million. The average cost of coal burned in TVA steam plants increased from $8.61 per ton in fiscal year 1974 to $12.99 in fiscal year 1975. The average cost per ton for the first 7 months of fiscal year 1976—that is, through the end of January 1976—was $17.96, and the average for the month of January itself was $18.62. Even assuming the market price of coal remains at the current level, TVA's cost of coal burned will continue to increase as older contracts for lower priced coal expire, and as prices under existing contracts escalate or become subject to renegotiation. If system coal consumption in the current fiscal year reaches the estimated amount, the total cost of coal burned in fiscal year 1976 will be about $690 million, an increase of more than $250 million over fiscal year 1975. Thus it is evident that higher coal costs are the major reason for the increased operating expenses. Operating costs have also been affected to a somewhat less degree by other factors such as purchased power costs which were necessitated in part by the Browns Ferry outage and by increases in other areas such as labor and maintenance costs.

Mr. EVINS. Based on these load projections and your anticipated construction costs and interest charges on new generating capacity, how high do you expect consumer power rates to rise by the winter of 1986–87?

Mr. WAGNER. Power rates will be determined by a great variety of factors. Based on current estimates the rate increases over the next 10 years may be much smaller than those of the past 10 years, providing coal costs do not increase at unreasonable rates. Throughout the next 10 years the rising capital costs of new facilities added to the system will cause both interest charges and depreciation to rise. The increase in capital costs will be somewhat offset by the increasing proportion of nuclear generation which would cause system fuel costs to rise more slowly or to stabilize.

POWER SUPPLY AND USE

CUMBERLAND STEAM PLANT

Mr. EVINS. Give the committee a current status report on construction of the Cumberland steamplant—units 1 and 2.

Mr. WAGNER. Onsite construction on the Cumberland plant began in March 1968. The two generating units were placed in commercial operation in March 1973 and November 1973, respectively. The work currently underway consists primarily of boiler modifications required to reduce operational costs and is scheduled for completion by June 1976.

Mr. EVINS. Why has the estimated cost of these units increased by $2 million?

Mr. WAGNER. The $2 million increase results primarily from a design decision to install longer wearing cast basalt-lined coal piping in the pulverizer system and from higher than expected payments to the Bureau of Employees' Compensation.

BROWNS FERRY NUCLEAR PLANT

Mr. EVINS. Give the committee a report on your current assessment of the significance of a fire at the Browns Ferry plant on March 22, 1975, particularly in regards to safety.

Mr. WAGNER. The fire at Browns Ferry has a great significance to safety for it illustrates that the defense-in-depth philosophy that underlies the design, construction, and operation of nuclear plants does, in fact, work. This philosophy provides echelons of safety features—quality in equipment, design, and construction, redundant safety features, and multiple barriers. Defense-in-depth does not depend on perfection in any single system or component, but results in an overall high degree of safety. Thus the philosophy assumes that there will be accidents.

As a result of the fire, some safety-related equipment did not function due to damage to electric power and control systems. However, alternate methods of control were always available for cooling the reactor after shutdown, and the nuclear fuel remained covered with water at all times. However, the outcome of the incident with regard to the protection of the public health and safety was successful. The reactors were shut down and cooled down successfully, no one on the site was seriously injured, and no radioactivity above normal operating limits was released. Thus there was no radiological impact on the public, and the defense-in-depth philosophy protected the public.

Mr. EVINS. Have you made any procedural or design modifications at the plant to improve safety as a result of the fire?

Mr. WAGNER. The Browns Ferry application was originally filed on July 7, 1966, and the construction permits for units 1 and 2 were issued on May 10, 1967, and for unit 3 on July 31, 1968. The design by TVA and review by AEC were governed by the state-of-the-art at that time. The operating license review in 1970–72 used the technology of that period. As a result of the fire and subsequent analyses, advances in technology since the original licensing in regard to fire protection are being incorporated into the plant.

Fire stop penetrations, where the fire originated, are being completely redesigned. Old sealant materials have been removed and are being replaced with recently developed, more fire-resistant materials.

Administrative procedures have been developed to strictly control any combustible materials that are required to be introduced into the plant in the course of its routine operation or maintenance and thereby limit to an extremely low level the probability of a fire. The organization and training of the plant fire brigade has been reviewed and augmented where necessary to increase the efficiency of the plant operators in fighting any fire that might occur.

Design changes have been made in two general areas; namely, electrical systems and fire protection systems. Vital cables and conduits were rerouted and all exposed electrical cables in safety related areas of the plant were coated with a fire retardant material. These actions were taken in an effort to further reduce the effects of a fire on vital electrical equipment and systems. Additional fire detection and extinguishing equipment has been provided to increase the plant capability to quickly bring under control and put out any fire which might occur.

Mr. EVINS. How costly was the fire?

Mr. WAGNER. The estimated direct construction cost for recovery from the fire is approximately $7,700,000 and the net cost of replacement energy obtained from other sources is $120 million, making the total about $128 million.

Mr. EVINS. How much purchased power did TVA require as a result of the fire, and how did this affect consumer power rates?

Mr. WAGNER. Through December 1975, the estimated amount of power purchased to replace the loss of Browns Ferry generation has been $111 million. In addition, and to the extent possible, some of the loss was made up through TVA coal-fired generation. The estimated rate effects of the higher costs of purchased power and TVA coal-fired generation over the costs of nuclear generation have amounted to an increase of about $1 for each 1,000 kilowatt-hour of residential usage per month.

Mr. EVINS. The General Electric Co. is providing the fuel and other major components for the Browns Ferry plant. The committee in recent press reports has noted that three engineers quit their jobs at General Electric over concern for nuclear plant safety. One of these engineers, it is understood, worked on the Browns Ferry plant. Comment on this situation.

Mr. WAGNER. It is clear from the interview which Chairman Anders of the NRC had with the three former GE employees that their concerns were not directed specifically at Browns Ferry. Mr. Anders reported that, and I quote, "Their major concern appeared to be philosophical in nature over the long-term use of nuclear power. They raised several general safety issues, all of which are under active consideration by the NRC staff. They said they had no additional detailed facts or data that in their view required immediate regulatory action." Continuing, Mr. Anders said, "Thus, the NRC finds no basis for taking immediate action as a result of the discussions today."

It is equally clear that the testimony offered by the three before the Joint Committee on Atomic Energy on February 18, 1976, was not directed to the Browns Ferry plant.

TVA believes that its own review, that of the NRC, and the independent review by the Advisory Committee on Reactor Safeguards are fully adequate to insure that the public health and safety is adequately protected in the modifications and operation of the Browns Ferry plant.

Mr. EVINS. Give the committee a current status report on construction of the plant.

Mr. WAGNER. Units 1 and 2 were declared in commercial operation in August 1974, and March 1975, respectively. In March 1975, a fire occurred which damaged some electrical cables and equipment and required shutdown of the two units. Following repair and modifications of the affected systems, we expect units 1 and 2 to be returned to service this spring. Unit 3 is currently undergoing preoperational testing, and our schedule calls for commercial operation in June 1976. Efforts to restore units 1 and 2 may result in some delay in operation.

Mr. EVINS. Explain the cost overrun of $20 million, which pushes the estimated total cost of the plant up to $835 million.

Mr. WAGNER. The estimated cost increased $9,800,000 for an additional 1,100,000 craft labor man-hours and $1,800,000 for additional equipment required to meet continuing changes in NRC safeguard and

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quality assurance requirements. Interest during construction increased $14,500,000 due to schedule delays and higher project expenditures, and contingency and miscellaneous adjustments decreased $6,100,000.

SEQUOYAH NUCLEAR PLANT

Mr. EVINS. Give the committee a report on the current status of construction of the Sequoyah Nuclear Plant.

Mr. WAGNER. The project design is well advanced and construction is about 70 percent complete overall. Turbogenerator erection is about 88 percent complete for unit 1 and 69 percent complete for unit 2. Installation of the nuclear steam supply system is about 68 percent complete for unit 1 and 32 percent for unit 2. Overall concreting is about 90 percent complete. Work is underway on the cooling towers, emergency raw cooling water pumping station, and installation of various piping systems, conduit, and cable. The commercial operation of the two units is scheduled for September 1977 and May 1978, and the project is scheduled for completion in May 1979.

Mr. EVINS. Commercial operation of the plant has slipped by 8 months because, according to your justifications, equipment and materials have been delivered late by the manufacturer.

Tell the committee what action you have taken to assure proper and timely delivery of the equipment and materials in the future.

Mr. WAGNER. We are implementing an integrated system to schedule the design, procurement, and construction activities required for our projects. This system will better identify the leadtime requirements for various items of equipment, which should relieve the problems of late deliveries. This system will benefit later plants to a much larger extent than Sequoyah.

Mr. EVINS. Your budget justifications show a cost overrun on the Sequoyah plant to be $80 million on the estimated cost report to the committee last year. Explain this massive cost overrun.

Mr. WAGNER. The estimate increase of $80 million results from major scope additions, design revisions, construction schedule delays, and other factors. The major scope additions consist of a deep water intake for the emergency raw cooling water system required by revised NRC regulations and a full-flow demineralizer building and equipment necessary because of revised design criteria. Of the total increase, $40 million is attributable to interest during construction arising from the 8-month delay in operation of the units and higher project expenditures. The balance of the increase provides for additonal craft labor, materials and equipment, and general costs associated with the scope additions, design revisions, and schedule stretchout.

RACCOON MOUNTAIN PUMPED-STORAGE PROJECT

Mr. EVINS. Give the committee a report on the current status of construction of the Raccoon Mountain pumped-storage project.

Mr. WAGNER. The design of the project is about 95-percent complete and construction is almost 80-percent complete. The powerhouse chamber construction is about 75-percent complete, the dam is 98-percent complete, and construction of the transmission plant is well advanced. On the lower level, work is underway on the powerplant chamber, discharge structure, main access tunnel, and service equip-

ment building. On the upper level, work is continuing on the earth and rock fill dam, visitors' building, control building, and the 500-kilovolt switchyard. Commercial operation of the four units is scheduled for February 1978, April 1978, June 1978, and August 1978, respectively, and the project is scheduled for completion in May 1979.

Mr. EVINS. It is stated in your justifications that completion of the plant has been delayed by 26 months. Explain this slippage in completion of construction.

Mr. WAGNER. The schedule slippage results from deficiencies in the spiral scroll case assemblies which contain the water that surrounds the pump-turbine units. The 26-month delay reflects the time required to redesign and remanufacture this equipment.

Mr. EVINS. Explain the massive cost overrun of $60 million for the Raccoon Mountain plant.

Mr. WAGNER. The stay rings supplied by the vendor failed during test procedures. This failure and subsequent redesign and remanufacture resulted in a 26-month delay in the project schedule and an additional cost of approximately $47 million. The rest of the increase is due to additional material requirements in the construction of the dam and higher equipment usage rates encountered in the construction of the plant.

WATTS BAR NUCLEAR PLANT

Mr. EVINS. Give the committee a report on the status of construction of the Watts Bar nuclear plant.

Mr. WAGNER. The project design is well advanced and construction is about 35-percent complete overall. Powerhouse concreting is well advanced, and the turbine building structural steel erection has reached 96 percent of completion. Installation of equipment has begun. The cooling tower contractor has virtually completed the first tower and is continuing internal work for the second. Construction of cooling water facilities and condenser erection is underway. The steel containment contractor has completed installation of the bottom liner plate for the unit 2 reactor containment vessel and is continuing installation of the bottom liner plate for unit 1. Commercial operation of the two generating units is scheduled for November 1978, and August 1979, respectively, and the project is scheduled for completion in June 1980.

BELLEFONTE NUCLEAR PLANT

Mr. EVINS. What is the current status of construction of the Bellefonte plant?

Mr. WAGNER. Major equipment for the plant has been ordered. The project design and construction are about 47-percent and 10-percent complete, respectively. Powerhouse concreting has advanced to 24-percent completion and installation of unit 1 reactor containment vessel bottom liner plate has begun. Excavation for pumping stations is underway. The unit 1 reactor pressure vessel and steam generators have been received. The two generating units are scheduled for commercial operation in June 1980 and March 1981. The project is scheduled for completion in March 1982.

Mr. EVINS. Explain the 6-month delay in completion of the plant.

Mr. WAGNER. The development of a detailed integrated schedule for design, procurement, and construction of the plant showed that the

construction manpower in critical crafts would peak at unacceptable levels. It would not be possible to employ so large a work force, and work areas are limited and would not permit the required force to work efficiently. The only practical alternative was to level the manpower requirements through lengthening of the schedule by 6 months.

HARTSVILLE NUCLEAR PLANT

Mr. EVINS. State and local officials have expressed concern over possible adverse socio-economic impacts that construction of such a massive plant might have on the local area. Give the committee a report on how TVA plans to lessen these possible adverse effects on the Hartsville area.

Mr. WAGNER. When TVA filed the application for the Hartsville project with the AEC, two local officials and the State of Tennessee petitioned to intervene in the proceeding on socioeconomic matters. After various meetings with TVA in which TVA's impact mitigation plans were reviewed, both the State and local officials withdrew from the proceeding, since their concerns had been satisfied.

A significant element in resolving these concerns is the involvement by local officials in the determination of the existence of various impacts and in the decisionmaking that will provide appropriate mitigation of impacts. A local committee of governments, the Hartsville Project Coordination Committee, has beeen established to monitor the continuing and changing impacts on local governments. TVA has provided funding to enable the committee to hire a professional staff. This provides an essential mechanism for communication with the local communities in order to assess the success of the various mitigation programs and obtain recommendations for future activities.

An agreement among TVA, the Tennessee Department of Education, and the seven local school districts provides for mitigation of impacts on education in the area. In addition to education, mitigation activities will be provided in the areas of housing, resident training and recruitment, education, water and sewer facilities, local government budgets, health and medical services, employee transportation, planning and coordination, and monitoring. Mitigation in these areas by TVA may take the form of direct monetary payments, supplying equipment, or providing technical assistance, or a combination of these.

Mr. EVINS. Your budget justifications state that the cost estimate of the Hartsville plant "has not been revised pending establishment of a firmer schedule and further appraisal of future price escalation and interest rate assumptions."

Does this statement indicate you expect the estimated cost to increase, and if so, how much?

Mr. WAGNER. The cost estimate presented to the Congress is based on the schedule presented in the budget program for 1976. The schedule has been tentatively deferred 1 year. It is anticipated that additional costs will be incurred as a result of the delay and continuing price escalation, but the amount of any increase has not been determined.

OTHER CAPITAL OUTLAY

Mr. EVINS. Give the committee a report on your plans for the Phipps Bend Nuclear Plant.

Mr. WAGNER. Our plans for the Phipps Bend site are to construct two nuclear-fueled generating units with a rating of approximately 2,574,000 kilowatts. The units will be similar to the units being planned for the Hartsville site. The units are of the boiling water type and would include a closed condenser cooling water system. Environmental and licensing studies are currently underway, and the outlook is that construction could begin in March 1977. Our anticipated commercial operation dates are March 1983 and March 1984.

Mr. EVINS. Report on the status of the Yellow Creek Nuclear Plant.

Mr. WAGNER. The Yellow Creek site is being considered for construction of two nuclear-fueled generating units with a rating of approximately 2,814,000 kilowatts. The units would be of the pressurized water type and would incorporate a closed condenser cooling water system. Environmental and licensing procedures are underway, and our current schedule calls for onsite construction to begin in June 1977. Our anticipated commercial operation dates are June 1983 and June 1984.

Mr. EVINS. How many additional nuclear plants do you expect to build and at what cost?

Mr. WAGNER. Projections of load growth into the late 1980's is approximately 1,500 megawatts per year. This load growth will require the addition of generating capacity of some type in the future. TVA has not made a determination at this time as to when this capacity should be added or what type of generation would be chosen. At the point when a decision is made we will compare coal versus nuclear generation and decide which is the better alternative.

Mr. EVINS. Has TVA encountered problems in purchasing nuclear fuel reserves and, if so, what action have you taken to secure adequate supplies?

Mr. WAGNER. TVA has experienced problems in nuclear fuel procurement in the entire fuel cycle except for conversion. Recognizing the difficulty in procuring TVA's total uranium requirements from uranium producers, TVA entered into a program of acquiring uranium reserves and of actively exploring for uranium in the United States as an additional means of supply. When we met with the subcommittee last year, we had estimated reserves in the ground of approximately 15 million pounds of uranium. During the year we have increased these reserves by about 3 million pounds to 18 million. These increases have resulted from our exploration program. We have not purchased any proven reserves in the ground during the past 1½ years since it has not been possible in the current market to acquire such reserves at reasonable costs. During this period the market price of uranium concentrates has increased severalfold and this has affected the cost of uranium reserves in the ground. The primary reason is the desire of an owner to sell the finished product to capture the full profit and not dispose of his basic raw material. There is some uncertainty as to what our uranium requirements will be for the next several years because of the Westinghouse Corp.'s announced intent not to deliver uranium concentrates for four TVA nuclear units in accordance with nuclear fuel supply contracts. Westinghouse had contracted to supply about 3.5 million pounds to TVA under these contracts but now proposes to deliver only 0.56 million pounds. TVA,

along with the other power suppliers, has filed a lawsuit to require Westinghouse to fulfill these contractual obligations.

Mr. EVINS. Do you plan to build additional steam generating plants?

Mr. WAGNER. TVA studies on a continuing basis the relative benefits of the various generating plant alternatives available to meet future loads. We have recently initiated an in-depth examination of fossil generation for possible installation as a capacity addition to the power system. While it is premature to speculate on the outcome of our current studies, coal-fired generation has been and continues to be a viable alternative to nuclear plants in meeting the region's future power needs unless this type of generation is made infeasible by environmental requirements.

WATER RESOURCES DEVELOPMENT

DUCK RIVER PROJECT

Mr. EVINS. Closure of Normandy Dam has been accomplished with completion of construction scheduled for September 1976. No further appropriations are being requested for the Normandy project in fiscal year 1977. Give the committee a full report on the current status of the Normandy project.

Mr. WAGNER. Construction of the project is well advanced and the dam was closed on January 5, 1976. Reservoir filling is underway and is expected to reach its normal seasonal level in the spring of this year. All remaining items including highway and bridge work, general yard landscaping and grading, earth dam seeding and sodding, erection of the maintenance building, and final cleanup are scheduled to be completed by September 1976.

Mr. EVINS. What are the plans of TVA and other agencies for development of recreational and other service resources in the Normandy project area?

Mr. WAGNER. TVA has constructed five public access points at various locations on Normandy reservoir. Timber was left in selected areas of the lake for the purpose of improving fishing. TVA is working with local governments to encourage development of city and county recreation areas, and TVA is working with the Upper Duck River Development Association and Agency to secure the development of needed commercial recreation facilities. Concept plans for specific recreation site have been prepared by TVA.

TVA has made sites available to the city of Tullahoma for a new water treatment plan and intake on Normandy Reservoir. The intake is presently under construction and nearing completion. The city of Manchester is currently considering the development of major new water system elements, probably utilizing Normandy Reservoir as a source.

Mr. EVINS. Give the committee a status report on the construction of Columbia Dam for which you are requesting $17 million in fiscal year 1977.

Mr. WAGNER. Design of the project is about 30 percent complete, land acquisition is 13 percent complete, and construction is about 5 percent complete. Construction activities have been at a low level due to limited funding until recently. Acceleration of work is now under-

way. The diversion of the Duck River was accomplished on February 5, 1976, and excavation for the concrete dam and spillway blocks has begun. Concrete placement is scheduled to begin in August 1976. Foundation preparation and grouting operations are in progress for the earth fill dam. The dam closure is scheduled in January 1980 and project completion in June 1980.

Mr. EVINS. Your budget justifications state that "construction will continue at a low level at Columbia until early in calendar year 1976." Keeping in mind that we are in a period of high unemployment, how can construction of the Columbia Dam be accelerated to provide more employment?

Mr. WAGNER. Acceleration of construction activities has already begun as a result of additional fiscal year 1976 funding provided in the appropriation signed by the President on December 26, 1975. By June of this year, employment will approach 200, compared to 26 last summer. Employment is expected to reach about 340 by the end of fiscal year 1977.

Mr. EVINS. What are your total capabilities for the Duck River project in fiscal year 1977?

Mr. WAGNER. The $17 million request for construction of the Columbia Dam represents our total capability for this project for fiscal year 1977.

BEAR CREEK PROJECT

Mr. EVINS. Give the committee a report on the current status of the Bear Creek project.

Mr. WAGNER. The Bear Creek project consists of four multipurpose dams and a floodway channel improvement. Construction of the Bear Creek Dam and Reservoir was started in May 1967 and the dam was closed in March 1969. The floodway construction started in June 1970 and was completed in October 1973. Little Bear Dam and Reservoir was started in January 1973, the dam was closed in October 1975, and final cleanup work will be completed in fiscal year 1976. Upper Bear Dam and Reservoir was started in May 1975 and closure of this dam is scheduled in January 1978. We also anticipate the start of the last unit of the project, Cedar Creek Dam and Reservoir, in April 1976 and dam closure in January 1978.

Mr. EVINS. Explain in detail the design modifications and archeological investigations for Upper Bear Dam.

Mr. WAGNER. Design modifications to the project included the flattening of the slope of the earth fill dam to achieve acceptable stability and the addition of a protective spillway retaining wall.

The archeological surveys for the dam and reservoir area are now complete. Two sites which were identified as archeologically significant are scheduled for additional testing and excavation this summer. Laboratory analysis and reports preparation is being conducted on all material recovered.

Mr. EVINS. Are you experiencing any legal problems or environmental challenges in connection with the Bear Creek project?

Mr. WAGNER. We have not experienced environmental challenges or other organized opposition to the Bear Creek project.

Mr. EVINS What are your total capabilities for the Bear Creek project in fiscal year 1977?

Mr. WAGNER. Our total capability for the Bear Creek project for fiscal year 1977 is estimated at $16,049,000, the same amount as the budget request.

TELLICO DAM

Mr. EVINS. Give the committee a report on the current status of the Tellico Dam project.

Mr. WAGNER. The overall project is about 80 percent complete. Work is continuing on construction of the main earth fill dam in the east channel area where the river flow was diverted on August 17, 1975. Rock excavation for the canal and construction of the canal bridge have begun. Construction of saddle dams is well advanced. Reservoir clearing operations are underway and work is continuing on the relocation of highways, bridges, and utilities. The dam is scheduled for closure in January 1977 and the project is scheduled for completion in December 1977.

Mr. EVINS. Your level of funding for Tellico was $23.6 million in fiscal year 1976 and your fiscal year 1977 budget request is $9.7 million—a decrease of $13.9 million. Is this your capability for fiscal year 1977?

Mr. WAGNER. Our capability for fiscal year 1977 is $9.7 million, the same as the budget request.

Mr. EVINS. Explain the environmental problem with the snail darter. Give the committee a report on any litigation pending in connection with the Tellico project.

Mr. WAGNER. There have been problems, Mr. Chairman, and I would like to submit a detailed response for the record.

[The information follows:]

STATEMENT ON LITIGATION ON TELLICO PROJECT

Last year at the appropriation hearings we informed both the House and Senate committees that opponents of the Tellico project were again planning to commence litigation, under the Endangered Species Act, to halt the project on the ground that its completion would destroy the snail darter and its presently known habitat. The darter is a small 3-inch fish which was discovered in August 1973. It was collected in the Little Tennessee River by Dr. David A. Etnier and Mr. Robert Stiles prior to completion of the litigation involving the environmental consequences of the Tellico project. The possible presence of "undescribed" species of darters in the portion of the Little Tennessee River to be impounded and the possible adverse impacts of the project on them were specifically recognized in testimony before the court and also in TVA's environmental impact statement for the project. Following a 4-day trial in September 1973, the district court upheld the adequacy of TVA's environmental impact statement and the validity of TVA's decision to proceed with the project. *Environmental Defense Fund* v. *Tennessee Valley Authority*, 371 F. Supp. 1004 (E.D. Tenn. 1973). The district court's decision was affirmed by the Court of Appeals for the Sixth Circuit. 492 F. 2d 466 (6th Cir. 1974).

We informed both committees last year that TVA did not construe the Endangered Species Act as preventing the completion of the Tellico project; that we believed the environmental consequences of the Tellico project had been fully disclosed; and that TVA was doing and would do its best to preserve the darter; but, in any event, that the project should be completed on schedule. The committee in appropriating the President's full appropriation request of $23,742,000 for fiscal year 1976 and $5.4 million for the transition quarter, directed TVA to complete the Tellico project "as promptly as possible for energy supply and flood protection in the public interest" (House Rep. No. 94–319, 94th Cong., 1st Sess. 76 (June 30, 1975)).

Since our last report to the committee, several events have brought the Tellico snail darter issue to a head. Despite some controversy over the procedures

used, the snail darter has been scientifically described as a separate species of fish (*Percina* (*Imostoma*) *tanasi*). Effective November 10, 1975, it was listed as an endangered species by the Department of the Interior through the U.S. Fish and Wildlife Service. (40 Federal Register 47505–506) (Oct. 9, 1975). On December 16, 1975, the Fish and Wildlife Service published a proposed rule in the Federal Register (40 Fed. Reg. 58308–312) that would list that portion of the Little Tennessee River lying between miles 0.5 to 17 as the critical habitat for the snail darter. Finally, on February 18, 1976, three individuals (two University of Tennessee law professors and a law student) filed suit in the U.S. District Court for the Eastern District of Tennessee, seeking a temporary and permanent injunction against further construction and completion of the project, claiming that these actions are illegal and in violation of the Endangered Species Act. On February 25, 1976, the district court refused to grant a preliminary injunction and set the case for trial on April 23, 1976. It is our opinion that the suit is without merit.

It is TVA's position that the ultimate decision to proceed with this project rests with TVA, and that TVA has acted responsibly, and in good faith in reaching its decision to complete the project. We believe that Congress did not intend the Endangered Species Act to be retroactively appiled to existing projects like Tellico, which was over 50 percent complete at the time of the act's passage and the fish's discovery, and which was 70 to 80 percent complete at the time of the official listing of the snail darter as an endangered species. Even if applicable to Tellico, TVA construes section 7 of the Endangered Species Act to require Federal agencies to take reasonable measures, in consultation with the Secretary of the Interior, to conserve endangered or threatened species of fish, wildlife, and plants. The act was not intended to supplant an agency's primary responsibilities, or to repeal prior congressional approval and funding of authorized projects, such as Tellico, because the habitat of an endangered species would be altered or destroyed by completion of the project. TVA certainly does not construe the act as a mandate to halt an authorized project without regard to its stage of completion or the fact that $80 million in public funds has been appropriated by Congress and invested in a regional development project to provide flood control, navigation, hydroelectric power, water supply, and to produce other benefits, including recreation, fish and wildlife use, shoreline development, new job opportunities, industrial development, and to foster improved economic conditions in an area characterized by underutilization of human resources and outmigration of young people.

While we believe the present suit lacks merit, the general question raised is of grave concern to us. The Tellico project is not alone in facing possible legal challenges based on the Endangered Species Act. TVA believes that almost any major Government project could be attacked on similar grounds if project opponents are willing to search hard enough to find a particular species of plant, insect, or animal life heretofore not even discovered—much less recognized as a separate species or as endangered or threatened. The act does not explicitly distinguish the societal value of species like the eagle or the whooping crane from other minor forms of insects, plants, or mollusks, many of which have not undergone extensive study or attempts at classification or subclassification. The Duck River project could face similar litigation. On September 26, 1975, the Department of the Interior proposed endangered species status for several species of midwestern pearly mussels which may be present in the Duck River (40 Fed. Reg. 44329).

TVA is conscious of its resource conservation mission and of the national policy to protect the environment. We are doing our best to conserve the darter while completing the project. TVA began funding a University of Tennessee study of this darter in September 1974, over a full year prior to the listing of the fish as endangered by the Department of the Interior. In the spring of 1975 TVA biologists initiated a conservation program which includes transplantation of this fish to the Hiwassee and other rivers. They have been assisted in this program by nationally recognized consultants, Dr. Edward C. Raney, professor emeritus of Cornell University, and Jones and Stokes of Sacramento, California. Our biologists have consulted and cooperated with the Endangered Species Office of the Fish and Wildlife Service and with the State of Tennessee's Wildlife Resources Agency. As part of our conservation effort, we have transplanted over 770 snail darters to the Hiwassee and Nolichucky Rivers to date. The fish appear to be doing very well in this new habitat.

We are doing our best to preserve the snail darter, and the results to date have been very encouraging. We cannot guarantee that the transplant will ulti-

mately be a success. In any event, however, we believe the Tellico project must be completed on schedule. Project costs have risen by millions of dollars as a result of earlier delays. Construction has been underway since March 1967 and approximately $80 million of public money has been invested to realize the project's benefits. We ask the committee to approve the $9.7 million requested by the President to complete the project.

OTHER WATER RESOURCES

Mr. EVINS. Explain why your request for additions and improvements at multipurpose dams has increased from $779,000 in fiscal year 1976 to $1,002,000 in fiscal year 1977.

Mr. WAGNER. The increase is for facilities and equipment used in operating multipurpose dams and reservoirs. The major item is to begin replacement of hoisting equipment for the 21 spillway gates at Wilson Dam. This dam was placed in service in 1924 and operation of existing methods to raise and lower spillway gates has become a problem especially during flood control operations.

Mr. EVINS. You are asking for $28,000 to make improvements to insure safe working conditions for employees.

Mr. WAGNER. The spillway deck at Wilson Dam needs to have safety handrails installed.

Mr. EVINS. You are requesting $236,000 for improvements to visitors' facilities at nine locations. Provide details of your plans for each location.

Mr. WAGNER. I would like to submit a list for the record.

[The information follows:]

1. Norris Reservation: Develop trails and wildlife enhancement plantings.
2. Watauga Reservation (two locations): Install sanitary facilities, picnic units, and develop parking and improve road and boat ramp.
3. Chickamauga Reservation: Install launching facility.
4. Fontana Reservation: Construct hikers' bathhouse.
5. Hiwassee Reservation: Paving of road and parking area.
6. Wilson Reservation (two locations): Install landing, float for ramp, chain link fence, and trail improvements.
7. Wheeler Reservation (two locations): Improve and pave roads and parking area.
8. Kentucky Reservation: Install sanitary facilities.
9. Melton Hill Reservation: Install picnic facilities.

Mr. EVINS. Why has the Federal cost of the Decatur railway bridge project increased from $6.2 million in fiscal year 1976 to $8.3 million in fiscal year 1977?

Mr. WAGNER. The major part of the increase is for 500 tons of additional bridge steel, at a cost of $1 million, which was recommended by our engineering design consultant after detailed design drawings were available. General industry price increases for bridge operating machinery account for $300,000 of the increase; projected delays in steel deliveries will require a stretchout of the project, with resulting escalation effects of $400,000. The remaining increase of $400,000 is made necessary by increased requirements in design, inspection, and general costs.

Mr. EVINS. Provide details of locations and plans for each item for development of recreation facilities for which you are requesting $803,000 in fiscal year 1977.

Mr. WAGNER. I would like to submit a listing of our present plans, recognizing that circumstances could arise that would alter this schedule.

[The information follows:]

1. Fort Loudoun Reservoir (one site): Roads improvements and install sanitary facilities, utilities, and picnic units.
2. Norris Reservoir (one site): Access road improvements.
3. Cherokee Reservoir (one site): Install sanitary facilities and utilities.
4. Nottely Reservoir: Develop roads and install picnic units, sanitary facilities, and utilities.
5. Wheeler Reservoir (one site). Pave roads.
6. Guntersville Reservoir (three sites): Install sanitary facilities, boat ramp, and parking and expand and pave beach parking lot.
7. Kentucky Reservoir (five sites): Pave roads and parking areas; install picnic units; develop parking and roads; construct boat launching ramp; and clear and clean up specific areas. Develop small wild areas.
8. Land acquisition. Unidentified tracts on multipurpose reservoirs. Land access tracts on Holston River at five locations.
9. Development of the South Cumberland recreational area in cooperation with State of Tennessee.

Mr. EVINS. Why has your request for investigations for future facilities decreased from $149,000 in fiscal year 1976 to $45,000 in 1977?

Mr. WAGNER. The 1976 estimate of $149,000 included $100,000 to begin design of the South Chickamauga Creek flood control facility at Chattanooga, Tenn. Activities include field surveys, foundation investigations, and other preliminary design work. These activities will be completed in the current fiscal year.

COMMUNITY ASSISTANCE

Mr. EVINS. Explain how TVA assists local communities in attracting new industry.

Mr. WAGNER. To carry out TVA's responsibilities for encouraging economic development in the Tennessee Valley region, TVA provides technical assistance to local communities in attracting new industry. This includes a continuous program of research in industry growth trends, which permits communities to identify growth industries and emerging industrial opportunities. We also help in matching industry location requirements with the resources of the community, and in the identification and preliminary planning of potential industrial sites and parks.

MERCURY

Mr. EVINS. Explain the problem with mercury concentrations in fish mentioned in your budget justifications on page 50.

Mr. WAGNER. During 1969 and 1970 TVA discovered concentrations of mercury in fish in Chickamauga, Pickwick, and Kentucky Reservoirs and the North Fork Holston River which exceeded Federal standards. TVA data was furnished to the States of Alabama and Virginia, which halted discharges of mercury from two caustic soda-chlorine production plants. TVA monitoring is continuing with data being distributed to EPA and the States of Alabama, Tennessee, Mississippi, and Virginia.

Present information does not indicate any decrease in the concentrations already existing in the reservoirs. We are optimistic, however, that the problem will correct itself through natural means, such as stream flushing and the covering of contaminated sediment.

Mr. EVINS. Why is your request for operating expenses of recreational development increased from $836,000 in fiscal year 1976 to $1,097,000 in fiscal year 1977?

Mr. WAGNER. Increasing use of public recreation areas on TVA reservoirs has resulted in a need for additional security and area supervisory services and additional maintenance expenses, especially at older facilities, at an increased cost of $173,000. The remaining increase of $88,000 is to handle an increasingly large number of requests from local agencies for technical assistance and to provide for additional recreation planning for the valley.

POOR VALLEY CREEK

Mr. EVINS. Give the committee a report on the Poor Valley Creek project.

Mr. WAGNER. In 1973 a memorandum of understanding was signed by Governor Dunn, of the State of Tennessee, and TVA to jointly develop a State park on the Poor Valley Creek embayment of Cherokee Reservoir. TVA agreed to provide 80 percent of the cost of the dam and transfer the adjacent reservoir lands for park purposes. The State agreed to provide 20 percent of the cost of the dam, acquire other necessary lands, and build and operate the park. In the fall of 1975 a draft environmental statement was circulated to outside agencies for comment. Their questions are being answered and incorporated in the final environmental statement which should be completed by late spring.

Mr. EVINS. Your budget justifications state that multipurpose reservoir operations in fiscal year 1977 are to be financed by appropriations of $7.5 million, $4.1 million from power proceeds, and $400,000 from "related income." Explain how these amounts are determined.

Mr. WAGNER. Costs of all TVA projects are allocated according to the purposes served. The costs of operating the system of multipurpose reservoir projects are allocated approximately 65 percent nonpower and 35 perecnt power depending on the programs benefited. Nonpower funds include $400,000 of income generated from operating the system such as income from land use permits and timber sales.

Mr. EVINS. It is stated in your justifications that maintenance is becoming more significant at TVA dams and reservoirs. Does this statement indicate that you expect maintenance to become a major problem in the years ahead?

Mr. WAGNER. As our dams, spillways, roads, and other structures continue to age, maintenance requirements will increase. However, maintenance is not expected to become a major problem for some years to come.

GENERAL RESOURCES DEVELOPMENT

LOWER ELK TOWN

Mr. EVINS. The commiteee provided funding in fiscal year 1976 for initiation of the Lower Elk Town project. Although we discussed this earlier, provide a report on the current status of the project.

Mr. WAGNER. Funds for starting this project were in the fiscal year 1976 appropriation, $1 million for fiscal year 1976 and $1 million for

the transitional quarter. The fiscal year 1977 allowance will complete the funding requirements for the project.

The Alabama Elk River Agency, a State agency, will be the developer. A contract between this agency and TVA is in the final stages of preparation. As soon as it is executed, funds will be made available to the agency to exercise its options on the Elkmont Village site. Detailed planning for the village is completed. The agency has issued invitations for bids to private engineering firms for specifications for installation of the roads, sewer, water, and underground untility services. This work could begin as early as late March.

Mr. EVINS. Your budget request for the Lower Elk Town project is $2.7 million for fiscal year 1977, an increase of $1.7 million over fiscal year 1976. Why is this increase necessary?

Mr. WAGNER. TVA's financial commitment to the project is $4.7 million. The fiscal year 1976 appropriation was $2 million, including $1 million for the transitional period. The request for $2.7 million in fiscal year 1977 is for the remainder needed to complete the project.

Mr. EVINS. Your justifications state that the Lower Elk project will "demonstrate the feasibility of a system of rural villages that offer a high level of public services and amenities." Elaborate on that statement.

Mr. WAGNER. Rather than permit future housing development to scatter into sprawling, unplanned strips along major highways and county back roads, the project will demonstrate that it is feasible to develop well-planned rural villages to meet the housing demand. The demonstration is expected to show that capital invested in a system of rural villages that offers a high level of public services and amenities can be recovered by the developer. Public services and amenities in each rural village will include central water and sewerage systems, underground electric and telephone services, nature trails, picnic areas, playgrounds, tennis courts, swimming pools, and riding and walking trails.

Mr. EVINS. Your justifications further state that the "Elkmont rural village serves also as a demonstration of new techniques in the treatment of waste water and the use of solar energy in residential heating and cooling." Explain these new techniques and how they will be demonstrated. Does ERDA provide any assistance on this project?

Mr. WAGNER. We are looking at the feasibility of waste water tertiary treatment by spray irrigation of vegetation. This would use the soil as a "living filter" before returning the waste water effluent to the streams. It will demonstrate how wastes, rather than representing pollution, can become a recycled resource that can renovate soils and add nutrients and minerals.

A number of homes will be used to demonstrate inexpensive techniques of using the Sun and prevailing weather to conserve electric energy by incorporating air ducts in the floor and roof systems, using heat absorbing construction materials and colors, optimizing insulation and vapor barriers, and properly orienting the structure on the site to maximize benefits from the Sun, weather, and existing vegetation. In addition, solar energy demonstrations in the project are planned for hot water, space heating, and cooling.

Applications have been submitted to the U.S. Department of Housing and Urban Development for grants to fund a solar demonstration in one residential unit. Additional applications will be submitted to HUD when they issue additional requests for proposal. ERDA and HUD have joint responsibility for management and coordination of the residential demonstration program.

AGRICULTURAL PROJECTS

Mr. EVINS. Your budget request for agricultural projects has increased from $1,181,000 in fiscal year 1976 to $1,248,000 in fiscal year 1977. Yet your finances from nonpower proceeds for this program have decreased from $345,000 in fiscal year 1976 to $329,000 in fiscal year 1977.

Mr. WAGNER. The additional appropriations will permit us to initiate a limited number of demonstrations for producing forage fed beef cattle.

Mr. EVINS. Explain why an increase in appropriations is necessary and why other revenues are declining.

Mr. WAGNER. The decline in revenue is the result of a small reduction in the amount of fertilizer we expect to use in the program. These revenues are derived from payments made by farmers to partially offset the cost of TVA fertilizers used in demonstrations.

Mr. EVINS. Explain why you plan to place less emphasis on regional conferences and workshops in fiscal year 1977 as stated in your justifications.

Mr. WAGNER. During the past few years considerable time and effort have been devoted to special workshops and conferences to assist us in identifying emerging problems and specifying new program needs. Now that we have identified specific problem areas, we will place more emphasis on action programs.

Mr. EVINS. It is stated in your justifications that, in regard to the rapid adjustment farm program, "TVA helps by furnishing fertilizer required in the demonstrations at no cost to the farmer, except for freight and handling charges." Explain why these farmers are not charged for the fertilizer.

Mr. WAGNER. TVA furnishes a small portion of fertilizer used on rapid adjustment farms. The purpose is to provide an incentive for these farmers to make changes in their farming operations as outlined in a farm plan developed prior to their participation in the program. The demonstrations ultimately lead to neighboring farmers adopting the new practices, including the use of the new fertilizers used in the program.

Mr. EVINS. How are these farmers selected for participation in the program?

Mr. WAGNER. Farmers are selected for the rapid adjustment program by a university-TVA committee. A number of criteria are used. A major agricultural problem is identified first of all. Then, a number of farms experiencing this problem are nominated by county extension leaders. The farm best suited to the problem criteria is selected.

Mr. EVINS. What special agricultural investigations do you plan to conduct in fiscal year 1977, and what will be the costs of each?

Mr. WAGNER. Special agricultural investigations include three categories of work: $37,500 is allocated to preliminary-type investigations,

which include such activities as assisting development districts in evaluating alternative farm waste disposal systems; $30,000 is allocated for evaluating the environmental impact on agriculture of regional developments such as highways, airports, and residential housing; $37,500 is to be used for providing technical assistance to development groups in the areas of rural housing and land use. Assistance is also provided to selected black land-grant universities to improve their agricultural research and teaching programs.

WASTE HEAT UTILIZATION

Mr. EVINS. Explain the need for an increase of $279,000 in fiscal year 1977 for waste heat projects.

Mr. WAGNER. The new demonstration-scale greenhouse facility at Browns Ferry is scheduled to begin operating during fiscal year 1977. Most of the additional funds will be used for horticultural and engineering tests at this facility. In addition, some of the funds will be used to test variations in the heat exchange systems for greenhouse and soil heating research facilities at Muscle Shoals.

Mr. EVINS. It is stated in your justifications that waste heat from powerplants is equivalent to 1.6 million barrels of oil, or slightly less than 20 percent of the total energy used in the United States annually. Explain TVA's research into how this energy can be harnessed.

Mr. WAGNER. About two-thirds of the heat used to fuel these plants is lost in the condenser cooling water. TVA is developing technology to utilize this waste energy in the production of food and fiber. For example, the Browns Ferry plant has sufficient energy to heat 1,500 acres of greenhouses. Success with these projects would result in more efficient use of energy, improved food production, and a reduction in the size of cooling facilities at powerplants.

Mr. EVINS. Does ERDA participate in this research effort?

Mr. WAGNER. Yes; TVA and ERDA through ORNL have cooperated. ERDA has funded the conceptual design for the green house structures. TVA has responsibility for development of greenhouse production systems and related research, including construction and operation of both research and demonstration-scale facilities.

Mr. EVINS. It is stated in your justifications that a Southeastern Waste Heat Research Center will be established at Browns Ferry in fiscal year 1977. Explain the need for this Center and your plans for its establishment and future operation.

Mr. WAGNER. Perhaps there is some misunderstanding in what we mean by a center. This is not an elaborate new research complex; it is intended to identify the focal point for our waste heat research activities. The purpose of the program is to develop and demonstrate the technology needed to utilize the enormous quantity of heat that is available at electric power generating plants. Specifically our plans call for small-scale research projects to be conducted at Muscle Shoals with demonstration-scale facilities being constructed and operated at Browns Ferry once the technology is developed. Each demonstration would, of course, be subject to congressional review and approval.

Research and development activities will focus on developing technology that utilizes waste heat for greenhouse environmental control, environmental control for confined livestock facilities, soil heating

to extend crop growing season, biological recycling of nutrients from livestock waste, and food-fish production facilities.

FOREST RESOURCES DEVELOPMENT

Mr. EVINS. Your budget request for forest resources development is $1,650,000, an increase of $160,000. Why is this increase necessary?

Mr. WAGNER. The $160,000 increase in fiscal year 1977 is needed to carry on a wide variety of projects, including assistance to local institutions in developing training programs for loggers, accelerated development of genetically improved plants for wildlife habitat, and promotion of logging and mill wood residues to produce energy.

Mr. EVINS. Why is it necessary to reinventory forests in some counties as stated in your justifications?

Mr. WAGNER. The 10 counties selected for remeasurement in 1977 are a part of a continuous forest resource inventory system covering the 125 Tennessee Valley counties. The intial inventories of these 10 were made some 10 years ago and are outdated due to considerable changes resulting from timber cutting, natural mortality, and tree growth. These reinventories determine where timber supplies are building up or are being depleted. They serve to guide new and expanding forest products industries into counties where there is a sufficient supply of the kinds of wood needed to sustain operations. They measure long-term trends in the forest environment, wildlife habitat, and land use. The knowledge from these inventories is essential to plan programs that will alleviate resource pressures that an expanding valley population will create.

Mr. EVINS. The wildland resource allocation procedure provides "computer technology and land management concepts to give landowners a valuable decisionmaking tool," according to your justifications. Explain how this system will work.

Mr. WAGNER. This is a computer program that analyzes landowner objectives in terms of his resources. It considers alternate management strategies and for each estimates possible wildlife, recreation, esthetic, and timber, and economic benefits. It then determines the best management strategy to produce maximum benefits consistent with landowner desires and resource capabilities.

Mr. EVINS. What benefits will be gained by the landowners?

Mr. WAGNER. It efficiently helps landowners make reasonable and effective multiple-use management decisions with respect to forest and associated open lands. The landowner is informed of realistic expectations in terms of income, wildlife, esthetics, soil stabilization, and other benefits he can expect from various management activities.

Mr. EVINS. Will landowners reimburse TVA for this service?

Mr. WAGNER. Development cost will not be recovered. When the program becomes completely functional, computer expenditures will be recovered from State forestry agencies and consulting foresters who will execute the program for private landowners.

MINERALS RESOURCES PROJECTS

Mr. EVINS. Explain why your budget request for minerals resources projects has decreased from $287,000 in fiscal year 1976 to $257,000 in fiscal year 1977.

Mr. WAGNER. The decrease results from no new aeromagnetic surveying being scheduled in fiscal year 1977. Other activities included in this program category will continue at normal levels.

Mr. EVINS. Give the committee a report on the benefits that the Tennessee Valley region has gained from TVA's mineral resources projects.

Mr. WAGNER. Benefits of TVA's mineral resources program have been realized through making available information concerning the possible occurrence and location of minerals in the Tennessee Valley region. The availability of such information has attracted industry to this region and brought about a fuller utilization of the mineral resources in the valley.

HUMAN RESOURCES DEVELOPMENT

Mr. EVINS. Your justifications state that one of the purposes of the human resources development program is to "reduce unemployment and underemployment in the valley." Explain how you plan to accomplish this goal.

Mr. WAGNER. TVA is helping to reduce unemployment and underemployment by operating two public service employment programs that are funded partly with Comprehensive Employment and Training Act funds from the States of Kentucky and Tennessee. Approximately 100 unemployed persons from these two States are enrolled in these programs and are gaining both work experience and job-related instruction that provide income maintenance as well as opportunities for job upgrading after they leave the program.

TVA is participating also in a public service employment program funded in part through title 10 of the Economic Development Act. Approximately 300 unemployed persons are enrolled in this program.

In these programs TVA pays for education component, counseling, job placement service, and administrative cost of work supervision and administrative services.

TVA is helping also to decrease unemployment and underemployment by the development of a craft training program that will allow local residents to gain access to high-wage craft employment at major construction projects of TVA.

Mr. EVINS. Explain the purpose and nature of the cooperative program with Volunteer State Community College.

Mr. WAGNER. The purpose of the cooperative program with Volunteer State Community College is to help qualify local residents for jobs created during construction of the Hartsville nuclear plant. The specific objective is to bring about a fourfold increase annually in the number of adult high school graduates. This program will enhance the graduates' ability to enter Hartsville-related apprenticeship and construction training programs even though a high school diploma is not specifically required. TVA is sharing the cost of this program with the Volunteer State Community College and four local school districts.

Mr. EVINS. Explain why you are placing special emphasis on attracting women and minority students to engineering and other careers.

Mr. WAGNER. The engineering field, as well as many other fields, while offering important career opportunities historically have included relatively few women and minorities. There are employment

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opportunities in these fields, and the attraction of women and minorities to them would not only help meet employer demands but would constitute a significant contribution to equal employment efforts.

Mr. EVINS. Explain the purpose and nature of the environmental study area TVA is developing near Nolichucky Dam.

Mr. WAGNER. The Nolichucky environmental study area provides citizens of surrounding upper east Tennessee areas an attractive and unique setting for environmentally-oriented learning experiences. Organized day use programs for the more than 180,000 students and teachers of the seven-county area are conducted by a specialist jointly employed by the local school systems. These programs make use of facilities at the area such as powerhouse classrooms, observation towers, trails, nature study areas, and the waterfowl management area. Other use of the area is in an informal interpretative program in which self-guided experiences are provided. This center provides a unique opportunity to demonstrate the relationships between environmental concerns and energy development.

Mr. EVINS. Provide details of the "resource identification work" at the Hartsville nuclear site and in the lower Hiwassee River area.

Mr. WAGNER. As part of our human resources development efforts we provide technical assistance to communities that are interested in developing local environmental education programs. One step in developing a program is to inventory the natural, biological, and cultural features of the area to provide a base from which the program will function. Such inventories will be conducted in the Hartsville and lower Hiwassee areas in fiscal year 1977.

REGIONAL ECONOMIC STUDIES

Mr. EVINS. Your budget justifications state the funding for regional economic studies "cover staff expenses" for conducting these studies. How many employees are covered under this item? What are the salaries paid these employees?

Mr. WAGNER. This item provides for 24.5 man-years at a salary cost of $429,000.

Mr. EVINS. What benefits has the Tennessee Valley region gained from these studies?

Mr. WAGNER. Regional economic studies provide tools utilized by practically every program in TVA. In addition, the results of these efforts are used by the various resource development organizations with whom we work. The collection, organization, and interpretation of data related to such factors as employment, income, and population provide a firmer base from which programs are planned and decisions made.

Mr. EVINS. How many townlift projects are proposed for fiscal year 1977?

Mr. WAGNER. Approximately 60 projects will be completed in fiscal year 1977. Each community's townlift is broken down into several projects, thus a span of years is usually involved.

ENVIRONMENTAL QUALITY PROJECTS

Mr. EVINS. Give the committee a report on your solid waste disposal programs, particularly as to how the program affects local areas.

Mr. WAGNER. Through our tributary area development program we provide technical assistance on solid waste disposal problems to cities and counties in all seven Valley states. Since 1969 approximately 120 communities and counties have been served. There are currently 77 requests for assistance pending. TVA assistance usually takes one of the following forms: feasibility studies pertaining to refuse collection and disposal systems; sanitary landfill operation and construction plans; and prototype system and equipment development.

The type of specialized assistance provided by TVA is generally unavailable to most communities from other sources. Nearly all of the plans provided by TVA are being implemented by participating governments at local expense.

Mr. EVINS. Tell the committee your plans for recycling waste oil-base materials generated by TVA activities.

Mr. WAGNER. We are concerned about the economical reuse of all waste materials. Used oil from our automobile and equipment pools and from old oil cooled electric transformers provides potential sources for reuse. We have studied using this material as fuel in our coal-fired powerplants but have determined that recycling for higher grade uses by the private sector is a better alternative. We are making arrangements for the collection and recycling of TVA waste oil materials.

Mr. EVINS. What findings have you made to date from your monitoring program of regional air quality?

Mr. WAGNER. We have been monitoring air quality at locations remote from high pollution sources to determine general background pollution levels and trends. It is too early to determine air quality trends; however, thus far we have learned that particulate and sulfur dioxide levels are well below the present national ambient air quality standards.

Mr. EVINS. Explain the need of a bioindicator air quality monitoring system.

Mr. WAGNER. A bioindicator air quality monitoring system uses plants that are genetically sensitive to air pollution injury. Some of these plants appear to be sensitive to only one pollutant—sulfur dioxide, or ozone, or fluoride. Other plants appear to be highly resistant to the same types of pollutants. By clustering groups of these plants—each sensitive or resistant to a different type of pollutant—in various areas of the valley, we have a long-term indicator of air pollutants for a very low cost. A more expensive alternative is use of electromechanical trend measuring devices.

DEVELOPMENT OF TRIBUTARY AREAS

Mr. EVINS. Your budget request for development of tributary areas is $2,100,000 for fiscal year 1977, an increase of $75,000 over the fiscal year 1976 estimate. Why is this increase necessary?

Mr. WAGNER. The increase is needed to help local governments with problems that they are not able to handle alone. This type of assistance includes helping to find solutions to problems in areas such as housing, recreation, roads, flood control, computerization of accounting and budgeting systems, and rural fire protection. The number of requests from local governments for such assistance continues to increase and a considerable backlog has developed.

Mr. EVINS. What is the nature of your assistance to local areas?

Mr. WAGNER. This assistance usually takes the form of technical assistance. The mix of programs offered varies in response to the current needs of local governments. Often we provide assistance directly to local governments in rural fire protection, solid waste management, computerization, and several other functional areas. In other cases, technical assistance from both TVA and non-TVA sources is mobilized to assist local governments in such diverse areas as recreation, regional planning, industrial development, community development, flood control, and emergency medical service.

To initiate new programs we sometimes loan equipment to local areas as an incentive. We have had good results in starting local programs by providing stream maintenance equipment, first equipment, experimental solid waste equipment, and medical equipment.

Mr. EVINS. Give the committee a report on your mass transportation demonstration in the city of Knoxville.

Mr. WAGNER. TVA has undertaken the demonstration to provide its employees an opportunity to use mass transit for commuting to and from work and to demonstrate how large employers can establish and operate similar programs.

The number of TVA employees driving to work alone has dropped from 65 percent in November 1973 to 19 percent in January 1976, with virtually all of the other 81 percent commuting by carpools, buses, or vans. It is estimated that during calendar year 1975 these ride-sharing efforts resulted in a savings of 400,000 gallons of fuel.

As a spin-off benefit of the demonstration, the city of Knoxville, Tenn., has initiated a van pooling program on its own and a car-bus pooling program. The van pooling program involves a grant from the Urban Mass Transportation Administration and is the first municipal van pool grant program in the Nation.

Mr. EVINS. How much will this demonstration cost and is the city sharing in the costs?

Mr. WAGNER. The cost in calendar year 1975 was $64,000. The city did not make any financial contribution; however, the city provides most of the buses, part of the capital cost of which is paid by the city.

RURAL FIRE PROTECTION

Mr. EVINS. Give the committee a report on the current status of your countywide fire protection program.

Mr. WAGNER. Throughout the Tennessee Valley there are virtually no countywide fire departments in rural areas. The major deterrents are high operational costs and the absence of rurally oriented fire-fighting equipment. Attacking each of these problems directly, TVA is publicizing and promoting the minuteman concept, a new idea in rural fire fighting. In this approach, a volunteer fireman is alerted by a pocket radio and goes to the fire not the fire station. He may be equipped either with fire extinguishers in his car trunk or he may be driving a small minipumper. The secondary response to a fire emergency is a fire truck either from the central city or other cities nearby. A second component of TVA's program is to provide local supervision of the construction of fire-fighting equipment. A third activity is the design, assembly, and demonstration of prototype rural fire-fighting

equipment. During 1975, 68 counties and communities were provided with advice about emergency response systems and 15 minipumpers and attack tankers were constructed under the guidance of TVA staff. Four countywide fire departments are now in operation: Cumberland, DeKalb, and Morgan Counties in Tennessee and Cherokee County, N.C.

Mr. EVINS. Provide details of TVA's involvement in development of a new State park at Tims Ford.

Mr. WAGNER. Our involvement in the recreational development of Tims Ford Reservoir, including a State park, dates from our early planning efforts for the reservoir. The largest single contribution to the State park came through TVA's acquisition of and transfer to the Tennessee Elk River Development Agency land for the park. TERDA in turn transferred 413 acres to the State for construction of the initial phase.

Other specific activities in bringing about the State park include an agreement with the Tennessee Elk River Development Agency and the Tennessee Department of Conservation on the need for the park, purchase of sufficient land, participation with the consultant retained by the State in 1969 to prepare a master plan for the park, and continued participation with TERDA and the State leading to construction of the park currently underway by the State.

INTERAGENCY HEALTH SERVICE DEMONSTRATIONS

Mr. EVINS. Explain how health programs developed for TVA employees are adapted to assist local communities.

Mr. WAGNER. In our own occupational health program we have developed a system which utilizes a high degree of mobility, automation, and centralized administration. We believe these same concepts and some of the equipment have applicability for meeting health service problems in remote communities. We try to demonstrate this by providing technical assistance, loaning specialized mobile equipment, and in some cases helping with laboratory and administrative backup work.

One good example is the Briceville Medical Clinic. Briceville is a remote mining community located in the mountains of east Tennessee. Here, working with local citizens and in cooperation with students of the Vanderbilt Medical School, we conducted a health fair in the summer of 1970. Many of the area's residents were examined, and we used our automated medical laboratory to develop medical profiles on each. Of course after screening, followup and long-term care are important. To accomplish this the community organized for the purpose of establishing a community medical clinic. We helped by providing a surplus mobile clinic, and the community raised money and hired a nurse-practitioner to staff the clinic. Last summer after much hard work by many volunteers, the cooperation of doctors, area hospitals, the county and State health departments, and others, Briceville dedicated a new permanent medical facility. This facility is serving people who 5 years ago were going without health care.

Incidentally, through our local flood control program, working with some of the same community leaders, we are just now completing a small channel project which will reduce Briceville's historic flood problem.

Both of these projects illustrate what a community can do if citizens unite and work, and if the government can provide some of the right kind of help.

Mr. EVINS. Explain the cooperative nature of your demonstrations of medical systems and technology. How are the costs shared?

Mr. WAGNER. These local programs are often started by conducting a health fair in cooperation with some medical school, which provides health screening to many area residents. Often from this beginning community health clinics are established which are capable of providing health services which were not previously available.

In these demonstrations we work with State health departments, medical schools, local health departments, hospitals, and physicians. These groups make the demonstrations work, and they carry on once TVA's role has ended. Generally, each group bears its own cost and the non-TVA cost exceeds by far the TVA cost.

LAND BETWEEN THE LAKES—CAPITAL OUTLAY

Mr. EVINS. Your budget request for capital outlay at Land Between The Lakes has decreased from $2,126,000 in fiscal year 1976 to $1,833,000 in fiscal year 1977, a decrease of $293,000. Explain the basis for this decrease.

Mr. WAGNER. To maintain funding in fiscal year 1977 at the same level as in fiscal year 1976, capital outlay funds for the Land Between The Lakes program were reduced to offset increased costs of operations. Higher operating costs occur as additional facilities are placed in service and as visitation increases.

Mr. EVINS. Explain the nature of the education stations for which you are requesting $79,000 in fiscal year 1977.

Mr. WAGNER. The $79,000 budget in fiscal year 1977 for education stations involves two projects, improvements to the existing Youth Station and initial development of an 1850's vintage farm.

Improvements to the Youth Station will account for $25,000 of the $79,000. The station accommodates overnight and day-use school groups.

The farm will involve moving several existing log structures to a single site. These will be arranged as a farmstead and will be operated as a living historical farm reminiscent of the early between-the-rivers era. Not only will the farm be in actual operation, there will be numerous ongoing demonstrations of crafts of the era. This will be a major center for cultural history interpretation in the area and will be operated through close coordination with colleges and universities in the region, who will supply students to assist with the programs.

Mr. EVINS. Why have recreation facilities increased to $545,000 in fiscal year 1977?

Mr. WAGNER. The increase in fiscal year 1977 provides for a much needed activities building at Brandon Spring Group Camp and an assembly area to accommodate large crowds of people.

Mr. EVINS. Give the committee a report on the current status of your highway improvements in the park.

Mr. WAGNER. Approximately 50 percent of the 41-mile-long Trace, the primary north-south road in Land Between The Lakes is in good condition. The remainder needs improving. Upgrading of an 8-mile

section of the Trace in Kentucky is scheduled to begin in fiscal year 1976 and be continued with fiscal year 1977 funds. Improvement of the remaining 13.1 miles in Tennessee is scheduled in the near future and will complete the major improvements now planned for the primary road.

OPERATING EXPENSES

Mr. EVINS. Explain why your operating expenses for Land Between The Lakes increased by $419,000 to $3,178,000 in fiscal year 1977.

Mr. WAGNER. Increases in Land Between The Lakes operations budgets have barely kept pace with inflation for several years. During this same period new facilities were opened for public use and additions made on many existing facilities to accommodate increased public use. Maintenance on roads, buildings, and campgrounds has been deferred in order to operate facilities and to meet the demands of both the general public and special groups. The increase in fiscal year 1977 will help to improve the level of maintenance at both new and aging facilities, permit operation of some new demonstrations, and cover increased visitor use at existing facilities.

Mr. EVINS. How many persons are employed in the operation and maintenance of Land Between The Lakes?

Mr. WAGNER. Employment in the operation and maintenance of Land Between The Lakes varies seasonally from approximately 140 during the off season to about 215 during the busy summer season.

Mr. EVINS. Explain the purpose and nature of the "cooperative programs with various organizations and institutions" mentioned in your justifications on page 106.

Mr. WAGNER. "Cooperative programs" is the term used to describe projects undertaken jointly with others, from colleges to special interest groups. Usually there are economical benefits to TVA, but the principal benefit comes from the increase in variety of recreational activities which can be enjoyed by visitors. Examples of cooperative programs include the construction of a hiking trail with the National Campers and Hikers Association. The trail, incidentally, is now designated as a National Recreation Trail by the Department of the Interior. Land Between The Lakes and the state park departments of both Kentucky and Tennessee jointly sponsor numerous special educational events each year. Examples of such events include Weekend with the Eagles, Archaeology Weekend, the Blue-Gray Affair (Civil War), and Geology Weekend.

Mr. EVINS. What is the purpose and nature of the work-study programs mentioned in your justifications on page 107?

Mr. WAGNER. The program gives participants an opportunity to gain field experience that will be useful in their careers, to gain an understanding for work and the fruits of work, and to develop an appreciation of the stewardship of our natural resources. Junior high, high school, and college level school groups have conducted work-study programs in resource management and ecology. Examples of the work include tree and wildlife shrub planting, trail maintenance, erosion control, the erection of wildlife nesting structures, litter pickup, building fish attractors, and other conservation activities.

Mr. EVINS. What is the current level of visitation at Land Between The Lakes?

Mr. WAGNER. Visits to Land Between The Lakes in calendar year 1975 totaled 2,131,814. This represented a 151,581, or 7.7 percent increase over 1974. As of February 22, 1976, there were 40,000 more visitors than during the same 2-month period in 1975.

Mr. EVINS. How has actual visitation compared with your expectations?

Mr. WAGNER. The increased cost and shortage of gasoline in 1974 and 1975 were expected to cause a decrease in visitors. The number of visitors dropped for a few months, but soon increased and exceeded expectations. The number of visitors in calendar year 1975 increased almost 8 percent over calendar year 1974. The number of visitors to the facility during the next 5 years is expected to increase markedly.

FERTILIZER DEVELOPMENT

Mr. EVINS. You are requesting $8,424,000 for capital outlay of chemical facilities, more than double the fiscal year 1976 appropriation level of $3,764,000. However, your nonpower proceeds for capital outlay has dropped from $1,990,000 in fiscal year 1976 to only $100,000 in fiscal year 1977. Explain the nature of these nonpower proceeds and why they are dropping so drastically in fiscal year 1977. Why is such a huge increase needed in appropriations?

Mr. WAGNER. Mr. Chairman, I would like to answer your question briefly and then supply a more detailed response for the record.

First, let me describe the fertilizer development program. The program consists of three elements: research and development, introduction, and the necessary capital projects to support the two. Historically, research and development has been financed entirely by appropriations. The introduction costs are partially offset by proceeds which are derived primarily from the sale of introductory fertilizer. Like research and development, capital projects are funded from appropriations with one exception. Late in 1974 and in 1975, fertilizer shortages and the resulting increase in demand created a special situation. Fertilizer prices rose and since the price for our introductory material is just a little under fertilizer market prices, income from introduction was exceptionally high. This same situation was expected to continue into fiscal year 1976.

At the same time, we were faced with some unscheduled capital requirements, primarily for pollution control facilities. Consequently, we decided that we would use the extra proceeds in fiscal year 1976 to fund some of our capital projects. Since that decision, the fertilizer market has made a complete reversal and the expected proceeds did not materialize. Moreover, we were faced with the necessity of deferring some of the fiscal year 1976 capital projects funded from appropriations to meet introduction expenses. The $8 million in fiscal year 1977 will finance essential capital projects needed to maintain an ongoing program. These consist of items deferred from fiscal years 1975 and 1976, plus some new facilities needed for pollution control.

[Information follows:]

TENNESSEE VALLEY AUTHORITY

FERTILIZER DEVELOPMENT PROGRAM

TVA's fertilizer program is national in scope. As the only Federal agency undertaking basic fertilizer research, TVA plays a major role in assuring that

high quality fertilizers are produced at reasonable costs and that farmers and the fertilizer industry understand how to use new fertilizer developments to maximum advantage. The beneficiary is the general public—the ultimate consumer of food and fiber. The production of nearly all modern fertilizers involves processes developed by TVA and patented in the name of the U.S. Government. Licenses to use TVA's patents are made available to private industry, thus assuring that the public reaps maximum benefits from the Government's research expenditures. Some 588 licenses have been issued for use in plants in 39 States.

The fertilizer development program is included in three budget categories: (1) fertilizer research and development, (2) fertilizer introduction, and (3) chemical facilities needed in the development and introduction of new fertilizers. The program is financed from appropriated funds and from income received from the sale of experimental fertilizers through introductory programs. Appropriations are used to finance research and development, almost all chemical facilities, and part of the introduction costs.

One objective of the introduction program is to manufacture and distribute fertilizers in enough quantity to generate broad acceptance by both farmers and the fertilizer industry. Although introductory fertilizers are sold to cooperators, the objective is to help defray part of the cost, not to generate a profit. Obviously, the cost of producing an experimental fertilizer is higher than producing a material which has been in production for some time. Because it is experimental, pricing the introductory material, even at cost, would make it more expensive than existing materials, and there would be no incentive for farmers to use it. Consequently, introductory fertilizers are priced a little below existing market price. As a consequence, income from the sale of fertilizers is influenced largely by the general fertilizer market situation. The problem is compounded by the budget cycle which requires that estimates of the market situation must be made about a year to a year and a half in advance of the fiscal year being budgeted.

During fiscal year 1974 the fertilizer market situation changed drastically. Shortages of commercial fertilizer materials developed and prices advanced rapidly. The estimates included in the President's budget for fiscal year 1976 were based on the assumption that good market conditions would continue through 1975, 1976, and the transition quarter. Because of the unusually high income projected from introduction, we proposed to use the extra funds for the installation of unscheduled pollution abatement equipment and facilities required to meet environmental standards and to defray part of the cost of needed production facilities. Modest increases were estimated in the contingency reserve.

A reversal of the fertilizer market situation started during fiscal year 1975 and conditions have continued to worsen. The demand for fertilizer decreased as a result of higher prices; at the same time the supply of fertilizers increased nationwide. Consequently the interest in TVA's introductory fertilizers also diminished. TVA's actual expenditures and income in 1975 for the fertilizer development program and the estimates now before the Congress for 1976, the transition quarter, and 1977 reflect the critical situation which TVA faces because of the reversal in the fertilizer supply-demand situation and the subsequent decline in prices.

The amount of fertilizer introduced in 1975 was below estimates; inventories increased; production expenses reflected higher costs of energy, materials, and labor; to offset this, facilities planned for construction from anticipated income were deferred; and the reserve for contingencies was completely depleted.

Estimates for 1976, which were included in the President's budget submitted to the Congress in January 1975, have been revised. In the budget now before Congress, we plan to defer all possible plant additions and undertake only essential plant improvements in order to offset increased operating costs. Our present estimates are based on an improvement in fertilizer sales and a reduction of inventories on hand at the beginning of the year. If the fertilizer market does not improve during the shipping season this year, TVA will be faced with even more serious problems for both 1976 and the transition quarter. Estimates before the Congress already indicate a zero balance in the contingency reserve at September 30, 1976.

The 1977 budget request for the fertilizer development program represents the minimum appropriation level which would restore the program to an efficient operating level. Chemical plant additions and improvements amounting to more than $7.3 million have been deferred from 1975, 1976, and the transition period. The estimate of $12.7 million in 1977 would fund essential facilities which have

been deferred along with additional pollution control equipment required to meet environmental standards.

The total cost for fertilizer introduction in 1977 remains at the same level as 1976, however, there is a difference in the source of funds required for financing the program. Income expected from fertilizer sales in 1977 is projected to be $7 million below the 1976 estimates; consequently, the activity will require $12.5 million in appropriated funds in 1977.

TVA is making all possible adjustments to meet this unexpected change in program funding. Plans are underway to shut down the phosphorus furnaces earlier than previously scheduled. Less expensive wet-process phosphoric acid is now available in sufficient quantity and at prices which will permit the program to move ahead without having to rely on the more expensive furnace acid. A comprehensive review of fertilizer plant capital requirements is being made to determine if some further reductions or deferrals can be made. Production schedules are being examined in light of a possible failure of the expected improvement in fertilizer prices and demand. TVA's fertilizer development program is struggling to survive through the remainder of 1976 and the transition quarter. The goal ahead is the reestablishment of a more efficient operation with the additional funds requested in 1977.

Mr. EVINS. Your appropriation request for operating expenses has jumped from $12,357,000 in fiscal year 1976 to $20,485,000 in fiscal year 1977. However, your nonpower revenues to assist in operating your fertilizer programs drops from $44,889,000 in fiscal year 1976 to $37,254,000 in fiscal year 1977. Why are your nonpower proceeds dropping so much in fiscal year 1977? Why is such a large increase in appropriations necessary?

Mr. WAGNER. Total operating expenses for fiscal year 1977 are at about the same level as for fiscal year 1976. As I mentioned earlier, proceeds are obtained mainly from the sale of experimental fertilizers to program cooperators. Total sales of fertilizers in 1977 will be some $7 million less than 1976 due to lower fertilizer demand and declining prices. This increase in appropriations is needed to offset the decrease in proceeds and to restore the fertilizer introduction program to an efficient operating level. It will enable us to meet high priority national fertilizer research and development requirements.

Mr. EVINS. Your justifications state that the fiscal year 1977 budget request reflects a continuation of the shift from TVA produced thermal-process to purchased wet-process phosphoric acid as a source of fertilizer phosphates. Explain why this shift is being made.

Mr. WAGNER. For two reasons, both associated with the relative costs of the two types of acid. Thermal acid in much more expensive to make because it requires substantially more energy and labor and is made in smaller sized plants. By buying wet-process acid rather than making thermal acid, the cost of our developmental production can be held down in the future. Secondly, developments based on the less expensive wet-process acid will be more useful to American agriculture since the thermal acid is priced out of the fertilizer market.

Mr. EVINS. It is stated in your justifications that "work will be continued on facilities to demonstrate production of sulfur-coated urea." Give the Committee a current status report on these facilities.

Mr. WAGNER. Detail design work for the equipment and the equipment arrangement, the steel frame for the building, instrumentation, and pollution control systems is under way.

Design is estimated to be about 30 percent complete. Procurement of materials and equipment is in progress and is estimated to be about 37 percent complete. The estimate project completion date is January 1, 1978.

Work has been delayed because it has been necessary to shift funds to developmental production in 1976 and the transition quarter to offset the effect of the worsening fertilizer market situation and the resulting decrease in nonpower proceeds.

Mr. EVINS. You are requesting $3,384,000 in fiscal year 1977 for the wet-process phosphoric acid concentrator. Yet no nonpower proceeds are being committed to this program as in previous years. Why are no nonpower proceeds being earmarked for this program?

Mr. WAGNER. Mr. Chairman, we had originally planned to finance the entire cost of the concentrator from fertilizer proceeds, but due to the reversal in the fertilizer market the funds are not available.

Mr. EVINS. Explain the huge increase in the appropriation request for this facility from $166,000 in fiscal year 1976 to $3,384,000 in fiscal year 1977.

Mr. WAGNER. This fiscal year we have spent $166,000 primarily for engineering design for the concentrator. The $3,384,000 in 1977 is for procurement and construction of the facility.

Mr. EVINS. Explain the need for the storage facilities for clarified liquid fertilizer for which you are requesting $500,000 in fiscal year 1977.

Mr. WAGNER. Clarified liquid fertilizers made from wet-process acid must be stored at temperatures below 60° F. to prevent precipitation of insoluble impurities. Consequently, the railroad tank cars which we used to store products made from thermal acid cannot be used, and we have no storage facilities where the required temperatures can be maintained.

Mr. EVINS. Explain the need for storage facilities for suspension fertilizer for which you are requesting $300,000 in fiscal year 1977.

Mr. WAGNER. Suspension fertilizers have some very desirable features. They are low in cost, have high nutrient analysis and are excellent carriers of additives such as insecticides and herbicides. They also have a characteristic on the negative side—they tend to settle when stored over long periods of time. Consequently periodic mixing is required. We do not have storage facilities suitable for the large quantities of suspension fertilizers we will be introducing in the future.

Mr. EVINS. Your primary pollution abatement facilities request has jumped from $2,116,000 in fiscal year 1976 to $4,003,000 in fiscal year 1977. Yet no nonpower proceeds are earmarked for this program in fiscal year 1977 as in previous years. Explain the need for this huge increase in appropriations and the lack of providing nonpower proceeds.

Mr. WAGNER. Several of the pollution abatement items which will be completed in fiscal year 1977 with appropriated funds were begun earlier, and were financed in part from fertilizer proceeds. As we have already indicated, the flow of these proceeds has not met our projections and completion must be funded from appropriations.

Mr. EVINS. What is the purpose and nature of improvement and additions to production facilities that you have planned in fiscal year 1977?

Mr. WAGNER. We proposed to modify and improve the suspension fertilizer unit and build a new liquid fertilizer clarifier. One of the purposes in moving from the pilot plant to developmental production is to identify and solve problems which were not apparent in the pilot

plant. Some of the funds will be used for modifications in the suspension fertilizer unit which will result in improved production and overcome a pollution problem. The balance will complete facilities for clarifying liquid fertilizers. The clarifier is needed to produce a clear liquid product from 11–37–0 liquid fertilizer made from wet-process phosphoric acid. Clarification is necessary to remove impurities carried over from the wet-process acid that would stop up equipment farmers use to apply the fertilizer.

Mr. EVINS. Why is your income from the fertilizer programs dropping from $49,400,000 in fiscal year 1976 to $42,373,000 in fiscal year 1977?

Mr. WAGNER. Income from experimental fertilizer sales in 1977 is projected to be down about $7 million from 1976. This is due to lower fertilizer demand and declining prices.

Mr. EVINS. Your budget request for fertilizer introduction has increased from $5,413,000 in fiscal year 1976 to $12,477,000 in fiscal year 1977. At the same time, your nonpower proceeds earmarked for this program drop from $44,889,000 in fiscal year 1976 to $37,254,000 in fiscal year 1977. Explain the basis for this decrease in nonpower proceeds. Why is the appropriation increase necessary?

Mr. WAGNER. Here again, the down-turn in the fertilizer market has reduced the amount of money available from fertilizer proceeds. The increase in appropriations is needed to offset this reduction. The total cost for the introduction program remains at the same level as 1976.

Mr. EVINS. Your justifications state your fertilizer programs have assisted in preserving "the small business segment of the fertilizer industry." Elaborate on that statement for the committee.

Mr. WAGNER. Last year, farmers in the United States used approximately 47 million tons of fertilizer materials. This fertilizer was sold through more than 12,000 outlets. An estimated one-half of these outlets are classed as small manufacturers and about 75 percent are individual firms.

These small firms benefit from our program in two ways. They receive better materials from the basic producers because practically all granular, complete mixed fertilizers and the major bulk blending fertilizer, 18–46–0, are produced by TVA-patented processes.

More importantly, however, they benefit because we work more closely with them. About 75 percent of the more than 250 cooperators in our educational programs are small business firms. We estimate that 80 percent of the licenses for use of our patented developments have been to small businesses. We work closely with this segment of the industry because of their direct relationship with the farmer and because they are less able to generate their own technology.

Mr. EVINS. Your justifications state that the "Nation depends almost exclusively on TVA to develop the new fertilizer technology required to maintain its position of world leadership in agricultural production." Explain how this situation occurred.

Mr. WAGNER. American agriculture relies on adequate supplies of high-quality fertilizers, three-fourths of which are made with the aid of TVA developments. Scientists estimate that 35 percent to 45 percent of our increased farm production over the past generation is due to greater use of fertilizers. TVA takes out patents on its new devel-

opments and grants nonexclusive licenses to any company for their use. Through 1975, 591 licenses had been granted to 360 companies to use TVA developments in 536 plants in 36 States.

Fertilizers available in the early 1930's were low in plant food content and physical quality. Formers used them sparingly or not at all.

TVA was directed to change this situation—to "improve and cheapen" fertilizer production and to engage in "experimentation, education, and introduction" to test and demonstrate the new products.

TVA started out by converting wartime facilities at Muscle Shoals, Ala., to produce concentrated superphosphate, a superior fertilizer, and developing cooperative educational programs to promote its use and the use of other scientific farming practices by farmers. Over the years, the Muscle Shoals facilities evolved into a National Fertilizer Development Center and a primary source of technology for the Nation. From it have come such major developments as ammonium nitrate fertilizer, diammonium phosphate, granular fertilizer technology, and improved fluid fertilizers. Educational programs continue to carry the benefits of TVA research into every corner of the country.

In 1964, USDA terminated its fertilizer research activities. Since that time TVA has been the only Federal agency undertaking fertilizer reseach. Research by the U.S. fertilizer industry has not been a significant factor in new fertilizer developments.

Mr. EVINS. How can private industry be encouraged to take a larger role in developing fertilizer technology?

Mr. WAGNER. The few attempts made by private companies in recent times to develop fertilizer research programs have largely been abandoned. The high cost and the poor prospect for turning up proprietary developments which could pay for the investment are major deterrents. We have urged industry to do more of its own research, but it has not responded.

Mr. EVINS. It is stated in your justifications that dwindling supplies of natural gas "signal severe problems for fertilizer and food production." Explain how a shortage of natural gas affects TVA's fertilizer programs. Would you elaborate on this?

Mr. WAGNER. Over 95 percent of U.S. ammonia capacity uses natural gas as the feedstock. Ammonia in turn is the basic building block for the production of fertilizers containing nitrogen. The production rate of natural gas in the United States is currently around 23 trillion cubic feet per year, and the latest estimate of known reserves is about 205 trillion cubic feet. Our production rate is declining at 8 to 10 percent per year. So you can see that the situation is serious and will become extremely critical in the near future. Naphtha or fuel oil can be substituted, but unfortunately these are petroleum-based products which are in short supply in the United States, and heavy reliance on imports from the oil-rich countries presents its own set of problems. Our best bet for the future is to use coal as a source of hydrogen. We have vast reserves of coal in this country, and many of them are located within or close to the farming areas that use the fertilizer. There are some moderate to large scale coal-based ammonia plants in operation or being constructed in South Africa, Turkey, and India. But these plants are based upon German technology largely developed before

World War II. Such plants are costly to construct, inefficient, and dependent entirely on foreign technology. U.S. industry is very reluctant to construct similar plants because of their costs and deficiencies and because of their total dependence on foreign technology.

Mr. EVINS. There is considerable activity on coal gasification for fuel purposes already. Why doesn't industry adopt this technology?

Mr. WAGNER. The current advances in fuel technology do, of course, have value for ammonia synthesis. However, further adaptation is required for these advances to be used efficiently for ammonia synthesis. This must be done in conjunction with adaptations of the ammonia plant. It is this coadaptation and demonstration that is necessary before the U.S. industry will risk the large investments required.

Mr. EVINS. What do you see as TVA's role in this?

Mr. WAGNER. I think we could play a very key role. As you know, TVA operates the National Fertilizer Development Center. There we have the necessary engineering and chemical expertise to install, test, and demonstrate a coal gasifier; we have a small, relatively new ammonia plant which would be available for modification and is adaptable for testing and demonstration of the process; and we have the close working relationships with the fertilizer industry that would use the process. In fact, the fertilizer industry already has come to us with the proposal that we initiate a major effort in this area. They say ammonia from coal is their highest priority need. I might add that in this respect both the National Academy of Science and the National Agricultural Research Policy Committee also have identified ammonia from coal as a high-priority project in relation to national and world needs.

Mr. EVINS. Does TVA have any capability to begin such a project in fiscal year 1977? What would be the total cost of such an undertaking and, assuming a start in 1977, what time frame are we talking about to complete the project?

Mr. WAGNER. It is difficult at this time to give precise figures. Based on our experience, we would need about $1.6 million in the 1977 fiscal year budget for initial engineering and possibly $35 to $40 million between 1978 fiscal year and 1982 to complete the project.

The fact that we already have the small ammonia plant needed for such a project represents a savings of some $14 million based on today's costs for such a plant—or much more if all related support facilities also had to be installed.

I think that if TVA were to be involved in the ammonia from coal project such as I have outlined, we could assure the earliest possible development and demonstration of a workable system at minimum cost.

GENERAL SERVICE ACTIVITIES

Mr. EVINS. Your appropriation request for general facilities is $1,933,000 in fiscal year 1977, an increase of $819,000 over fiscal year 1976. Explain why this increase is necessary.

Mr. WAGNER. Over one-half of the increase results from higher costs for new equipment and parts, especially replacement trucks, trailers, and construction equipment needed in TVA construction activities. The remainder of the increase is mostly for the completion of construc-

tion of a facility near the Browns Ferry Nuclear Plant for research and demonstration in the use of heated water to produce vegetable crops.

Mr. EVINS. Explain the need for a high precision computing facility for which you are committing $2 million in nonpower proceeds in fiscal year 1977.

Mr. WAGNER. The high precision computer proposed in fiscal year 1977 will be used primarily in computations of design and environmental operational data for nuclear powerplants which require a high degree of accuracy. The more expensive alternative is to rent time from other sources. Much of this work is now being done for TVA by outside contractual arrangements, and the volume of computations is projected at a level that makes purchase of a computer economically feasible.

Mr. EVINS. Explain the need for 200 new passenger sedans for fiscal year 1977.

Mr. WAGNER. The 200 sedans proposed for purchase in 1977 will replace sedans that will individually have been driven over 60,000 miles and/or in use at least 6 years. Keeping high mileage older cars in operation is expensive not only from a maintenance standpoint, but also because of high fuel consumption. The 200 sedans to be replaced are full-sized cars equipped with V-8 engines. The new sedans will be compacts equipped with six cylinder engines.

Mr. EVINS. Many of the items in your request of $2,129,000 for other general facilities and equipment are for general resource development programs. Why are these requests for equipment and facilities not included in program requests?

Mr. WAGNER. The facilities and equipment financed in this budget category are used in all TVA programs. Much of the equipment is applicable to general resource development programs but is used also for water resource development and other programs.

Mr. EVINS. What benefits has the Tennessee Valley region gained from the Valley Mapping and Remote Sensing Program?

Mr. WAGNER. By providing accurate, basic map information to TVA, State and local governments and the private sector, the Valley mapping program has been and continues to be a key tool in developing the resources of the region. Examples of such use include: planning and design of major water resource power facilities; industrial and recreational development evaluation; land use planning; geologic investigations; powerline, pipeline, and highway routing; sanitary landfill planning; water and sewer system and network planning; and floodplain zoning and insurance studies.

Remote sensing is becoming an increasingly valuable tool in resource development. It has already become a valuable aid in such areas as water temperature and quality, forest inventory and typing, land cover mapping, wetlands classification, strip mining, flood damage, and air quality. Effective applications developed within TVA in several disciplines have been demonstrated and are now in use by other agencies and the people of the region.

Mr. EVINS. Give the committee a report on TVA's plans to assist in celebration of the Bicentennial.

Mr. WAGNER. The Tennessee Valley Bicentennial South Caravan opened in Muscle Shoals, Ala., January 2, 1976, as planned. The

caravan toured the State of Alabama until February 10 when it moved into Georgia on its tour through eight southern States. The attendance at the caravan has been good, especially in the smaller cities. Through February attendance will be approximately 100,000 people. The cost of the caravan is being shared by TVA, the participating States, and the local communities which host the caravan. The Army and Air National Guard units of each State have volunteered the men and vehicles to move, assemble, and generate power for the exhibit. Two hundred and fifty TVA retirees have volunteered their services and are being used as caravan staff in 2-week shifts.

Mr. EVINS. What benefits does the Tennessee Valley region gain from paying the expenses of Soviet delegates under scientific and technical cooperation?

Mr. WAGNER. The program is aimed at the exchange of energy-related information between the United States and Soviet Russia. Our technical people have already been to Russia and the fiscal year 1977 allowance of $20,000 will be used to meet TVA expenses involved in the reciprocal visit by the Soviets. The benefits are twofold. Besides the obvious contribution to relations between the countries, the technical knowledge and information derived from our visit to the U.S.S.R were quite valuable. We plan to build on that knowledge during the forthcoming visits by the Soviets.

Mr. EVINS. Representative Clifford Allen has submitted some questions and I would like you to supply a detailed answer for the record to these questions.

I note Mr. Allen's presence in the audience. We are pleased to have him with us.

[The information follows:]

Question. What was the increase or decrease in your Fuel Cost Adjustment and Purchased Power Adjustment for the month of February, 1976 to be applied to residential customers in the areas served by TVA?

Answer. The adjustment which TVA applied to the bills of its distributors was 64 cents per 1,000 kWh. Due to power losses on the distribution systems this amount of money must be recovered by the distributor on less energy. Therefore, the increase for the month of February was 70 cents per 1,000 kWh of residential usage. The adjustment for March was a decrease of 4 cents per 1,000 kWh, the fifth such decrease in the last 6 months.

Question. What was the increase or decrease in your Fuel Cost Adjustment and Purchased Power Adjustments for the month of February, 1976 to be applied to Commercial and Industrial users of TVA power?

Answer. The increase in February for a large directly served industrial customer billed under part C of the general power rate was 66 cents per 1,000 kWh on the first 20 million kWh and 64 cents per 1,000 kWh on all kWh over 20 million.

Question. Now, you have approved, Mr. Wagner, an increase in the Fuel Cost Adjustment of 70 cents per 1,000 kilowatt hours for residential users. What was the net power revenues of TVA for the six month period ended December 31, 1975?

Answer. Our financial statements do not include a category designated as net power revenues. Our total operating revenues for that period were $852,792,173 and the net income was $103,045,337.

Question. How does that net income figure compare with your past operating history?

Answer. The net income through December 31, 1975, appears to be on track toward our total year estimate of $204,648,000. If this total amount is realized

it will be about 12 percent of revenues. I would like to submit a comparison of our 1976 estimates with the past 5 fiscal years. The information follows:

	1971	1972	1973	1974	1975	1976 estimate
Net income	$119.0	$112.1	$106.4	$106.1	$103.4	$204.6
Operating revenues	$598.0	$641.8	$749.3	$883.6	$1,176.3	$1,711.1
Net income as percent of operating revenues	19.9	17.5	14.2	12.0	8.8	12.0

One equally good way to evaluate the estimated 1976 net income is to compare it with TVA's net assets. The information follows:

	1971	1972	1973	1974	1975	1976 estimate
Net income	$119.0	$112.1	$106.4	$106.1	$103.4	$204.6
Net assets	$3,242.0	$3,781.7	$4,214.4	$4,676.6	$5,554.2	$6,623.8
Percent of net assets	3.7	3.0	2.5	2.3	1.9	3.1

It must be remembered that from the estimated net income figure of $204.6 million stated above, we must deduct $20 million for repayment to the Treasury on the appropriation investment in the power system and a return on that investment of $65.1 million. This would leave only $119.6 million, or 7 percent of our estimated operating revenues to increase the equity in the power system.

Question. Based upon the first two quarters, what do you project the net income to be for fiscal year ending June 30, 1976?

Answer. The President's budget estimate for net income for the full year is $204.6 million. The results through December seem to indicate that this estimate is approximately correct.

Question. Will that be the largest net income derived by TVA since its inception?

Answer. Measured in terms of absolute dollars, that's correct. However, measured in relative terms as I explained earlier, it is in line with past experience.

Question. How many Federal agencies does the Tennessee Valley Authority sell power to and serve directly?

Answer. In addition to its own interdivisional sales of power, TVA supplies electric power to 10 Federal installations operated by the Army, the Navy, the Air Force, and the Energy Research and Development Administration.

Question. What percentage of total power revenues in dollars are derived by TVA from sales directly to these Federal agencies?

Answer. In recent years the percent of total revenue from sales to other Federal agencies has been growing significantly due to the increasing loads of ERDA. In 1971, 10.3 percent of revenues came from these sales. In 1976 we estimate that this will have increased to 17.9 percent of total revenue. I would like to submit data for the past 5 years and the estimates for this year.

[The information follows:]

Percent of revenue from Federal agencies:

1971	10.3
1972	11.4
1973	13.8
1974	13.8
1975	15.5
Estimate 1976	18.0

Question. What percentage of total power sales by TVA in kilowatt-hours are sold directly to these Federal agencies?

Answer. These sales which made up 13 percent of our kWh sales in 1971 are expected to account for 20 percent in 1976. I have a 5-year series and our budget estimates for this year also.

[The information follows:]

Percent of kWh sales to Federal agencies:

1971	13.0
1972	13.7
1973	16.5
1974	16.4
1975	18.2
Estimate 1976	20.1

Question. How many large industrial companies does TVA sell power to and serve directly?

Answer. TVA has entered into 50 contracts to supply power directly to 38 companies having large or unusual power requirements. Separate facilities are served under different contracts even though in some cases more than one are owned by the same company.

Question. What percentage of total power revenues in dollars are derived by TVA from sales directly to these large industrial customers?

Answer. Power revenues from sales to directly served industrial customers vary somewhat with ups and downs in the economy, but recently they have averaged about 20 percent of our total revenues. I have the same 5-year series and the estimates for 1976. The information follows:

Percent of power revenues from directly served industries:

1971	20.9
1972	19.4
1973	19.3
1974	20.3
1975	19.3
Estimate 1976	18.6

Questions. What percentage of total power sales by TVA in kilowatt hours sold are sold directly to these large commercial and industrial customers?

Answer. The pattern of kWh sales is similar to the pattern displayed by revenues. The information follows:

Percent of kWh sales to directly served industries:

1971	23.5
1972	21.5
1973	21.1
1974	22.4
1975	20.5
1976 (Estimate)	19.5

Question. Please submit a list of the particular Federal agencies and facilities served directly by TVA and their location within the TVA service region.

Answer. In addition to its interdivisional sales, TVA supplies power to the following Federal installations:

FEDERAL CUSTOMER AND LOCATION

U.S. Energy Research and Development Administration, Oak Ridge, Tenn.
U.S. Energy Research and Development Administration, Paducah, Ky.
U.S. Air Force—AEDC, Tullahoma, Tenn.
U.S. Air Force—Columbus Air Force Base, Columbus, Miss.
U.S. Army—Chemical Corps, Muscle Shoals, Ala.
U.S. Army—Fort Campbell, Christian County, Ky.
U.S. Army—Redstone Arsenal, Huntsville, Ala.
U.S. Army—Volunteer Army Ammunition Plant, Chattanooga, Tenn.
U.S. Navy—Memphis Naval Air Station, Millington, Tenn.
U.S. Navy—Naval Weapons Industrial Plant, Bristol, Tenn.

Question. Please submit a list of the particular large commercial and industrial customers served directly by TVA and their location within the TVA service region.

Answer. TVA's directly served customers and the locations of the facilities served are as follows:

CUSTOMER AND LOCATION

Acety-Arc, Inc., Calvert City, Ky.
Air Products & Chemicals, Inc., Calvert City, Ky.
Airco, Inc., Calvert City, Ky.
Aluminum Co. of America, Alcoa, Tenn.
American Enka Co., Lowland, Tenn.
Amoco Chemical Corp., Decatur, Ala.
Beaunit Corp., Etowah, Tenn.
Bowaters Southern Paper Corp., Calhoun, Tenn.
Carborundum Co., The, Jacksboro, Tenn.
Champion International Corp., Courtland, Ala.
Cities Service Co., Copperhill, Tenn.
Consolidated Aluminum Corp., New Johnsonville, Tenn.
Diamond Shamrock Corp., Muscle Shoals, Ala.
E. I. du Pont de Nemours & Co., New Johnsonville, Tenn.
Engelhard Minerals & Chemicals Corp., Rockwood, Tenn.
Firestone Tire & Rubber Co., The, Bowling Green, Ky.
Foote Minearl Co., New Johnsonville, Tenn.
GAF Corp., Calvert City, Ky.
General Motors Corp., Athens, Ala.
Goodrich Chemical Co., Calvert City, Ky.
Government Services, Inc., Fontana, N.C.
Hooker Chemicals & Plastics Corp., Columbus, Miss.
Hooker Chemicals & Plastics Corp., Columbia, Tenn.
Intl. Minerals & Chemicals Corp., Birdgeport, Ala.
Intl. Minerals & Chemical Corp., Kimball, Tenn.
Intl. Pollution Control, Inc., Calvert City, Ky.
Kerr-McGee Chemical Corp., Hamilton, Miss.
Mead Corp., The, Stevenson, Ala.
Monsanto Co., Columbia, Tenn.
Monsanto Co., Decatur, Ala.
Monsanto, Co., Guntersville, Ala.
Olin Corp., Charleston, Tenn.
Pennwalt Corp., Calvert City, Ky.
Revere Copper and Brass, Inc., Scottsboro, Ala.
Reynolds Metals Co., Sheffield, Ala.
Stauffer Chemical Co., Mount Pleasant, Tenn.
Tennessee Forging Steel Corp., Calvert City, Ky.
Tenn. River Pulp & Paper Co., Counce, Tenn.
Texas Eastern Trans. Corp., Egypt, Miss.
Texas Eastern Trans. Corp., Barton, Ala.
Texas Eastern Trans. Corp., Mount Pleasant, Tenn.
Texas Eastern Trans. Corp., Gladeville, Tenn.
Texas Eastern Trans. Corp., Tompkinsville, Ky.
Union Carbide Corp., Columbia, Tenn.
Union Carbide Corp., Sheffield, Ala.
United States Steel Corp., Cherokee, Ala.
W. R. Grace & Co., Memphis, Tenn.

Question. Why is the energy charge or fuel cost adjustment rate factors higher for residential consumers than for large industrial and commercial customers of TVA distributors and TVA's direct customers?

Answer. The energy charge and the adjustment factor are not the same thing.

For large general power customers, unlike residential customers, the energy charge is only a fraction of the total bill. The energy charge is geared to TVA's variable costs of generating electricity, and is based on the total number of kilowatthours consumed during the billing period. In addition to an energy charge, the bill to a large industry includes a demand charge, geared to TVA's fixed costs of providing capacity, which is based on the maximum demand measured during the billing period. A large customer must also pay substantial facilities rental charges for power deliveries at less than transmission line voltages—161,000 volts—and must undertake a long-term contract with substantial minimum bill obligations. Residential and most small general power

customers do not pay separate demand, energy, or facilities rental charges; instead, the cost components covered by such charges are included in the per-kilowatthour charge which the small customer pays, and which, like the separate energy charge for larger customers, is based on total kilowatthours consumed. Thus, the "energy charge" to large industries and the charge per kilowatthour to residential consumers are not directly comparable. A realistic comparison of charges between residential and industrial customers must include the demand and facilities rental charges paid by the latter. Such a comparison must also include the effects of load factor, since a high load factor customer will have more units available over which to spread his fixed costs, and thus may have a much lower cost per kilowatthour than a customer with a lower load factor, even if the rates charged are identical. Industries usually have a much higher load factor than residential consumers. In addition to these considerations, the unit cost of supplying large amounts of power to a single customer is less than the cost of supplying the same total amount to many small users, and the charge for residential consumers reflects the higher unit costs of supplying them.

As to the adjustments, TVA in January 1975 added a formula to all of its rates by which the applicable energy charges automatically reflect changes up or down in TVA's costs of fuel and purchased power 2 months before. The adjustment factor applies equally to all wholesale purchases by the distributors of TVA power. TVA's power contracts with the distributors provide that retail revenues will be adjusted to compensate for any wholesale rate adjustments charged to any distributor. One of the costs that must be reflected in the retail rates under these provisions is the distributor's costs of energy losses for which the distributor has been billed under the wholesale rate. The amount of these losses is different for the various classes of customers because of the different facilities required by the distributor to serve them. For example, deliveries to large industries are concentrated and require a minium amount of transformation and distribution facilities. Residential sales on the other hand usually require long distribution lines, and sometimes, there may be several changes in voltage levels before delivery to the customer. The differences per kilowatthour in retail adjustment factors to each of the customer classes therefore reflect the average cost of transformation and distribution line energy losses between the point of wholesale delivery by TVA to the distributor and the point where the distributor delivers electric service to the retail customer.

Question. It was my understanding that this fuel cost adjustment was a pure energy charge and had nothing to do with the amount of power consumed. Please explain the difference, if I am in error.

Answer. The energy charge is the charge for the number of kilowatthours consumed. The adjustment is made to that charge. Accordingly, it goes directly to the amount of power consumed.

Question. From whom does TVA purchase power when their own demand exceeds their capacity?

Answer. TVA purchases power from the neighboring electric systems with which it is interconnected and from systems with which it has contracts. TVA also sells power to some of these systems as permitted by section 15d of the TVA act. The electric systems involved are: Appalachian Power Co., Big Rivers Electric Corp., Carolina Power & Light Co., Cincinnati Gas & Electric Co., East Kentucky Power Cooperative., Kentucky Utilities Co., Louisville Gas & Electric Co., Mississippi Power & Light Co., Southern Services, Inc., Union Electric Co., Central Illinois Public Service Co., Illinois Power Co.

Question. On what terms does TVA purchase this excess capacity?

Answer. The contracts for such power specify the amounts and periods of availability and the prices that will apply. The price usually includes a reservation or demand charge per kilowatt and an energy charge based on the supplier's source of supply plus an allowance for transmission losses and handling charge.

Question. How often in this fiscal year, which ends in June, has TVA purchased power from its various excess capacity suppliers?

Answer. This fiscal year we have purchased power from five neighboring utilities under contracts that made power available to TVA during seven differing periods which overlapped at certain times.

Question. What portion of the energy charge is attributable to purchased power by TVA?

Answer. The amount of the fuel and purchased power adjustment to the energy charge which is attributable to purchased power varies from month to month. For example, in March 1976 the portion of the wholesale adjustment attributable to changes in purchased power costs was $1.32 per 1,000 kilowatthours.

Question. What influence does TVA have in the supervision of the 160 distributors that TVA supplies power to and serves?

Answer. One of the basic objectives of the Tennessee Valley Authority Act and of TVA's contracts with its distributors thereunder is the supplying of the electric power needs in the TVA area at rates as low as are feasible. This objective is expressly recognized in TVA's distributor contracts and is reflected in many of the terms of the contracts. Thus, the distributor contracts contain detailed covenants on many matters including the rates to be charged and the purposes for which and the order in which revenues received by distributors from the resale of power may be utilized. These provisions are included in the distributor contracts pursuant to section 10 of the TVA Act which authorizes the TVA Board to include in its contracts with distributors such terms and conditions, including resale rate schedules, as in its judgment may be necessary or desirable for carrying out the purposes of the TVA Act. TVA presently provides 10 levels of residential resale rate schedules and corresponding general power resale rate schedules, as well as outdoor lighting resale rate schedules, to meet the varying financial circumstances of the local distribution systems. TVA and the individual distributor agree under the wholesale power contract as to the lowest level of rates which can be applied and still insure that the distributor will remain on a self-supporting and financially sound basis. Provisions are made for retail rate level changes from time to time to meet the changing revenue needs of the distributor. Such changes require an amendment to the wholesale power contract.

Further, upon the request of any distributor, TVA will provide advice and assistance on matters within the scope of the contract. TVA also receives monthly and annual operating reports from each of its distributors under the power contracts, reviews those reports, and from time to time discusses with the distributor any questions about the distributor's operations which may arise as a result of these reports or other reviews. TVA has the right, under its wholesale power contracts, to review the distributor's electric system book and records at any time. If any action of a distributor is inconsistent with the provisions of the power contract, TVA seeks to obtain compliance voluntarily by working with the distributor. However, if necessary, other appropriate measures may be taken to assure performance of contractual obligations.

Question. Are you in fact supervising their establishment of rates to be charged to residential and commercial end-users of TVA power?

Answer. As indicated in my response to the previous question, TVA and its distributors agree upon the rates to be charged by distributors to their residential, commercial, industrial, and outdoor lighting customers. The general power rate schedule covers service to both commercial and industrial customers.

Question. Then, it is with your approval or supervision that each of these municipalities and cooperatives establish rates to be charged residential and commercial end-users of the various customers of these 160 distributors in the TVA service region?

Answer. Yes. The resale rate schedules to be applied by each distributor to its residential, general power, and outdoor lighting customers is specified in that distributor's wholesale power contract. Any change to a different rate schedule requires amendment of the wholsesale power contract.

Question. Now, could you please explain how a municipal distributor, specifically Johnson City, Tenn., which has only 26 customers per mile of line and serves approximately 64 percent rural consumers, can sell to its customers on the lowest rate schedule approved by TVA (R–9 and C–9) and Nashville, one of the largest municipalities, which has 48 customers per mile of line and serves only 3 percent rural consumers, is charging its customers on the next to the highest rates approved by TVA (R–2 and C–2)?

Answer. Your information on Nashville's rate schedules is not totally correct. The R–2 rate used by Nashvile is the third level residential rate, rather than the next to highest. Nashville also applies the C–1 rate schedule rather than C–2. The major reason that Johnson City can apply a lower rate schedule than Nashville is that the cost of providing electric service in a medium-size community such as Johnson City may be quite different from the cost of providing service in a large metropoltian area. For example, it requires more than twice the investment in electric system facilities to serve a customer in Nashville than it does in Johnson City. Nashville's operating expenses per customer are also considerably higher than Johnson City's. Among some of the reasons for Nashville's higher costs are: (1) the providing of service to the large downtown area through underground facilities which cost much more than overhead facilities; (2)

generally higher construction costs because of rock conditions; (3) larger investments in subtransmission and distribution facilities; higher voltage (4) costs associated with frequent replacements and relocations of electric system faciilties before they are fully depreciated because of highway and street construction and relocation, urban renewals, and so forth; (5) the higher costs of rights of way in the metropolitan area; and (6) higher levels of tax equivalent payments and interest charges.

Question. Now TVA has recently requested and has been granted through legislation an increase in its debt ceiling in order to make substantial capital improvements through bond indebtedness. Is that correct?

Answer. Yes.

Question. Then, it is TVA's policy to make its substantial capital improvements, which cost millions and millions of dollars, by financing those various projects by long-term bonded indebtedness?

Answer. TVA finances capital improvements for the power program from retained earnings as well as through the sale of bonds.

Question. What percentages of capital expenditures made by TVA are financed through long-term debt and what percentages of capital expenditures come from current revenues?

Answer. The percentages vary from year to year depending on capital expenditure requirements and the level of earnings. Over the past 5 years, ending in fiscal year 1975, the percentages of capital expenditures financed by debt have ranged from 75 percent to 93 percent. The average percentage financed from debt over the 5 years has been 86 percent and the average percentage of financing from current revenues, 14 percent. As we have pointed out on a number of occasions, we believe a higher percentage of TVA's financing must come from current revenues. In the utility field it is generally considered to be undesirable to rely on such a large percentage of debt financing.

Question. As a general policy statement, how do the 160 municipal and cooperative distributors fund their capital improvements?

Answer. Distributors fund their capital improvements with a combination of internally generated funds and borrowings. The ratios vary from distributor to distributor and from one time period to another as individual governing boards consider changing conditions of the money market and varying annual system needs in planning for the funding of capital requirements.

Question. Would you please comment on the fact that for the fiscal year ended 1974 construction expenditures of $159 million were made by the 160 distributors while only $15 million of addition long-term debt was incurred to finance these projects?

Answer. For fiscal year 1974, the 160 distributors reported investment of $159 million in new capital facilities and a total of $39 million in new borrowings. After deducting the annual payments on existing debt, the net increase in total debt for fiscal year 1974 was $15 million.

Question. If my addition and subtraction are not incorrect, that means that over $144 million in capital expenditures—which by the way was more than TVA's entire net income for fiscal year end 1974—were financed out of current revenues of the distributors. Evidently, the fiscal policy of the 160 distributors is in direct conflict with that of TVA.

Answer. The financial policies of individual TVA distributors may differ from the policy of TVA and, in addition, financial policies vary among distributors. Differences between TVA and the distributors result, in general, from the higher capital investment required for the production and transmission of power compared to the capital investment required for power distribution—about $5 of assets per dollar of revenue for TVA compared to about $1.70 of assets per dollar of revenue for the average TVA distributor. This enables the distributors to more easily provide a higher proportion of the funds required for capital investment from current revenues. Also, the risk position of the distributors is different from TVA and limits the extent to which they may safely borrow. It is possible for a distributor to suffer the shutdown of a single large customer and be in a critical financial position if the distributor has a heavy load of debt.

Question. Has the TVA Board ever considered either by merger of the 160 distributors or by enabling legislation to take over the total distribution of power to all consumers of electrical power in the TVA service region?

Answer. Section 10 of the TVA Act empowers TVA to sell electricity directly to "individuals" and thus would have permitted TVA to itself carry out the distribution of electricity to the ultimate consumer. This power, however, must be considered in conjunction with the mandates of the act requiring a preference in the supplying of power to States, counties, municipalities, and nonprofit coop-

erative organizations of citizens or farmers. In light of the clear provisions and policies of the TVA Act calling for cooperation between TVA and State and local agencies, the TVA Board decided that local electric systems should be used to retail the electric power to the region's consumers. Although TVA in its early days did operate certain distribution facilities, this operation, in line with the Board's policy, was always for limited periods in limited areas, and only until local citizens or systems were ready to assume the distribution responsibilities. We believe the success of the region's power program through the years shows the wisdom of that early decision, and we have had no cause to consider changes in the existing arrangements.

Question. As you are probably well aware, legislation has been introduced in this Congress in both houses calling for a "Lifeline Rate Act" allowing a subsistence amount of power to be sold at the lowest rate offered by the utility, either public or private. Would you please comment on this proposal?

Answer. The lifeline rate concept concerns us for a number of reasons. First, it represents a sharp break in cost-of-service pricing by carving out one class of customers for special treatment and requiring other customers to subsidize this special class with increased power rates.

Under existing law, lifeline rates could also constitute unlawful discrimination between classes of customers. As I recall, a number of States have already rejected lifeline rates. Another problem we see with "lifeline rates" is that they cannot be applied in any rational manner because of the impossibility of determining how much is a "subsistence quantity" of electricity. Arriving at one uniform "subsistence quantity" will necessarily be arbitrary and will, in effect, require the utilities to choose who should get electricity at less than cost and who should pay more than cost.

Moreover, there is no assurance that lifeline rates will benefit those they are ordinarily intended to help, the low-income customer. In fact, where a great deal of residential heating is by electricity regardless of income, such as in the Tennessee Valley, many low-income customers may actually have their rates increased. In fact, selling electricity at less than cost to a special group may actually encourage them to use a greater amount, a result contrary to any energy conservation effort.

Finally, lifeline rates are often based on the misconception that large users of electricity are offered promotional rates. This is clearly not the case on the TVA system where power rates are based on the cost of serving each class of customers. Quite simply, it generally costs less per kilowatt-hour to serve a large user than a smaller user. However, in addition to the kilowatt-hour charge, large users also pay substantial "demand" charges and "facilities rental" charges, costs for which residential customers are not separately billed.

Question. Is the TVA Board now considering any new rate structures or amendments to its present rate structure to help alleviate the burden of high power bills to the poor and the elderly who are on fixed incomes? If so, please outline the method that should be implemented to solve this problem and why you favor this over the "Lifeline Rate Act of 1976" introduced by Congressman Clifford Allen and now sponsored by over 70 Members of Congress and recently introduced in the Senate by Senator Howard Baker.

Answer. Because of the skyrocketing costs of fuels and other costs that must be paid for by the ratepayers, the electric utility systems throughout the Nation have been deluged with requests of environmentalists, public officials, regulatory commissions, and others to develop new rate structures—rates that would encourage conservation, depress use during hours of peak demand, increase use at night, help the poor and elderly on fixed income, et cetera. It seems to us that a solid background of information about power system costs and load characteristics is essential in studying, developing, and testing the feasibility of these proposed rates. This is why the TVA Board has authorized a joint load metering research program with the Chattanooga Electric Power Board. It is also the reason the National Association of Regulatory Utility Commissioners is sponsoring comprehensive studies of eight or nine subjects relating to electric rates such as the pricing methodology, price elasticity of electricity, and ratemaking. A TVA representative is assisting in organizing these studies, and it is likely that the TVA system will be involved directly in some of the analyses. Information to be gained from these basic studies should help utility commissions and others avoid what has been described as "an administrative nightmare" by those observing the attempts by the California Public Utilities Commission and the electric utilities in that State to apply the State's new "lifeline" law.

Mr. EVINS. Mr. Allen says he asked for a net operating income statement for the past 6 months, fiscal year ending December 31, and you had ignored his letter and hadn't answered his letter. Can't you supply him that information?

Mr. WAGNER. Mr. Chairman, I can assure you we haven't ignored any letter we have received. I don't recall that one in particular.

Mr. EVINS. You shouldn't put it away in your files and not respond to questions from a Member of Congress.

Mr. WAGNER. We will surely supply.

Mr. EVINS. Give him the information relating to the request of December 31.

Mr. WAGNER. We will be glad to do that.

Mr. EVINS. Last year I exhibited to you about a 1-foot high stack of letters, protests on the rate increases. Here I have some 35 more. The first one is the county judge of Warren County. Next one is the city manager of Gallatin, Tenn., and people all over the district. There have been many editiorials, many news stories.

By the way, here is one from Cookeville, Tenn.—they wanted to reduce the rates and TVA wouldn't allow them to do so. Headline says, "TVA Called Dictator; Wants Rate Cut; Agency Opposes It."

I wish you would explain this for the record.

Mr. WAGNER. Let me say we have suggested Cookeville might make a further reduction.

Mr. EVINS. If you will allow these agencies to pass on some of these rate reductions where they have efficient operations and where they can, it would be appreciated by the people.

I want to include for the record these letters recently received and some newspaper clippings.

[The material follows:]

MCMINNVILLE, TENN., *August 19, 1975.*

Hon. Congressman JOE L. EVINS,
House Office Building,
Washington, D.C.

DEAR CONGRESSMAN EVINS: The situation of power rate increases has become intolerable in the TVA area as I am sure you are aware of.

Since August of 1974 there has been a $7.82 per thousand kilowatt-hour increase. This very obviously is nothing but a ripoff from the people by the bureaucracy in TVA.

I know that you, as an individual, do not have the power to control this monopoly in the power industry. But I do feel that you can make a lot of noise about it in Washington, and eventually someone will listen.

I have never bought the bill of goods that has been crammed down the American people's throat on the energy crisis that is supposedly so critical in our nation. I see it as simply a big man control and domination of the entire working class of people in this country.

With the bad winter months coming, I can foresee a situation that can lead to one of the most critical times this country has ever seen. This being brought about by the fact that people cannot pay their electric bills along with all the other inflated bills. The end result is total chaos. I know that something can be done to put a stop to such legalized swindling.

I know there is not much that I can do, and perhaps this letter won't have much impact with you, but I shall continue to cry out more vigorously until something is done to give relief to our people in this most formidable situation. I hope you shall cry out in Washington. I believe that if you will somebody will begin to listen.

Very respectfully yours,

H. T. PELHAM,
County Judge, Warren County.

CITY OF GALLATIN,
Gallatin, Tenn., June 18, 1975.

Hon. JOE L. EVINS,
Congress of the United States,
House of Representatives,
Washington, D.C.

DEAR MR. EVINS: Enclosed you will find a copy of a letter I wrote to Mr. Aubrey J. Wagner, Chairman of the TVA along with the two news releases which are mentioned in that letter.

It is not quite enough to be literally correct in a news announcement which can be so easily misread that the media picks it up as "No Electric Rate Increase." The TVA came in for much unjustified criticism during the period of rising coal prices; they also pushed the panic button and bought some most expensive coal. However, the buying of expensive coal was a judgment decision made in good faith, and the increases in electric rates were probably justified.

Don't you think it is incumbent upon men who hold important positions in the Government to issue intellectually honest press releases?

Yours sincerely,

RICHARD M. FENKER,
Chairman, Finance Committee.

Enclosures.

RAIL OIL CO., INC.,
Gallatin, Tenn., June 17, 1975.

Mr. AUBREY J. WAGNER,
Chairman, Tennessee Valley Authority,
Knoxville, Tenn.

DEAR MR. WAGNER: Along with a communication addressed to all distributors of TVA power dated June 13, 1975 and signed by Mr. James E. Watson, manager of power was included an undated news release. I would like to quote the first paragraph of that news release:

"The TVA Board of Directors completed its quarterly financial review Thursday and determined there will be no adjustment in power rates for the July–September quarter. However, the cost to consumers will continue to rise or fall with trends in TVA's actual costs for powerplant fuel and related expense."

This news release was given a great deal of publicity in all of the newspapers as well as the television stations in this area. The headline news was "No Electric Rate Increase!" Three days later on June 16, 1975, a communication addressed to all distributors of TVA power, signed by James R. Burdeshaw, director of Power Marketing, contained the following sentence:

"This increases the adjustment to the residential rates from 0.393¢ per kWh to 0.591¢ per kWh or $1.98 per 1,000 kWh."

I suppose a literal reading of the June 13 news release could be construed as leaving the door open to the rate increase contained in the June 16 announcement, but it was a little on the sneaky side.

I am a member of the Gallatin City Council and am the council's representative on the Gallatin Electric Power Board, and I can assure you that explaining rate increases to one's neighbors is an unpleasant task; a task that was made much more difficult by the bad press of our big neighbor the Nashville Electric Service.

Mr. Wagner, those of us connected with the electric department have had all the trouble in the world this last year trying to represent the best interests of TVA in our area, trying to explain the increase in electric costs to the consumer. Now how in the world do you expect independent businessmen, whose job on a power board is only parttime, to represent TVA here when TVA press releases issued just 3 days apart are completely contradictory. It is bad enough to represent the power company here and take all the abuse due to the increased rates, but when the organization we are representing is not honest in its announcements then maybe you should re-examine your public relations program.

It's bad enough to raise rates but sometimes nothing can be done about that—it is unconscionable to distribute dishonest news releases.

Yours very truly,

RICHARD M. FENKER.

QUARTERLY RATE REVIEW COMPLETED

The TVA Board of Directors completed its quarterly financial review Thursday and determined there will be no adjustment in power rates for the July–September quarter. However, the cost to consumers will continue to raise or fall with trends in TVA's actual costs for powerplant fuel and related expense.

These cost trends are covered separately in monthly billing charges that are determined automatically by changes in costs for fuel and power imports. Most of the increase in electric bills over the past year has resulted from these monthly billing charges, as they have reflected a sharp increase in fuel expense.

Quarterly rate reviews during the past year have resulted in one further adjustment to cover increases in other power system costs, and it was effective in January.

TENNESSEE VALLEY AUTHORITY,
Chattanooga, Tenn., June 16, 1975.

To all distributors of TVA power.

Enclosed is the statement of amounts applicable for July 1975 to the wholesale and resale rate schedules under the January 2, 1975, adjustment addendum.

Under the fuel and purchased power portion of the subject statement, the amount applicable to the wholesale rate will increase from 0.357 cents per kilowatthour to 0.537 cents per kilowatthour. This increases the adjustment to the residential rates from 0.393 cents per kilowatthour to 0.591 cents per kilowatthour or $1.98 per 1,000 kWh.

This large change was caused by a combination of factors. One was the continuing increase in the cost of coal burned. Others were the loss of low-cost generation from Browns Ferry and the extended shutdown of the Cumberland plant units for major maintenance and modification which required increases in power imports from other utilities, increased operation of oil-fired combustion turbines, and higher dependency on TVA's other available coal-fired units.

If you have any questions, please feel free to contact your district office.

Very truly yours,

JAMES R. BURDESHAW,
Director of Power Marketing.

HENDERSONVILLE, TENN., *September 1, 1975.*

Congressman JOE L. EVINS,
2300 Rayburn House Office Building,
Washington, D.C.

DEAR CONGRESSMAN EVINS: I am writing to you with the hope of accomplishing some sort of relief from our ever-increasing electric bills via TVA.

I moved to the State of Tennessee in May, 1975 and have had two electric rate increases since that time. The average increase has been approximately $10 per increase.

It is my understanding that the upcoming September increase will be the 10th increase this year. This is a very discouraging situation.

Please, isn't there something that can be done to halt these rapid increases? Please help us.

Sincerely,

JAMES R. ROARK.

MADISON, TENN., *August 13, 1975.*

DEAR CONGRESSMAN EVINS: The electric bills are very high and I don't see how the working man can possibly keep up.

Pretty soon it will get to be so that we won't to able to buy groceries or even light the house.

I believe that the TVA has raised these prices to an outrageous amount.

Could you please help?

Thank you very much.

MR. AND MRS. J. B. DAILEY.

GALLATIN, TENN., *August 17, 1975.*

Congressman JOE L. EVINS,
Washington D.C.

DEAR CONGRESSMAN EVINS: The high cost of energy has got to come down. The oil industry together with the Arabs and TVA is strangling the American people.

We need to have elected representatives on the TVA Board to stop these increases in power rates.

We need to separate the economic functions of producing, refining, distributing and marketing oil products to break up these monopolies.

Congressman, I hope you will give some leadership to solving these matters.

Sincerely,

JAMES W. HAWKINS.

HIXSON, TENN., *September 12, 1975.*

Re: Support of your proposed TVA bill.

Hon. JOE EVINS,
U.S. Congress,
Washington, D.C.

DEAR MR. EVINS: Local Chattanooga TV and press reported your proposed legislation to limit TVA power rate increases to each 2 years, with prior hearings. The increase to five TVA Board members. And that you thought the measure should "provide better management for the agency". Also that the entire Tenn. delegation supports your proposals. I heard Mrs. Lloyd on TV last night supporting your bill and also that she had some legislation of her own; that the present situation could not continue.

In the past 3 years, I have heard it mentioned many times that there should be some higher body to review and approve power increases. And that increases should be on a set schedule, mentioning 6 months and a year.

TVA is a monopoly, which is alright. But it is the only nonregulated monopoly in the country and this is not good.

Local papers here barely mention TVA hearings last April. I thought it could have been the Public Works Subcommittee, of which you are chairman. If they were printed, I would appreciate if your office could furnish the title under which it is listed with the Government Printing Office, so I could order copy.

As a native of Hamilton County, Democrat and retired TVA employee with over 33 year's service, and as an active union member and elected officer over a 20-year period, I can make an educated guess on the reaction to your proposal. Some newer employees and some briefcase toters in middle management will probably criticize (among themselves) and refer to TVA's "flexibility"—always a favorite. And an attitude that anyone even questioning any TVA activity is an avowed TVA "enemy". Then the word "loyalty" will be used. Yet older employes, most TVA retirees and older citizens (especially Democrats), face the fact that there has been slippage in TVA from the TVA of 30–35 years ago, even though they still believe in the concept and know the good it has done in the past. Also these more mature people, TVA employes included, know that no representative from Tennessee or in the Congress can even approach the length and quality of your record of support in TVA's legitimate needs; but that when TVA wanders off base or becomes too arrogant, then you represent the people of Tennessee first and always—and not TVA management. I would think even Mr. Wagner knows this. That is one of the basis of your widespread reputation and esteem.

From the 1917 flood in Chattanooga, through Roosevelts 1932 election, birth of TVA, and a long-time employee and retiree, I pretty much know the whole TVA story, before and after, as you do. And certainly I am no TVA-hater or newcomer to the region, making flip judgments based on high power rates alone. I know the results and reputation of TVA's first 20 years and how it was earned, because I was part of much of that period. But, as others, have observed a gradual change taking place in TVA since World War II, not all good. There has been a gradual deteriorating loss of confidence by employees, then the public; and it began before the coal and oil situation. Coal and oil have gouged everyone unmercifully and should be brought under control; it has affected the whole Nation. But completely aside from that, there seems to have been a drift of TVA toward

becoming just another arrogant bureaucracy; too much self-praise and trying to manufacture a false image instead of working for a real one. Trying to invoke the reputation of 35 years ago, which was made by another generation, 90 percent of whom are now gone, to quiet probing questions of today. But TVA is not a sacred cow who can coast forever on a reputation of 35 years ago. They do have thousands of dedicated employees, although many of the older ones are disillusioned, but are still capable and conscientiously perform their duties out of their own self-respect; not because of any stars in their eyes. TVA always gets eloquent in talking about the wonderful happy, cooperative one big family bit, when testifying before Congress. But after serving in about every capacity as a union representative and on a grievance committee for 2 years and the experience, it simply is not that rosy now days. There once was a time when such cooperation and confidence mutually existed, and still does within some individual small units, but mostly it is not quite so rosy, to state it mildly.

It seems sometimes that TVA could not do a better job of weakening its public support, if it were deliberately trying to. Meetings with the public by TVA officials, does not even dent any course they take. The only possible remedial action has to be an overburdened Congress with positive action, but lead by one who is thoroughly knowledgeable of TVA, its history, its good and its bad. And I can't think of anyone more qualified in this than yourself.

I would have liked to go into more detail on this and other legislation, and opinions from experience, but I have already created an imposition by the extreme length of this letter. So again my appreciation to you on behalf of people who cannot afford an expensive lobby and as one of Tennessee's three best all-time representatives in my lifetime (others: Cordell Hull and Estes Kefauver) and support of your proposal.

Very truly yours,

L. W. FIGGINS.

P.S. Recognition of your unapproachable record of 30 years or more, does not mean I am anything less than enthusiastic of Mrs. Lloyd's record of only 8 months. I have heard her mention on TV at least three times, your support of projects she has sponsored, and I appreciated that.

NASHVILLE, TENN., *August 8, 1975.*

Congressman JOE L. EVINS,
2300 Rayburn House Office Building,
Washington, D.C.

DEAR CONGRESSMAN EVINS: As a user of electricity we are hereby protesting the large increase in our electric bills.

In 1974 for the period of June 19, 1974, we used 1,842 kilowatt hours with a bill of $28.04. For this same period, June 19, 1975, we used 2,628 kilowatts (according to Nashville Electric Service) with a net bill of $53.53 which we do not believe is correct.

We own a very modest home and there are only 2 in our family and one of us works and are not at home during the day to cook. It is about all we can do to pay such a large electric bill and it has always been our understandnig that TVA should mean cheaper rates! This is not true.

We therefore urge you to investigate TVA and to put a stop to these ever-increasing bills. You were elected to look after our interets and we are expecting you to do so.

Anything you can do to put a stop to these outrageous bills will be greatly appreciated.

Yours very truly,

Mr. & Mrs. M. S. DILLARD.

WHITLEYVILLE, TENN., *August 5, 1975.*

DEAR MR. EVINS: Well I will warn you that I am getting old and can't write too good and sometimes I forget how to spell words.

I am writing you about the Upper Cumberland Electric bill in Gainesboro my husband and I are having to pay.

We are both getting old and can't do much work. He is just a little farmer. We don't have much income, $81.50 and that is social security.

I can't see how we will pay our bill if it doubles it will be $84.00 this winter. We don't have no other way to heat our little home.

Mr. Evins, my husband and I have all ways voted for you.

I wouldn't know you if I seen you but we believe you are a good man.

So would you please try to help us, some way. Our light bill is too high. I know some more people just like us just can't pay the light bills.

Well Mr. Evins this is my story and believe me its true.

I just don't know what to do. So if you can please help us there are many more people just like us.

You may put this letter in your trash can, but I don't believe you will. Thank you for your time in reading this mess if you do read it.

Your friends,

Mr. & Mrs. Cordell Minchey.

Hermitage, Tenn., *August 4, 1975.*

Mr. Joe L. Evins,
Representative, 2300 Rayburn House Office Building,
Washington, D.C.

Dear Mr. Evins: Each day it seems to become more apparent that the most popular game being played is "Rip Off." This game is more and more evident whenever I read the paper, go to the grocery store, or shop for my family in any way. The straw that broke the camel's back for me and aroused my anger to the extent that I am, at long last, doing the only thing I know to do—write my Congressman—came in the form of my latest electric bill from Nashville Electric Service, with the all too familiar phrase, "Fuel Cost Adjustment," written across the top.

This phrase has been written across the top of my last 12 electric bills, and the paper this morning tells me it will be written across the top of my next bill. These adjustments started out at a modest 0.0460 and have steadily increased until this morning's announcement that the increase would be 0.660. It seems to me that this phrase is becoming a catch-all phrase for TVA to increase its income whenever they decide a few extra dollars would be nice to have. I'm well aware that the cost of coal has risen, and rightly so when I read and see pictures of families in the Appalachian coal mining regions. However, commonsense tells me that the cost of fuel cannot possibly have risen so rapidly as TVA would like for us to believe. This easy way of passing on added expenses gives TVA absolutely no incentive to acquire thrifty habits and employ the cost-cutting methods that the average family has had to acquire in order to survive.

Fortunately, we are in a solid middle-income salary range. However, in projecting the cost of heating our modest 1,200 square foot home this winter, I find that at the present rate we are now paying for electricity, our heating bill will be almost $90 for our coldest month, compared to $54 just last January. This is really starting to hurt! And, when I think of the elderly who are on fixed incomes, and the many people who are on welfare and the minimum wage, there's no doubt in my mind but that many people are going to be very cold this winter.

Please consider this letter a strong request for a thorough investigation of TVA. The increases placed on us in the past year and a half are astronomical and beyond my comprehension.

Sincerely,

Mrs. LaDonna B. Shepherd.

Nashville, Tenn., *July 30, 1975.*

Hon. Joe L. Evins,
U.S. Congress, 2300 Rayburn House Office Building,
Washington, D.C.

Dear Congressman Evins: My husband and I would like to express our deep concern about the ever increasing rise in the electric bills here in Nashville and Davidson County.

Although we are financially able to pay these enormous bills we are greatly concerned about those who are unable to do so. What is going to happen this coming winter when most people heat by electricity? I can tell you . . . there will be many who will suffer as they will be unable to heat their homes at the present electric rates. Something must be done about this!

We are, therefore, urging you as a Member of our Congress to look into this matter and to investigate our TVA from whom we are supposed to be getting cheaper electricity. The sole purpose of having TVA was to get cheaper electricity. Instead, they are continuing to raise the rates month-by-month and now it has come to the place where it is far beyond the pocketbooks of the average citizen.

Something is wrong . . . and we most urgently ask you to please investigate this situation. We elected you to look out after our interests and we are counting on you to do whatever is necessary to put a stop to these ever increasing bills.

Most respectfully yours,

Mr. & Mrs. M. C. HIGHTOWER.

HENDERSONVILLE, TENN.

Congressman JOE L. EVINS,
2300 Rayburn House Office Building,
Washington, D.C.

DEAR CONGRESSMAN EVINS: I am writing in a plea for the people you represent. My summer electric bills look like last winter's electric bills. I shudder to think of this winter's bills with all the increases we've had, and yet the increases to come. My husband and I both must work to meet the increasing bills. We need help from the monopolies that are taking over. If N.E.S. is to blame, please check into it. If TVA is to blame, please investigate. Some people aren't able to work to meet these increasing bills, while others can't afford to have a family as it now takes both adults to work and meet these bills. The people cannot take much more.

Tennessee was once an opportune State with cheap TVA electricity. Now, they have monopolized and we're no better off than those who live in other States, and maybe we're not as well off. There's no opportunity in Tennessee anymore and, as yet, no one has been able to control any of this. Please help us. While some are getting rich, the poor and nearly poor must struggle even harder.

Mrs. JANICE KANE.

WATERTOWN, TENN.

Hon. JOE L. EVINS.

DEAR SIR: I'm writing concerning our electric bill with the TVA. We need help from someone. Our bill has jumped sky high. Working people just don't seem to have a chance. It seems people on welfare and food stamps have no worry about earning a living, there are so many people I know that should not be on food stamps or welfare. They're better off than I, but I'm not complaining. I thank God that I'm able to work and earn my keep. Back to the reason for this letter. Our bill seems to get higher every month. Please, please see what can be done about TVA. I work at a shirt factory and it's terrible to work a week to pay your electric bill with all other prices on things rising. Excuse my handwriting but it'll get the message across.

Sincerely,

BARBARA BARRETT.

BRENTWOOD, TENN., *July 28, 1975.*

Hon. JOE L. EVINS,
Member of Congress, Washington, D.C.

DEAR MR. EVINS: I am writing to ask you to help get relief for people in this State on their electric bills. Our bill went up in July from $58.17 to $86.37. Also, we are told our bills will go up again in August.

I don't think there is any way to get help on this except through our elected officials. I am much concerned about people who have less income than we do. I don't really see how some of them could pay bills like these. Also, many of them don't know who to turn to.

Please consider those people and let us all pay a fair amount for our electricity without feeling we are being "ripped off" each month.

This is a topic of conversation in nearly any gathering of people—so it is of much concern to everybody.

Sincerely yours,

MRS. THOMAS M. OGLES.

NASHVILLE, TENN., *July 21, 1975.*

Hon. JOE L. EVINS,
House Office Building, Washington, D.C.

DEAR CONGRESSMAN EVINS: For the past several months the electric bills in Nashville have been continually increasing because of the rate increases Tennessee Valley Authority is imposing upon the consumers.

It is very difficult to understand why consumers are being charged higher rates when there are reports of millions of dollars of surplus revenues and of TVA negotiations for coal at lower rates than a year earlier. I just learned today that our August bills will show an increase of 60 cents per 1,000 kilowatts used.

I feel that it is imperative that our representatives from Tennessee demand that the members of the board of the Tennessee Valley Authority appear before you in person and adequately justify these rate increases.

I sincerely appreciate any assistance you can give me and other citizens of Tennessee in relieving this additional burden during this inflationary period. Thank you, I am

Sincerely,

(Mrs.) PHYLLIS H. BRANAN.

NASHVILLE, TENN., *July 21, 1975.*

Hon. JOE L. EVINS.
House Office Building, Washington, D.C.

DEAR CONGRESSMAN EVINS: I am writing to request a public explanation regarding why TVA has seen fit to consistently raise electrical rates over each of the last 5 months. I feel the people who live in the TVA district have a right to demand that the directors of that body publicly address the need for the excessive increases recently imposed upon the electricity consumer. From living in Tennessee the past 14 years I know that many Tennesseans have purchased electrical appliances and heating systems specifically because of the reasonable electrical rates that TVA supposedly offered. Now these same people are being penalized with these constantly spiraling rates. There certainly needs to be an explanation offered.

What can the residents of the TVA district do to exert influence on this seemingly independent arm of the Federal Government?

Any assistance you can offer in this complaint is appreciated.

Sincerely,

HARRYETTE HARTFORD.

PLEASANT HILL, TENN., *June 30, 1975.*

Hon. JOE L. EVINS,
U.S. Representative, Room 2300, Rayburn House Office Building, Washington, D.C.

DEAR REPRESENTATIVE EVINS: It is understandable that you have received hundreds of letters treating with the same problem which is agitating me today. The fact of the case is that I am thoroughly disgusted with TVA.

We have a small, well insulated brick house. There are only two of us. We are elderly retired people, so there are no children running in and out of the house. We heat our house with electric power. Our electrically operated equipment is at a minimum. The following list will attest to this fact.

We never light more than two rooms at a time.

There is one water heater.

One cooking stove which is in use less than 2 hours daily.

One Maytag washer, wringer style, in use 1 hour weekly.

One electric iron used an average of 3 hours weekly.

One TV used an average of 2 hours daily.

One medium size refrigerator.

One toaster used an average of 10 minutes daily.

It was 14 years ago that we moved into this house. At that time the average cost per month for electricity was $17.50. This year we paid $31 per month for a short while. The price was then raised to $35 per month. This morning we received our electric bill and was asked for $51 per month for the coming year. Besides the $35 per month which we have paid for several months the bill re-

quested an additional payment of $89.06. The rate that we have paid this year is an advance of 300 percent over the 1961 rate.

Recently we noticed in the "Knoxville Journal" that the TVA was investing several millions of dollars in real estate and of course they are constructing a new multimillion dollar office building.

Of course the money that they are using is profit from the consumers of electric power. Is it not true that it would be far better did they employ their time and energy in the generating of electricity and not become interested in the many projects into which they are delving?

Hospitals, nursing homes, manufacturing establishments, in fact all users of power with the exception of retired folk who are living on meager fixed incomes can pass these excessive charges on to the buying public. In fact we who are retired not only pay for what we consume but also for what thousands of others consume.

As you know, social security has been increased 8 percent. Can we pay a 300-percent increase in power rates with an 8-percent increase in social security payments?

There are thousands of electric customers who will bless the names of their Representatives and Senators if they are convinced that Congress is honestly making an effort to right the wrongs which the TVA is inflicting on them.

Very truly yours,

JAMES W. CONLIN.

NASHVILLE, TENN., *June 18, 1975.*

Representative JOE L. EVINS,
Rayburn House Office Building,
Washington, D.C.

DEAR MR. EVINS: Rare indeed are the occasions when I feel so strongly about an issue that I will take the time to express my views, but the Tennessee Valley Authority's announcement of another rate increase is the straw that broke the proverbial camel's back.

This rate increase by TVA when coupled with similar such instances by South Central Bell, Nashville Electric Service, oil companies, and scores of others is just too much! This sort of inflationary practice has no place in a time when consumers are hard pressed to afford basic shelter, food, and clothing.

Mr. Evins, I implore you to use any power you have to halt this rate increase. I am certain that by doing so you would be representing the best interest of the public who elected you to the office you now hold.

Respectfully,

JOE E. SWING.

LAFAYETTE, TENN., *April 24, 1975.*

Hon. JOE L. EVINS,
House of Representatives,
Washington, D.C.

DEAR MR. EVINS: I want to express my thanks to you for the stand you have taken on escalating TVA power rates. It seems ridiculous that we in Tennessee have become subject to such staggering rate increases.

I am a retired schoolteacher, having been in some type of schoolwork for 43 years. I retired at the end of the 1972 schoolterm, hoping that I could live in modest comfort.

With my savings I purchased a small, and I hoped to be a comfortable, house in Macon County. With the mild winter we have had, my electric bill has been increasing at a staggering rate. I close as much space as possible from heat.

I am concerned not only for myself but for others if rates continue to increase. I shudder to think what I and many others may suffer should next winter be a cold winter, or even as cold as the one we have just been through, should something not be done to halt this tremendous rate of increase in TVA power rates.

Yesterday I had a visitor from San Antonio, Tex. He expressed shock that we in Tennessee should suffer such shortages and rate increase in Tennessee. He further stated that he had been told that it was due to the coal situation.

Thank you again for your stand. Some comfort can be felt to know that you are fighting for us.

Yours truly,

MARY FITZGERALD.

LEWISBURG, TENN., *April 28, 1975.*

Hon. JOE L. EVINS,
Rayburn House Office Building,
Washington, D.C.

DEAR SIR: I want to congratulate you on your stand with Mr. Wagner concerning his handling of the rising cost of coal prices to TVA.

While we all are aware that prices are rising, it seemed TVA sat on its hands and allowed the coal companies to renege on contracts. We are certainly feeling the pinch of extremely higher electric bills.

Yours truly,

ELIZABETH B. COCHRAN.

DEAR SIR: As a consumer of TVA electrical power, I would like to voice my concern and frustration over the constant increases in utility rates. This concern is based on several specific issues which include:

1. Apparent uncontrolled rate increases which seem to be irresponsible and lead to a waste ethic on the part of the Tennessee Valley Authority.
2. Lack of obvious efforts on the part of the TVA to reduce its own overhead expenses while it asks the consumer to pay higher rates for lower consumption.
3. Efforts of the TVA to expand into areas of private enterprise rather than letting bids for needed goods and services.
4. Apparent inequities in utility bills which exist in neighborhoods and homes of similar circumstances.
5. Inequities due to reading meters after rate increases have been instituted without proration of fees for those kilowatt hours consumed prior to rate increase.

As a consequence of these concerns, it is apparent that the Tennessee Valley Authority and the local power distributors should be more closely scrutinized by the various State and local public service agencies, the U.S. Congress, and the concerned State legislative bodies.

As a citizen of this State, I would like to encourage your participation into a full and comprehensive investigation of the policies, procedures, and finances of the Tennessee Valley Authority and its various local power distributors.

Respectfully,

JOANN WEATHERFORD.

JELLICO, TENN., *February 31, 1976.*

Hon. JOE L. EVINS,
House of Representatives,
Washington, D.C.

DEAR MR. EVINS: Can nothing be done about the unreasonable rates that TVA is charging?

I hardly see how we, the consumers, can keep paying such astronomical rates. My bill for one was outrageous, $201 plus. Many others with whom I have talked had their bills to double while some increased 60 to 70 percent. I ask you is there anything just or reasonable about that.

Both my husband and I work, so by cutting back on food, our rare evenings out, and other things that we can possibly do without, will by the time it comes due be able to pay our bill; however, I am very tempted not to. All they could do is disconnect my electricity and if rates remain the same or heaven forbid double by June as I heard last night on the news, I am going to have to buy kerosene lamps anyway. But even more important what is the lady, yes, there is one in Jellico, drawing $90 a month going to do when she receives a bill for $100. There are others, I'm sure.

I shutter to think how many old people will freeze to death because they have no means to heat their homes, how many will starve to death because they cannot afford to buy food, and how many will go without needed medication because they cannot afford it when TVA gets through with them.

I understand that when President Eisenhower was in office he tried to sell this atrocious monopoly to private enterprise. Does the Government not have control over monopolies? I was under the impression that they did. Well, if the Government cannot intervene and do something about the situation, I for one advocate selling it to private enterprise. I know things could be no worse.

It is my understanding that TVA was built to aid the rural people of Tennessee. My father, in fact, helped build the dam at Norris, way back when it

was an aid to the people instead of a hindrance. Now TVA has become such a financial burden that one is almost encouraged to quit working, have half a dozen illegitimate children and get welfare and food stamps like half the other people in the U.S.A. It seems they fare so much better than the working man. I do not mean the aged and the disabled.

Will you as an elected public servant step in and help the poor working man, or will a decision have to be made at the polls on election day. In the past you have served our State well. Please help us now.

Sincerely,

JUNE MAIDEN.

INDUSTRIAL DEVELOPMENT COMMISSION,
OF CAMPBELL COUNTY,
Jacksboro, Tenn., February 16, 1976.

Congressman JOE L. EVINS,
Suite 2300, Rayburn Building,
Washington, D.C.

DEAR CONGRESSMAN EVINS: I am sure you have been advised by letter as well as the news media by the doubling of electric power bills in Campbell County by the LaFollette Electric and Water Department and the Tennessee Valley Authority.

A delegation from Campbell County visited Mr. Wagner, chairman of the Tennessee Valley Authority Board in Knoxville one day this past week voicing their complaints and objections to this exorbitant increase in their power bills. Mr. Wagner has agreed to interview these citizens again on February 23. In this first interview he advised them that they had been considering electric stamps to be used the same as food stamps. This seems to be a most asinine statement as the Government has all the problems and involvements with the food stamp program it needs.

It is my opinion the Tennessee Valley Authority needs some type of curtailment that power increases can not be made more than once a year and then at the pleasure of the Congress if they deem it necessary.

Mr. Wagner's excuse of the high price of coal is not true. TVA needs to get it's house in order and be stripped of it's unlimited powers to operate and do as they please.

In my position as industrial commissioner of Campbell County, I cannot say now that we have TVA power the cheapest in the United States. I have been advised by many of my prospects who are served by public utilities, their rates are no higher than TVA.

Any assistance or advice you can give us to bring our electric power rates back to a more realistic figure would be appreciated.

Sincerely yours,

J. WALES SMITH, *Commissioner.*

JELLICO, TENN., *February 18, 1976.*

Hon. JOE L. EVINS,
House of Representatives,
Washington, D.C.

DEAR REPRESENTATIVE EVINS: I am writing to protest the increasing TVA rates in our area. The utility board can't explain it, TVA can't explain, and I certainly can't explain it.

My husband strips coal and has had several contracts with TVA and I know what price per ton TVA pays. It has dropped from last year and yet TVA cites its rates increases to rising coal costs, which sir, is absolutely false.

In our area, I know of several cases where electrical bills exactly doubled in 1 month, where elderly people living on $90 to $120 a month fixed income had $100 a month electric bills to pay. This is absolutely ridiculous and certainly against TVA's policy of low electrical rate.

TVA states increasing coal prices and inflation for this increase, however, coal prices for TVA has dropped from $20 per ton to $13 per ton. This is a falsehood that TVA is trying to make the people in this area buy. They do, however, have long term contracts from last year with certain coal producers at last year's rate, which they are trying to find any non-compliance of stripping laws by these

producers to forfeit these contracts. This does not justify continuing increase in electrical rates.

If TVA is not investigated, the voters in this area will speak positively at the polls in the next election against anyone who is silent on this issue.

Sincerely yours,

SANDRA DAVENPORT.

JELLICO, TENN., *February 13, 1976.*

Hon. JOE L. EVINS,
House of Representatives, Washington, D.C.

DEAR REPRESENTATIVE EVINS: How are young married couples with children expected to live and pay the huge electric bills we have received? Are we to let our children do without the necessary food and clothes they need so that TVA can continue to pay their executives huge salaries and build million-dollar buildings in which they can work (?) in comfort?

My husband and I both work. We were taught by our parents that work was honorable, yet the nonworkers seem to have more than those who work.

I was taught in school that TVA was formed for the purpose of providing electricity at a low cost. Were my teachers and books wrong? I was also taught that our Government, since they owned Tennessee Valley Authority, controlled it. What has happened to this control?

This is my first time to write an elected official. I feel it is time that I let you know how I feel about the unjust electric bills in this poverty area.

Will you please consider your fellow Tennesseans and do something about controlling TVA?

Sincerely yours,

MRS. JOHNNY D. FAULKNER.

[From the Herald Citizen, Dec. 24, 1975]

TVA CALLED "DICTATOR"

COOKEVILLE RATE CUT OPPOSED BY AGENCY

(By Mary Jo Denton)

Invoking the name of Nashvillian Clifford Allen several times, Cookeville City Council yesterday tangled with TVA.

John Smith, representing TVA, appeared before the council to say that TVA does not approve of the electric rate changes recently enacted by the council and will not allow them.

The Council on December 4, after a long and careful study of the electric department, acted to lower residential customer rates by about 99 cents per month per customer and to lower commercial and industrial customer rates by about $1.10 per customer per month.

To do that on a temporary basis—perhaps for the next six months—the council, acting on the advice of electric department manager W. R. (Chic) Holland, changed their rate structures from R–7 to R–9 (residential customers) and from C–6 to C–7 (commercial and industrial customers).

The rates were lowered for the purpose of helping Cookevillians make it through the winter months of an economically hard year, the council said.

But TVA had not approved the rate changes when they were acted upon by the council and does not now approve them, Smith told the council yesterday.

And Cookeville's contract with TVA stipulates that there will be no rate changes until TVA agrees with them, he said.

TVA's objection stems from the fact that the new rates enacted by the council are "two series levels apart," meaning essentially that the council lowered the rates for residential customers more than they lowered them for the other customers, Smith said.

Lowering the residential customer rate to R–9 would be acceptable if Cookeville would also further lower commercial and industrial rates to C–8, he said.

"Otherwise, you are leaving yourself open to lawsuits brought by some of your own customers, and if you get sued, TVA gets sued," Smith said.

Noting that no commercial or industrial customer had complained and that most would probably welcome the lower rates their own employes would pay for home electricity, the councilmen and city manager Bethel Newport vigorously attacked TVA as a unfair dictator in this case.

"We don't like you coming in here and telling us how to set our rates—if we want to give away electricity, as long as we pay TVA for what we get, you ought to have no say in it," Councilman Kenneth Dyer said.

"Well, you believe in going by a contract you signed, don't you?" Smith replied, noting that TVA's contract with Cookeville allows that the city and TVA must agree on rate changes before they can be put into effect.

Councilman Donald Ferrell, who noted that TVA "began to have to review and explain things more" only after Nashville representative Clifford Allen "got onto you," recalled for Smith another incident between Cookeville and TVA.

"We had another TVA man here once telling us what to do, and I asked him if he was just going to turn off the electricity on us if we didn't do as he said, and he didn't have anything to say to that—he took off so fast he left his brief case here," Ferrell said.

"And I don't know what you're here for—just go home—and don't forget your satchel!" Ferrell said.

City manager Bethel Newport likened TVA's objection to the rate changes to "slapping at gnates," and said it is incomprehensible that TVA cannot approve the two different rate levels.

"It seems to me you all ought to have the mechanics in your rules and regulations to do this just on the temporary basis we meant it for—and I would even say it looks like the question is this: TVA wants to dictate to us, and we don't want to be dictated to," Newport said.

"The rate regulations are based on studies and on the cost of providing the service. Under TVA, you don't have to go before the Public Service Commission, and we are responsible through the TVA act for setting rates," Smith said, adding that Cookeville already has one of "the lowest rates in the Nation," and that no other seller of electricity has asked recently to lower rates.

"It is that we want to lower rates that got to TVA, isn't it?" said vice-mayor Odell Huddleston.

"I'm like Clifford Allen, I just can't see TVA having that much control over us," he said.

"I don't think your rate changes are fair to your commercial and industrial customers," Smith said.

"I'm interested in helping the little man, not the big man," said Councilman Ferrell. "TVA ought to have to live on $100 a month social security, like some people do," he said.

"TVA is not supposed to make money, it is—private companies are to do that," said city manager Newport.

"And some private companies now have lower rates than TVA, don't they?" said councilman Ferrell.

Only some in the Northwest, Smith said, and they too will be going up soon, he said.

"Well, what will you do if we just go ahead and change our rates anyway?" asked vice-mayor Huddleston.

"It will go through the legal process, but it's a shame to do that when you are only being asked to change the commercial and industrial rate enough so that you aren't being unfair or else to keep both rates up to a point where your cost will be in line with everything the way they should be," Smith said.

The electric department study made by manager Holland has shown that the department will lose some $114,000 revenue by changing the rates, even on the temporary basis to help out customers through the winter months.

But the councilmen and Holland had said, and said again yesterday, that by "tightening our belts, we can do this without strain," that is, if the department did not try to expand too much.

"And we wanted to help people out, and we are solvent enough to do that," councilman Ferrell said yesterday.

Holland noted yesterday, as he had before, that out of the department's total of 7,116 customers, only 182 are big industries and 1,176 are small businesses. The other 5,719 are residential customers.

So the verbal battle between the council and TVA raged on for about an hour yesterday, with no final agreement in sight.

"We will study all this before the holidays and will write you a letter informing you of our intentions," city manager Newport told Smith.

[From the Herald Citizen, Dec. 31, 1975]

RATE CUT STILL IN TUSSLE

TVA RENEWS DEMAND FOR CONTRACT COMPLIANCE

(By Mary Jo Denton)

Ending in another standoff, the tug of war between Cookeville City Council and TVA over electric rates continued yesterday, with TVA charging the city has violated its contract with the agency.

But it appears now that the city will be forced by TVA to raise residential custmores' rates back to the R–7 structure, meaning an average customer's bill will have 99 cents added to it—the same 99 cents taken off just three weeks ago.

It was on December 4, after a long and careful study of the electric department, that the council voted to lower residential rates and to lower commercial and industrial rates by about $1.10 per customer per month.

They voted to do that on a temporary basis—perhaps for the next 6 months, for the purpose of helping Cookevillians make it through the winter months of an economically hard year.

But TVA had not approved the rate changes when they were acted on by the council, even though electric department manager W. R. (Chic) Holland had informed them of the request as early as October 16.

Then, last Tuesday, TVA representative John Smith appeared before the council to say that Cookeville's contract with TVA stipulates that there will be no rate changes until TVA agrees with them.

TVA does not allow for two-level differences in rates for residential customers and commercial customers. The council's lowering of residential, customer rates was changed from R–7 to R–9, the lowest possible rate, and the commercial rate was lowered from C–6 to C–7, which is two rates from the bottom.

Having two level differences in these two rates is unfair, or discriminatory, to the commercial customers, Smith said last week.

Smith returned to the council yesterday, this time flanked by TVA attorney Ed Drum and TVA supervisor of study Jim Blanton.

"The rates you have just gone to are not provided for in your contract, and we are here to say you've had a week to decide to do something about it, and it is extremely important to TVA that you comply with the contract," Smith said yesterday.

Council members last week argued vehemently with Smith over TVA's right to dictate the city's rates to its customers, Smith replying over and over that the agency is authorized by Federal TVA legislation and by its contract with Cookeville to do so.

The same charges of dictatorship and countercharges of contract violation were leveled yesterday between the council and the TVA representatives, with the TVA agents perhaps firmer and a bit more stern in their demands yesterday.

The discrimination the city has allegedly shown in its rate lowering can be corrected, TVA argues, by further lowering the commercial rate from C-7 to C-8, a rate they say is in line with the R-9 rate for residential customers.

"This would, according to our calculations, mean a loss of revenue to you of only $13,000 more, and it would keep you and TVA from risking a lawsuit from your commercial customers," TVA agent Blanton said.

The present lowered rates, the city has calculated, will mean a loss of $114,000, even on the temporary basis it is set up for. But as one city official pointed out to the Herald-Citizen, this means simply that the electric department would not make "as much money under the new rates as it would have under the old rates—it's not exactly that we would be losing that much."

Vice-mayor Odell Huddleston accused TVA of demanding the further lowering of commercial rates because "you know we can't afford to go that low, and this is your way of forcing us to go back to the higher rates."

But the TVA representatives denied this, Blanton remarking that "the $13,000 wouldn't put you in the red—you could do it."

One of the most sensitive sore spots with the councilmen is the fact that TVA took so long—since October 16—to make the decision that the city could not lower the rates.

With this in mind, the councilmen and city manager Bethel Newport yesterday asked for 1 more week in which to consult on the matter with city attor-

ney John Poteet who was out of town Tuesday before informing the agency of what will be done.

The TVA men clearly did not approve of this week's wait, and Smith, noting that he had wanted the rates changed when he was here last week, said yesterday he had brought with him an agreement that was already drawn up for changing the rates.

Asked just what action TVA would take if the council chooses to keep the new rates as they are, TVA attorney Drum said that would be a breach of contract and said that "what we do about it depends on the direction you take here today—we have several courses of action."

City Manager Newport repeated his comment of last week—that TVA ought to have some mechanism in its rules and regulations to allow an electric system which can afford it to give its customers some relief.

"We are more aware than you all are of the needs of our citizens, and I'll tell you this—if we are not aware of them, they make us aware every 3 years. But you all don't have any such way of knowing about their needs," Newport said.

"As for the contract, we know we have to honor contracts. But that contract is submitted by you—we have no input—all we can do is sign it. And I am fierce about local government and about State and Federal government interfering in it," Newport said.

Mayor Bob Poteet also assured the TVA men that Cookeville officials are not the type to fail to honor a contract.

"We never intended to circumvent the contract, we just wanted to help our people, many of whom are hard-pressed. Maybe it was not much help, and it might have even been little more than spiritual help," Mayor Poteet said.

"But we are not the type to violate contracts, and I will surrender and capitulate after I'm convinced there is no other way," he said.

"I seriously doubt that we can lower the commercial rates any further, and it looks like this will force us to just shoot back to where it was before and forget it," Poteet said.

The TVA attorney, noting that of the 160 power systems supplied by TVA only 19 use even the one-level rate difference in residential and commercial rates, told the councilmen that TVA does not oppose lowering customers' rates but said "it's a matter of application of the rates on the proper basis."

He also pointed out that when the rates are changed again—that is, when they are changed to comply with the allegedly breached contract—the period from December 4 to whatever date those changes are made will have to be accounted for by adjustments.

This means that if the city decides to return to the higher rates, it will have to charge a customer for the 99 cents a month it previously knocked off his bill. Or if the city goes to the lower level of commercial rates in order to get TVA's approval of the lower residential rates, it will then have to make adjustments on the commercial customer's bill to credit him with what he would have had knocked off for the intervening period.

After Tuesday's discussion had gone on for over an hour, the councilmen repeated their request that they be given another week to study the situation with the city attorney.

Though they obviously wanted a decision immediately, the TVA men finally agreed to this.

"But we are not at all likely to change our minds on this," the TVA attorney said.

[From the Herald-Citizen, Jan. 6, 1976]

Cookeville Holds To Rate Cut

(By Mary Jo Denton)

TVA has not yet won out over Cookeville City Council—the city plans to keep its lowered electric rates and appeal the agency's denial of approval for the new rates.

City Attorney John Poteet told the council this morning that unless TVA can show "some reasonable rationale for its denial of the rate cuts, then you have a right to go ahead and then appeal to the TVA board."

The council lowered electric rates for residential customers two levels on the fee scale and rates for commercial customers one level back in December after a long and careful study of the electric department which showed the cuts would mean a loss of $114,000 in revenue. The cuts were made on a temporary

basis for the purpose of helping Cookevillians through the winter of an economically hard year.

Electric department manager Chic Holland, had informed TVA of the intention to lower the rates as early as October 16, but the agency did not render a decision on the matter until after the council took action. Then representatives of TVA appeared in two December council meetings objecting to the lowered rates and all but ordering the city either to go back to its higher rates or else lower commercial rates two levels just as the residential rates were lowered.

TVA representative John Smith and attorney Ed Drum last week told the council that the city is in violation of its contract with TVA on the matter—because the contract stipulates that TVA must agree with any rate changes made, they said.

They argued that the lowered rates, amounting to about 99 cents per month per residential customer and about $1.10 per month per industrial or commercial customer, showed discrimination against the industrial customer because his rates had been lowered only one scale. TVA had not allowed two level differences in the two rates anywhere, they said, and to do so would open both the city and TVA to lawsuits from the industrial customers.

City attorney Poteet, who was out of town last week, today told the council that such distinctions can indeed be made and are being made in electric user rates across the Nation.

"The contract itself provides that the two types of customers will be treated differently on rates—and all you all want to do is to go one step further, to make two level differences in the rates—and I think if there is a reasonable rationale for wanting to do that they have no right to deny it," Poteet said.

He said that if the dispute goes to court, the ultimate question will be just that: whether the city has a good reason for wanting to lower the rates the way they have.

"For instance, if it could be shown in the electric dept. records that more and more customers were having a rough time meeting their bills, then that would be a reasonable basis for lowering the rates," Poteet said.

City Manager Bethel Newport said he had not made a check of the records to look for that type of thing but said it might be the case.

Poteet said that TVA's contract with the city does not prevent the rate lowering as the TVA men have argued that it does.

"It's just that the two parties of the contract have to agree, and from a purely legal standpoint that's all," Poteet said.

TVA argues that its "policy" is to disallow two rate level differences in the two customer classes and says that that policy is based on their studies of costs of providing the electricity and on their concern that both classes of customers be treated equally.

Mayor Bob Poteet pointed out today that an industrial customer has the means to pass his electricity cost on to his customers or clients, whereas the residential customer—only a consumer—does not.

City Attorney Poteet said the council should first request a written determination of TVA's decision and then should appeal the denial to TVA.

And that is what the council decided to do.

"We'll leave the rates the way they are and appeal it," Mayor Poteet said.

[The Clay Statesman—Celina, Feb. 20, 1974]

Countians Hard Hit By Electric Bills

INCREASE BY AS MUCH AS 225 PERCENT

Clay Countians were hard hit by their electric bill this month, some saying it had increased by as much as 225 percent over last month.

Customers of Tri-County Electric Membership Corp. were complaining publicly and to the cooperative, but a co-op official said there was little the co-op could do to help them.

Donald Winn, office manager in Lafayette, said he had a large number of calls and blamed the 14 percent increase in price of electricity from the Tennessee Valley Authority for some of the increase. He went on to cite several other possible reasons for a particular bill being higher this month.

"Normally, February bills (which cover the January reporting period) are the highest of the year," he said. Most of the bills covered the period from December 5, 1973 to January 5, 1973.

Other reasons for an increase, he said, might be:

1. The holiday period, when more persons are at home and using more electricity through extra cooking, heating spare rooms and using more electrical appliances.

2. An ice storm, which put from 6,000 to 7,000 homes out of service for a week, and therefore many have added another week to the regular bill through delay. (In which case, he said, the next bill for those homes might reflect only a 24- or 25-day "month.")

3. In particular cases as a fairly regular occurrence, some may have misread their meters. About 15,000 customers read their own meters. The co-op has 370 routes for meter readers. Where a meter was misread or read some days after the regular date on which families read them, "extra" days may appear on the meter because it was read later than usual in that month.

"We sometimes get bills that show as much as 40 days on them. Naturally, those bills will be higher. If each user read his meter on the same day each month, he would have a better reading of the exact amount of electricity being used," Mr. Winn said.

Clyde King, Celina banker and member of the co-op's board of directors said several things occur to him about the increase.

"It is regrettable but Tri-County is only passing on the increase from TVA. This is the first month the increase has been applied. My bill was higher, like everyone else's," he said.

He said TVA gave the higher cost of coal and large expenditures for devices to meet environmental control devices at its generating plants as reasons for raising the wholesale rate.

"I was hoping that they could have spent that money on some of the old loans. I'm not convinced the TVA increase was justified," he said.

Meanwhile, Mr. Winn suggested that anyone who has reason to suspect that his bill contains an error, either this month or anytime in the future, should get in touch with the Tri-County office in Celina.

But first, he said, they should take into account the increase, which is $1.77 per thousand kilowatt-hours used.

"If they look closely, they will see that the consumption has probably gone up, not just the price," he said.

By multiplying the basic rate times the number of thousands of hours used and adding in the $1.77 per thousand increase, they can get a better reading on how the bill was figured, he added.

Tri-County bills are prepared by an office in Jackson, Tennessee, and for that reason the books are not always at the Lafayette office. But by taking the information on the meter stub it will be possible to figure the bill, he explained.

TVA Has $800 Million in Surplus Earnings

Knoxville, Tenn. (AP)—The Tennessee Valley Authority has amassed more than $800 million in surplus earnings—$52.6 million during the year ending June 30, 1973—according to its annual report.

The report was issued this week as electric bills throughout the TVA area were increased because of a 14-percent hike in TVA electric power rates. The governmental agency said the rate hike was necessary to meet rising expenses.

The surplus, known as "retained earnings," are held back so TVA can maintain an appropriate ratio of financial equity to its debt, TVA board chairman Aubrey Wagner said.

"To maintain the financial integrity of the system," said Wagner, "you have to plow some earnings back in."

During congressional hearings last year, the surplus margin was questioned by U.S. Rep. Joe L. Evins, D-Tenn. The Congressman noted the profit margin far exceeds that sought by privately owned electric utility companies.

"You are far from being in the depleted and depressed condition that you would make it appear," Evins said at the time. A spokesman for Evins said all aspects of TVA's most recent rate hike will be investigated.

Wagner noted the TVA Act of 1933 authorizes the agency's three directors to establish an operating margin above routine expenses, which include production costs.

If the earnings were not retained, he said, the authority might not be able to demonstrate financial stability. Without that, he suggested, it could not obtain the multimillion-dollar bonds it gets for expanding its power network and anti-pollution efforts.

"If we operate with no margin, by 1990 we would be 90 percent in debt, according to our projections," Wagner said in Nashville.

Mr. EVINS. I yield to Mr. Whitten.

Mr. WHITTEN. Thank you, Mr. Chairman. I think Mr. Evins is right about the effect of these rate increases.

They are national in scope. Mississippi Power and Light Company rates are much worse than yours. I don't understand why all involved in rate making don't make a concerted effort and go after those who are preventing you from opening up these coal fields.

I still come back with the fact, that you are not working to reduce these rates. If you were, you would join with the others and take out after EPA, which is causing it. Are you hearing about these scrubbers?

Mr. WAGNER. We are suing EPA now over whether we can use the least costly method for meeting national standards for protecting public health and welfare.

Mr. EVINS. How much would the scrubbers cost if EPA makes you buy them?

Mr. WAGNER. If we have to go through with the regulations that are being proposed in pending amendments to the Clean Air Act, the annual cost would be about $350 million a year, and we are fighting it as hard as we know how. We think we can do the job, without any sacrifice to environmental quality, for about one-tenth that cost.

Mr. WHITTEN. I have people that don't get enough income to pay their electric bill. It can't last. I don't put as much fault on the TVA for the existing rates. But I do fault you and all the rest of the power producers for not joining hands and letting the President and the OMB and the Congress know what we are doing to ourselves through this system.

Mr. WAGNER. You have raised two questions, one what we are doing about fuel costs——

Mr. WHITTEN. Fuel cost is what we are talking about, but also fuel availability, developing these coal fields. If we could just get access to the coal in this country and get us to where we would be self-sufficient in energy needs and not be dependent on imports from the oil countries.

COAL AVAILABILITY

Mr. WAGNER. At the moment we can get all the coal we want.

Mr. WHITTEN. At a price.

Mr. WAGNER. That's right. Most prices we pay now are higher than they need to be in relation to cost of producing it. We are opening our own coal mines as fast as we can, trying to get additional reserves.

Mr. WHITTEN. How long did we export coal to Japan without restriction? Do we still do that?

Mr. WAGNER. I don't know. We have lost some coal to export. Most export coal is metallurgical grade.

Mr. WHITTEN. Doesn't affect you?

Mr. WAGNER. Not immediately. We did lose one contract to export a number of years ago. The price is the big thing. We feel if more mines were open, the price would come down. We have offered long term——

Mr. WHITTEN. The answer to any shortage is increased supply so you know if it is all opened up it would come way down.

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Mr. WAGNER. We think so.

Mr. WHITTEN. You know it would.

Mr. WAGNER. Yes.

Mr. WHITTEN. If you had cheaper transportation that would reduce it further.

Mr. WAGNER. That's right.

Mr. WHITTEN. Have you made a study of the Tennessee-Tombigbee to see what it would contribute to your area?

Mr. WAGNER. The Tombigbee wouldn't help TVA so much in coal. It will help others. Most of our coal would come from areas that wouldn't use that. It wouldn't make much difference in our coal prices.

Mr. WHITTEN. Has there been a national conference between the various government power agencies and the private power companies to see what collectively you might do to get this message over?

Mr. WAGNER. I serve on a number of committees and other people do.

Mr. WHITTEN. Do you ever meet?

Mr. WAGNER. Yes, we do.

Mr. WHITTEN. How often?

Mr. WAGNER. I couldn't answer that.

Mr. WHITTEN. It must have been a long time ago if you don't even remember it.

Mr. WAGNER. They are not meetings set up primarily on coal.

Mr. WHITTEN. You introduce everybody, everybody has a good dinner. What do you do?

Mr. WAGNER. We discuss problems of coal supply but generally the utilities I think have been a——

Mr. WHITTEN. Would you give us the membership of that and how often it has met in the last 3 years that committee?

Mr. WAGNER. It is not a single committee.

Mr. WHITTEN. Do you know each other?

Mr. WAGNER. Yes, sir.

Mr. EVINS. Mr. Whitten, if I might interject, every time TVA raises its rates, the private utilities laugh up their sleeve. They say if TVA can raise their rates, we will raise ours. Let them raise them some more. I don't think they are unhappy about TVA's rate escalation policy.

Mr. WHITTEN. I don't differ with you a bit in that, but what I was trying to get here is whether collectively the power generating groups in the country, all of them, whether they have any group meeting together to try to resolve this problem?

COAL RESERVES

Mr. EVINS. Let me interject to ask Mr. Wagner this question. Last year the committee put in its report a recommendation that the TVA utilize some of its own coal reserves. You have reserves in Illinois, Tennessee, Kentucky, perhaps other States. You have held these reserves for years. We said now is the time to use them, inject a little competition and help bring down coal prices when they are inordinately high. What have you done following that recommendation of this committee about using your reserves?

Mr. WAGNER. Our coal production from our own reserves is up one-half a million tons from last year, to 4¾ million tons, rising as fast as we can bring it up. By 1979, it will be up——

Mr. EVINS. Would you say use of your own coal reserves has had a significant impact on helping bring down price of coal by commercial competitors?

Mr. WAGNER. I don't think I could say that, Mr. Chairman. This is what I mean when I say it is a national problem. We are a big operation, but we are a small operation in relation to the total country. By mining our own reserves, we have saved ourselves $2.50 to $3 a ton over what it would have cost to buy the coal.

Mr. EVINS. If you save $3 a ton, that is a significant savings.

Mr. WAGNER. Yes, it is. We are looking for more reserves now. We have added, I think, about 40 million tons to our reserves since we were here last year. We are currently looking at areas that would give us maybe another 400 million tons in reserves.

Mr. EVINS. I was one who supported you on planning for the future to purchase, if necessary, the Peabody Coal reserves. I think TVA should plan for the future. They should have adequate reserves. What caused TVA to back off and to abandon their position on the Peabody?

Mr. WAGNER. There were two problems. Between the time we made the offer and the time we let it lapse under its own terms, Peabody had become involved in some lawsuits involving sums approaching half a billion dollars. When we got into examining the coal reserves closely they were not as useful as we had hoped in terms of locations and sulphur content.

Mr. EVINS. Further questions, Mr. Whitten?

Mr. WHITTEN. Thank you, Mr. Chairman. I would like to remind you of my request that we have the name of the members of that committee and how often they have met in the last 3 years.

Mr. WAGNER. Let me explain, there is no specific committee. I am talking about a number of committees.

Mr. WHITTEN. That is the way you looked when you said "Yes" awhile ago.

Mr. WAGNER. I can only answer truthfully. There is no such committee. There is no specific committee that is organized to try to bring the price of coal down.

POWER ORGANIZATIONS

Mr. WHITTEN. Do you have a joint group that meets on these problems?

Mr. WAGNER. There are a number of joint groups that meet on problems.

Mr. WHITTEN. Name them all. That way I will get you down to what I am talking about. Name them for the record, and put down when they have met if you are on them.

Mr. WAGNER. I will do that, if I am on it or if we have someone in our organization who is on it.

[The information requested follows:]

TVA participates in the activities of a number of electric utility industry organizations, committees and task forces directed toward solving energy problems. These industry groups take many forms, have various meeting frequencies, and work in many areas such as air quality, water quality, coal mining regulation, the development of new and better ways to generate electric power and others.

Organizations in which Chairman Wagner is involved include the Electric Utilities Advisory Committee to FEA; the Executive Committee of the Electric Utilities Advisory Committee; member of the Board of Directors, U.S. National Committee, World Energy Conference; the FPC Executive Advisory Committee for the National Power Survey; vice chairman of the Breeder Reactor Corporation; and the Liquid Metal Fast Breeder Reactor Advisory Committee.

Members of TVA's staff serve on many other similar groups, including Edison Electric Institute sulfate task force; Committee on Energy and the Environment of the National Research Council; Utility Water Act Group; Coal and the Environment Group—a coalition of coal users and transporters; Tennessee Governor's energy task force; Kentucky Governor's energy task force; Delegate to GAO Study—U.S. Coal Development; American Public Power Association; and Electric Power Research Institute—numerous industry committee.

Mr. WHITTEN. Thank you, Mr. Chairman.

Mr. EVINS. Mr. Myers?

Mr. MYERS. I have no questions, Mr. Chairman.

Mr. EVINS. Mr. Bevill?

Mr. BEVILL. Thank you, Mr. Chairman.

How much of the increase in your request over last year's can be attributed to the increase in coal prices, and how much to inflation in other price areas?

Mr. WAGNER. The increases in coal prices affect power operating expenses which must be financed with revenues from the sale of power. Therefore, the appropriation request is not influenced by rising coal prices.

Mr. BEVILL. Given the current upswing in coal prices, how long do you expect to be able to operate within the new debt ceiling? How much will you have to borrow this year?

Mr. WAGNER. TVA expects to borrow about $1 billion to finance capital additions in fiscal year 1977. Borrowings are not used to finance the coal burned at steam plants. The only direct influence coal is likely to have on utilizing the limit on borrowings will be the extent to which TVA makes investments in coal reserves in the ground and investments associated with new mine development on TVA-owned coal reserves.

Mr. BEVILL. How do your rates currently stand in relation to those of other power generating companies? How many actually have lower rates? What rate increases are expected in fiscal year 1977?

Mr. WAGNER. Electric rates in the Tennessee Valley region remain among the lowest in the United States. Recent estimates are that only about 10 percent of the utilities across the country applied residential rates lower than TVA's lowest rates. Most of those utilities are located either in the Pacific Northwest where electric power is almost totally provided from low-cost hydroelectric sources or in the Southwest where lower cost natural gas is still available for use in boilers for electric power generation.

TVA reviews its rates quarterly and as yet has not determined whether any adjustments may be required in fiscal year 1977. In the most recent quarterly rate review, the TVA Board has determined that no increase will be necessary for the last quarter of fiscal year 1976.

Mr. BEVILL. What is the current progress on the Bear Creek project? What percentage do you expect to have completed by the end of fiscal year 1977?

Mr. WAGNER. The Bear Creek project consists of four multipurpose dams and a floodway channel improvement. Construction of the Bear Creek Dam and Reservoir was started in May 1967 and the dam was closed in March 1969. The floodway construction started in June 1970 and was completed in October 1973. Little Bear Dam and Reservoir was started in January 1973, the dam was closed in October 1975, and final cleanup work will be completed in fiscal year 1976. Upper Bear Dam and Reservoir was started in May 1975 and closure of this dam is scheduled in January 1978. We also anticipate the start of the last unit of the project, Cedar Creek Dam and Reservoir, in April 1976 and dam closure in January 1978.

Mr. BEVILL. What is the current status at Browns Ferry?

Mr. WAGNER. All restoration work on units 1 and 2 has essentially been completed to place these units back in operation in a safe manner meeting all requirements of the Nuclear Regulatory Commission. Actual startup actions to return the two restored units to operation will begin this spring in time for their output to be available to the power system during the summer peak-load period. Construction of unit 3 has essentially been completed with the same improved features as units 1 and 2, to the extent that initial fuel loading and operating testing can also begin later this month. Its output should become available to the system in advance of next winter's peak period.

Mr. BEVILL. What is the current status of the railway bridge alterations going on in Decatur, Ala.?

Mr. WAGNER. Design drawings and specifications are essentially completed and Southern Railway is reviewing the plans. If Southern Railway approves the plans promptly, we expect to award a contract in May for construction of the bridge. Completion is scheduled in 1978.

Mr. EVINS. Mr. Burgener?

TVA FINANCING

Mr. BURGENER. I am trying to look at your financial statement, Mr. Wagner. Your income is a little over $2 billion, is that correct, for 1977, estimated? That is on page 3.

Mr. WAGNER. Yes.

Mr. BURGENER. The source of that income is a little over $2 billion, most of it power sales, of course. You are a wholesaler and not a retailer?

Mr. WAGNER. No; we sell directly to a few large industries and Federal facilities.

Mr. BURGENER. For the most part you are wholesalers?

Mr. WAGNER. For the most part, wholesalers.

Mr. BURGENER. You will have an income of $2 billion plus appropriations of $121 million, is that correct?

Mr. WAGNER. That's correct.

Mr. BURGENER. It is $2,121 million. Am I correct in looking at your capital outlay for 1977, is that $1,278 million for power supply.

Mr. WAGNER. Yes, sir.

Mr. BURGENER. I see you have other for regional development operation.

Mr. WAGNER. Appropriations are not applied to the power program, they are applied to water control, flood control, navigation, that sort of thing.

Mr. BURGENER. How will you apply the $2 billion? You will first pay for operations?

Mr. WAGNER. That's right. From the $2 billion income, we first pay for operations.

Mr. BURGENER. You pay the Treasury $88 million?

Mr. WAGNER. Yes. We make payments in lieu of taxes and we pay for construction. We pay operation and maintenance, we pay interest on investment, we make payments to the Treasury and then we have a balance left which we use to build new facilities instead of having to borrow the money. We will in total borrow $1 billion next year.

Mr. BURGENER. That is my next question. To finance this capital outlay, which will total how much roughly—$1.5 billion?

Mr. WAGNER. $1,279 million.

Mr. BURGENER. How are you going to finance that, by borrowing?

Mr. WAGNER. Mostly by borrowing; yes.

Mr. BURGENER. What is your total debt now, $8 or $9 billion?

Mr. WAGNER. It is not that much. Around $5 billion, I believe.

Mr. BURGENER. I was trying to figure out what the net cost to the taxpayer, Federal taxpayer annually, approximately would be.

Mr. WAGNER. The net cost to the Federal taxpayer annually is appropriations only. This is $121 million in fiscal 1977. The power system pays its own way. There is no appropriation made for that.

Mr. BURGENER. What would the cumulative amount have been since 1933?

Mr. WAGNER. I don't have the figure in mind, but we can produce it.

Mr. BURGENER. For the record, I would appreciate that.

[The information requested follows:]

TENNESSEE VALLEY AUTHORITY—APPROPRIATIONS, PAYMENTS TO THE TREASURY AND RETAINED INCOME FROM THE POWER PROGRAM REINVESTED, FISCAL YEARS 1934 THROUGH 1977

[In thousands of dollars]

	Power program	Nonpower program	Total
Appropriations:			
Actual through 19TQ	[1] 1,383,590	1,507,885	2,891,475
Estimate for fiscal year 1977		121,185	121,185
Total	1,383,590	1,629,070	3,012,660
Payments to the Treasury:			
Actual through fiscal year 1975	1,232,912	41,653	1,274,565
Estimate for fiscal years 1976, 19TQ, 1977	195,156	51	195,207
Total	1,428,068	41,704	1,469,772
Retained income from power program reinvested in the program:			
Actual through fiscal year 1975	898,406		898,406
Estimate for fiscal years 1976, 19TQ, 1977	341,600		341,600
Total	1,240,006		1,240,006

[1] No appropriations have been made for the power program since the 1959 amendment to the TVA Act.

Mr. BURGENER. I know this agency has rendered great service and provided a lot of things to a lot of people. I would like to figure up the bill.

Mr. WAGNER. The figure that I have here, I would want to check it but it looks like appropriations by the Congress have been about $3 billion through the years. Incidentally, for the period 1934 through 1970, the total Federal expenditures on per capita basis in the Tennessee Valley region, including TVA, were about 60 or 65 percent of the average for the United States. So the assumption that has been made by some people that the area has grown because there has been a great outpouring of Federal dollars is not correct. Actually, there have been fewer Federal dollars per capita spent in the Tennessee Valley region than the average for the Nation as a whole. We would like to believe it is because we have worked in ways that stimulated local activity and private enterprise has put money into what goes on there, too.

TVA EMPLOYEES

Mr. BURGENER. Finally, where is the largest single collection of permanent employees that you have?

Mr. WAGNER. Knoxville is the largest. We are spread principally in three areas, Muscle Shoals, Ala., Chattanooga, Tenn., and Knoxville, Tenn. Because of the very heavy design for nuclear plants, Knoxville is the largest with something like 4,000 employees.

Mr. BURGENER. With 4,000 employees, what do you operate there? Is that headquarters?

Mr. WAGNER. That is the administrative headquarters of the organization, but the largest part of that number is for engineering, design, and construction employees.

Mr. BURGENER. Do you operate things like cafeterias?

Mr. WAGNER. No; TVA does not.

Mr. BURGENER. Within house?

Mr. WAGNER. No. We do have a cafeteria at Muscle Shoals that is operated under concession.

Mr. BURGENER. Do you have your own building owned by the Government or by your agency?

Mr. WAGNER. Some buildings we own ourselves. Mostly we are in rented buildings. The buildings we own are in Chattanooga and Muscle Shoals.

Mr. BURGENER. Is it more economical to rent?

Mr. WAGNER. Yes, sir, we feel it is.

Mr. BURGENER. Thank you, Mr. Chairman.

Mr. EVINS. Mr. Bevill?

STRIP MINING AND RATES

Mr. BEVILL. Thank you, Mr. Chairman. It was reported that TVA was taking a position of supporting the surface mining legislation that was pending in Congress, which the President has vetoed twice. I am one of those that urged him to do it because of the reduction in production of coal that would result. We are not talking about reclamation. Everybody is for reclamation, but this legislation, in the President's opinion and in many others, would reduce production of coal so I am urging you, if you do take a position on surface mining legislation, pending here in the Congress, that you do study it, be-

cause I know you don't want the production of coal reduced. I know that is not what you stand for.

No. 2, this proposal that has been submitted, that will be submitted to you if you haven't received it yet, that is known as the T–19M–3, I want to urge that you disregard this because it is a proposal that I understand will actually increase the power bills to some 152 distributors out of 160 in order to reduce the rates for 8 distributors. I realize that I am putting it in a nutshell here, but the thing that concerns me is, in meeting with the distributors and discussing it with them, I understand that what this amounts to is that the rural areas of the TVA are going to be the ones that are going to be hit with the power increases that the TVA did in 1969, switch over from, or changed the whole setup and started a cost basis on those charges. I don't think the people in rural areas of the TVA or the rural areas of any part of this country can afford any more increase in rates, so I just want to throw that out for caution.

Mr. WAGNER. We will be glad to answer. I might comment, the TVA Board has not yet had that proposal presented to us. We certainly will take your viewpoints into account.

Mr. WHITTEN. Much of your development activities in the Tennessee Valley area is similiar to that the Interior Department and the Department of Agriculture does in other areas. You don't have a duplication of that activity or C. & D. projects, for instance, these other projects, where agriculture carries on in much of the country, in the TVA area you do many of the things that are done by other agencies in other areas.

Mr. WAGNER. We either do them or else we stay out of the business and let them do it.

Mr. WHITTEN. In other words, it is not duplication.

Mr. WAGNER. No, sir, it is not duplication.

Mr. BURGENER. One final question, Mr. Chairman. This is on the mechanics of rates. How many retailers do you have?

TVA DISTRIBUTORS

Mr. WAGNER. About 160 distributors.

Mr. BURGENER. These distributors are municipalities?

Mr. WAGNER. Municipalities and electric cooperatives.

Mr. BURGENER. No private?

Mr. WAGNER. We have one private distributor.

Mr. BURGENER. Except for the one, they are publicly owned?

Mr. WAGNER. Yes.

Mr. BURGENER. How are the rates set?

Mr. WAGNER. We have a series of rate levels. We sit down with a distributor when its contract expires—generally a 20-year contract. We sit down with him and take a look at the financial statement.

Mr. BURGENER. You sit down with them every 20 years?

Mr. WAGNER. We sit down with them more often than that. We periodically review each distributor's financial situation to see if they are receiving sufficient revenues to provide for the operation and maintenance of their systems on a self-supportive and financially sound basis. Our contract with each distributor provides that if its revenues are more than sufficient for these purposes, TVA and the distributor shall agree upon a reduction in the rates.

Mr. BURGENER. They don't have to agree?

Mr. WAGNER. We generally do. Congress provided in the TVA act that we should sell power to the ultimate consumer at lowest feasible cost. When TVA elected in the beginning not to retail power directly, but to sell through distributors, we incorporated in the contract the provision that we would have to agree on the rates that they charge. In this way TVA can be sure the money is being used properly.

Mr. EVINS. You haven't explained to my satisfaction and to the committee the Cookeville protest in which they wanted to lower rates. I understand Tullahoma, Tenn., did lower rates and you approved that. Cookeville proposed to reduce their rates. TVA said no, you can't do it. They blocked it. They protested. Again, I wish you would explain why you wouldn't let a distributor lower their rates if you want to.

[The information follows:]

The city of Cookeville, Tenn., took action to reduce rates for one class of customers by two rate levels and to reduce rates for another class of customers by only one rate level. This action resulted in a two-level differential between the respective customer classes. TVA considers that a differential of more than one rate level results in a special concession to certain customers and is discriminatory among customers generally and, therefore, inconsistent with the provisions of the power contract and the requirements of the TVA act.

After review of the action taken, we recommended that this distributor reduce the rate for the second customer class one additional level which would have restored the former acceptable differential between the two. This would have resulted in even greater rate reductions than the action taken by the distributor.

We have proposed other possible alternatives and are eager to work with Cookeville toward a satisfactory resolution to this matter.

Mr. WHITTEN. Before today's hearing is adjourned, I want to once again emphasize the contribution that Chairman Evins has made to his district, State and Nation.

I ask that the staff insert in the record at this point materials relating to the career and accomplishments of Joe L. Evins.

[The material follows:]

Following are measures of economic improvement in the Tennessee Valley region since 1947, when Representative Joe Evins began his congressional service:

In 1947, total personal income in the Tennessee Valley region was $4.5 billion. In 1975 it was well over $30 billion.

In 1947 the region had about 400,000 jobs in manufacturing. Today it has about 900,000.

Electric power supply has been a significant factor in the dramatic improvement in employment opportunities and living standards across the region. The region's electricity requirements today are nearly 10 times as large as they were in 1947. Through the years this has presented an enormous challenge in financing and building the powerplants needed to meet those growing requirements, and the Congress has made it possible for TVA to carry out that program.

Electricity has also helped improve living standards in the home. In 1947 only a third of the region's farms had electric service, and average home use of electricity was only 2,200 kilowatthours a year. Now use is more than six times that level. In the 1947 fiscal year the average cost of electricity to the home consumer in the region was about 1.7 cents per kilowatthour. It was below that level for the next two decades and did not reach that level again until 1975. It is still only two-thirds of the national average.

Since 1947 the TVA flood control system has prevented nearly a billion dollars in flood damages.

The Tennessee River waterway created by TVA dams and reservoirs now carries about 10 times as much freight as it did in 1947, with annual savings about $72 million on shipping costs. Through this period Congress has provided funds to maintain and expand locks and other navigation facilities to accommodate that growth.

Congress also has supported other valuable regional development activities of TVA, including area development programs on tributary rivers, agriculture, forestry, recreation, and environmental programs.

[From the Tennessean, Mar. 1, 1976]

EVINS REVEALS PLANS TO LEAVE CONGRESS

WASHINGTON.—Representative Joe L. Evins, a veteran of 30 years in the Congress and the most powerful member of the Tennessee delegation, said yesterday he will not seek re-election.

The announcement came after several days of speculation that Evins, 65, was considering stepping down when his term ends next January.

"Although I am confident that I could be re-elected, I feel that after 30 years in Congress it is time for the people of the Fourth District to have the opportunity of selecting another person as their Representative in the Congress," Evins, a Democrat, said in a statement released yesterday.

The Congressman cited "health considerations plus the increasingly heavy burden of the work load" as the principal reasons for his decision. However, he emphasized that he is not retiring completely and will continue to maintain "a lively interest" in public affairs.

He also said he intends to attend to personal business when retired and to spend more time with his wife, children and grandchildren.

"This has been a very difficult decision, but after much deliberation and thought I have concluded that after 15 terms and 30 years of service in the U.S. Congress, it is time for me to step aside for the election of a younger person to carry the burden and the standard of the Fourth District of Tennessee," he said in the release.

Evins, generally considered to be at the peak of his influence and effectiveness, is chairman of the Subcommittee on Public Works and Appropriations. The subcommittee oversees the annual funding of public works and energy-related projects and programs which total about $8 billion yearly.

Public works agencies funded by the subcommittee include the Tennessee Valley Authority, the U.S. Corps of Engineers, the Bureau of Reclamation, the Appalachian Regional Commission and the Energy Research and Development Administration (ERDA).

In addition, the representative serves as chairman of the House Small Business Committee which has been expanded to 37 members. He has held the post 12 years and has headed the public works subcommittee 8 years. In the past, Evins has also served as chairman of the House Committee on Personnel and Patronage. The group handles about 500 job placements, including Capitol Hill pages, clerks and police officers.

From 1936 to 1970, prior to accepting chairmanship of the public works subcommittee, Evins was chairman of the subcommittee on housing, space, veterans and independent offices appropriations.

"My years of service in the Congress have been rewarding, exciting and stimulating," Evins said in the statement. "There have been many opportunities for service to the people of the 4th District, the State and the nation. I have served long and to the fullest of my capabilities. I have given all in service of the people I love in the 4th District who have been so gracious and kind to me over the years."

Evins said he wants to "quit while I am on top" and before the "disabilities of age set in."

"I want to return home and live in Tennessee," the Congressman said. "Over the years I have endeavored to serve all the people of Tennessee without regard to party affiliation."

He has served longer in the House, in terms of continuous service, than any other Congress member from Tennessee.

Ranking 14th in seniority among Congress members, Evins is credited with having initiated funding and a subcommittee for five dams in Tennessee that, although recommended, were not part of the Presidential budget.

The dams are the Cordell Hull Dam near Carthage, Percy Priest Dam in Nashville, Tims Ford Dam in Franklin County, Normandy Dam in Bedford and Coffee Counties and Columbia Dam near Columbia.

He has also been instrumental in the construction of many reservoirs, roads, bridges, highways, airports, post offices, federal buildings, hospitals and other facilities and has said he considers the projects "investments in America."

His colleagues sometimes refer to him as Hadrian, referring to the ancient Roman builder.

Evins, also called the dean of the Tennessee delegation, has served under six Presidents. In the past he has been seen as a possible gubernatorial or senatorial candidate, but he said yesterday he has only wanted to serve in the House.

Looking back over his 30 years in office, the representative said he has seen some changes in dress, as well as government, on Capitol Hill. He said more changes need to be made to strengthen the legislative branch of government.

"There have been some changes and reforms over the years. In the old days under Mr. Rayburn (the late Speaker of the House Sam Rayburn) the Members wore dark suits, white shirts, and conservative ties. Today we see a variety of tailored blazers and colorful ties and shirts worn particularly by the younger Members," he said.

"Today we have an increasing number of ladies serving in the Congress. While there have been many changes, I consider Congress today to be strong, viable, and responsive to the public interest.

"The Congress is the true arm of the people and, faced with big budgets and big bureaucracy, should be strengthened rather than constantly criticized."

Evins was first elected to Congress in 1946 from the old Fifth District. Since then, he has survived three reapportionments—in 1950, 1960, and 1970.

Presently, the Fourth District includes 25 counties, ranging from Kentucky to the Alabama border, from Sumner County east to include Cumberland County and south to Lincoln and Franklin counties.

"No Congressman has ever had a greater, finer, or more special constituency," Evins said. "We have come a long way together. We have worked together to achieve new heights and new dimensions of growth and progress. We have seen the visible results of our partnership for progress."

A recent magazine article on the Congressman predicted that he will take his place in history with great Tennessee leaders such as Presidents Andrew Jackson and James K. Polk, Secretary of State Cordell Hull and Sen. Estes Kefauver.

[From the Nashville Banner, Mar. 1, 1976]

REP. EVINS, DELEGATION'S DEAN, WON'T SEEK 16TH TERM THIS FALL

(By Frank Van Der Linden)

WASHINGTON.—U.S. Representative Joe L. Evins—dean of Tennessee's congressional delegation and powerful House leader—will not seek reelection after 30 years in office.

"This has been a very difficult decision," the 65-year-old Smithville Democrat said, "but after much deliberation and thought, I have concluded that after 15 terms and 30 years of service in the U.S. Congress it is time for me to step aside."

Evins' decision to leave the Fourth District seat he first won in 1946 opens the way for ambitious young politicans in both parties to seek the post.

Evins has had such power as a House Appropriations subcommittee chairman that he has never had a serious challenger. The Republicans in his district have generally liked his voting record.

However, since the district has cast a majority of its votes for former President Nixon, the Republicans probably will try to pick up the Evins seat this November.

Evins' plans to retire were first revealed by the Nashville Banner a week ago and officially confirmed today.

He told the Banner, "I have done all I could for the people of Tennessee in 30 years, and I could not do much more in 32."

As chairman of the Appropriations Subcommittee on Public Works, Evins has obtained hundreds of millions of dollars for the Tennessee Valley Authority, the Atomic Energy Commission, and the U.S. Army Corps of Engineers.

He noted that the engineers have built dams at practically all available sites on the Cumberland River, and the TVA has almost completed its dams in the Tennessee River basin.

Evins also observed that the billion-dollar Tennessee-Tombigbee Waterway is about 18 percent complete. He has been very influential getting funds for all these projects.

Evins also has served for several years as chairman of the Small Business Committee.

Evins decided to retire while he still was young enough to enjoy many years of leisure in his district. He suffered a heart attack a few years ago, but had recovered.

In early 1975, under the domination of young liberals, the House Democratic Caucus kicked out three veteran Southerners from their committee chairmanships.

The three were Reps. Edward Hébert of Louisiana, Armed Services, Wright Patman of Texas, Banking, and W. R. Poage of Texas, Agriculture.

A similar move was made to oust Evins, but it failed. This attempt is believed to be one factor in the Tennessee Democrat's decision to step down.

[From the Herald-Citizen, Cookeville, Tenn., Mar. 2, 1976]

COMMENT: JOE L. EVINS: GREAT CONGRESSMAN

(By Charles Denning)

Meeting Joe L. Evins 10 years ago left two indelible impressions on my memory—How gracious they were, he and Mrs. Evins, called "Miss Ann," as they sat in the front parlor of their big, white-columned home in Smithville sipping coffee in the late afternoon and talking with Coleman Harwell about the Evins and Harwell children, all daughters, I believe, and their schools.

"The Congressman," as those who work for Mr. Evins refer to him, is a large man, ruddy-faced when he has had rest and run; and Mrs. Evins, a small bird-like woman. quiet and alert. Something about them—maybe everything about them—seemed so typically, so emphatically Southern gentility: not only the big house, its furnishings and the coolness which seemed suspended in the interior spaces.

Mrs. Evins is both delicate and tough—leather and lace, like certain Southern women. And Mr. Evins, who speaks in a sonorous voice and writes in a rather grand language, wears black or dark blue suits with faint pin-stripe, a vest a broadbrimmed hat and gleaming black shoes. When he shakes hands with an old friends, does he not also grasp the man's elbow with his left hand?—it seems perfectly natural that he would, a gesture of warmth.

How hard he worked, that was my second, even more acute impression. Joe L. Evins' appearance and social graces are Southern, but so is his intensity.

Here he was in serene, easy-going Smithville, Tenn., far away from the political and legislative nerve center of the Nation, Washington, but already on that spring morning he had been in his study at work, and the night before.

Briefcases were stuffed, and papers, note tablets and thick reports were spread and stacked upon a writing table.

Hadn't I expected that Congressmen work? I don't know what I had expected. Perhaps I had thought, foolishly, that when a man rises to that elevation, somebody else does his work for him. A glimpse into the small room at the back of the house where Joe L. Evins had apparently labored alone erased that illusion from my mind, replacing it with an important insight, which is that work makes the man—and the higher a man rises, the more of it he has to do.

Along with that lesson, there arose a tremendous respect and even a bit of awe for the man who had taught it.

It was not, therefore, lightly that Mr. Evins, over the 30 years that he served his Middle Tennessee district, came to be known as a "workhorse Congressman." It is a description which he proudly and realistically accepted. Some are showmen; some preen in the publicity spotlight and pull its beams down upon themselves, masters of the gimmick and the stunt—but not Mr. Evins. "Joe L.," as his constituents speak in the familiar of him, "is a worker."

He is a workhorse, and he is a "wheelhorse," too. His hand holds the machinery of power, and controls a large portion of it in Washington—some say he is among the top dozen most powerful men on Capitol Hill, others say the top six. The achievements of his 30-year career leave no doubt—the dams, reservoirs, roads, bridges, highways, airports, post offices, Federal buildings, hospitals, community centers, libraries, vocational schools, water plants which he has funded.

Now, at 65, Joe L. Evins is choosing to divest himself of that mantle of power, that burden he has shouldered in the name of Tennessee's Fourth District, and return among the people who for 15 successive times have sent him to represent this region, stretching from the sound of the Grand Ole Opry east across the Cumberlands and over the Plateau; and from Kentucky to Alabama, the country of the Cumberland River and the Caney Fork.

Let us welcome him, and thank him.

TO JOE L. EVINS, A STATE'S GRATITUDE

The dean of Tennessee's congressional delegation, Fourth District Representative Joe L. Evins, has decided not to seek a 16th term in the House of Representatives.

Representative Evins, who has continuously served longer than any Tennessee Member of the House in history, will retire when his term ends in January.

For 30 years, Joe L. Evins has represented the people of his district with dedication and devotion to duty, with attention to detail few Congressmen possess. As his constituents knew, Representative Evins always finds time to hear complaints, large and small, and has the innate ability to do something about them.

And therein lies much of the reason for his astounding success in Congress—the willingness to hear problems and the courage to take action to correct them.

Since his election to the House in 1946, Representative Evins has enjoyed the ultimate compliment from his district. He has never faced serious opposition in any of the many times he has faced reelection.

The decision made by Representative Evins over those 30 years have had profound effects upon his district, his State and Nation, and the world. As chairman of the Appropriations Subcommittee on Public Works, Representative Evins obtained untold millions of dollars for the Tennessee Valley Authority, the Atomic Energy Commission and the U.S. Army Corps of Engineers for projects in Tennessee and the South.

Also bearing the Evins imprint are notable projects such as the Tennessee-Tombigbee Waterway and those projects under the direction of the Bureau of Reclamation, the Appalachian Regional Commission and the Energy Research and Development Administration.

Additionally, Representative Evins served with distinction as chairman of the House Small Business Committee for the past 12 years.

Characteristically, Representative Evins says he is stepping aside for "a younger person to carry the burden and the standard of the Fourth District of Tennessee."

Representative Evins is at the height of his influence and effectiveness. He is indeed on top, his power unequalled by any other member of Tennessee's delegation and by few other Members of Congress.

Mr. Evins cited "health considerations plus the increasingly heavy burden of the workload" as main reasons for his decision. But he added that he is not retiring completely and will continue to maintain a "lively interest" in public affairs.

Of that we can be thankful. A man of the stature, experience and governmental expertise of Representative Evins is a valuable asset, one that Tennessee will miss.

Our best wishes are extended to Representative Evins upon his plans for retirement, along with the hope he will be active in behalf of his State for a long, long time.

Mr. EVINS. Thank you, Mr. Whitten.

We are going to close on a harmonious note. TVA has three sources of revenue. They have annual appropriations. They have all the power sales which they can utilize if they wish. Three, they have bond sales. I would say an organization with three sources of revenue could handle those revenues in such a manner so as to keep these rates down and get these rates controlled. I never want to be on the board. I don't envy your job. But I know if I was on it we would hold those rates down.

One other thing. This is from TVA's own statement, TVA rates are among the lowest in the Nation. They do not say they are the lowest in the Nation. They say they are among the lowest in the Nation. The Congress set them up to be a yardstick. We think we are getting away from the yardstick proposal. Thank you all for your appearance.

[Whereupon, the hearing recessed at 11:30 a.m. to reconvene at 10 a.m. on Tuesday, March 9, 1976.]

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