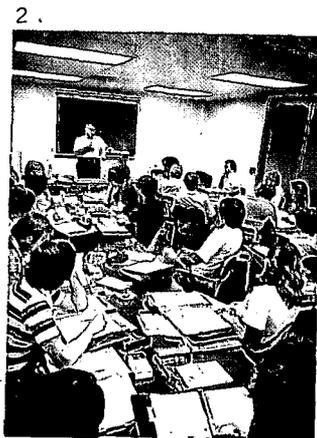
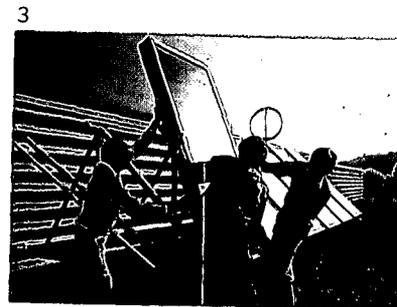


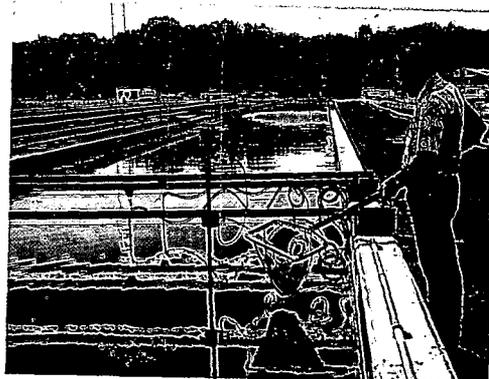
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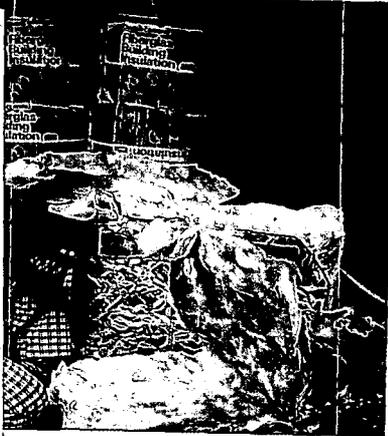


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Tennessee Valley Authority Power Annual Report 77

Power Annual Report

For the Fiscal Year ended September 30, 1977

TVA is a corporate agency of the United States Government. It was established by Act of Congress in 1933 to develop the Tennessee River system and to assist in the development of other resources of the Tennessee Valley and adjoining areas.

The production and sale of electric power are part of TVA's resource development program. TVA supplies power at wholesale to 160 municipal and cooperative distributors and one privately owned electric system which in turn distribute power to about 2.6 million customers in parts of seven states. TVA also serves directly 48 industrial customers with large or unusual power requirements and several Federal nuclear, aerospace, and military installations.

Financially, the power program is separate from other TVA programs. It is required to be self-supporting and self-liquidating. Power accounts are kept in accordance with the uniform system prescribed for electric utilities by the Federal Power Commission, now the Federal Energy Regulatory Commission.

This report deals with TVA's electric power activities. Additional information about power or other activities may be obtained from the Director of Information, Tennessee Valley Authority, Knoxville, Tennessee 37902.

The U.S. Government fiscal year was changed in 1976; consequently, this report deals with the 12 months ended September 30, 1977. Comparisons with prior years refer to previous fiscal years, which ended on June 30. A summary of the effects on operations of the transition quarter between fiscal year 1976 and fiscal year 1977 is set forth on page 34 and in some of the historical information on pages 36 and 40.

Board of Directors. Aubrey J. Wagner, Chairman
William L. Jenkins, Director
S. David Freeman, Director

General Manager R. Lynn Seeber
General Counsel Herbert S. Sanger, Jr.
Comptroller. Willard R. Stinson
Manager of Power. Godwin Williams, Jr.

On the cover: The pictures symbolize TVA's involvement in comprehensive energy programs. **1.** Widows Creek Unit 8 wet limestone scrubber. **2.** Advisor training for home energy surveys. **3.** Studies of solar energy applications. **4.** Clean use of coal. **5.** Testing the effects and uses of rejected heat from power plants. **6.** Encouragement of energy conservation, especially adequate insulation. **7.** Research in electric rates.

TENNESSEE VALLEY AUTHORITY

A corporation wholly owned by the United States of America

Highlights of 1977

Docket # 50-390
Control # 781140036
Date 4-17-78 of Document:
REGULATORY DOCKET FILE

TVA has proposed a number of programs to assist the national research and development effort in energy conservation and other energy resources. In some ways the region may become a field laboratory to help solve some of the Nation's energy problems.

Energy conservation received a massive boost in the Valley with the Home Insulation Program. Energy advisors consult with residential customers to give conservation recommendations; a program of interest-free loans is available to finance insulation work for residents with electric heat or electric air-conditioning. Potential savings include 1.25 billion kilowatthours and almost \$25 million in operating costs annually.

Sales of 122 billion kilowatthours were 12 percent more than sales for the preceding fiscal year. Winter and summer temperature extremes caused much greater heating and air conditioning loads. A better business climate also added to sales.

Peak loads were very high because of the weather, exceeding 23 million kilowatts in winter—14 percent higher than the preceding fiscal year—and 21 million in summer.

Units 1 and 2 at Browns Ferry Nuclear Plant resumed operation and unit 3 began initial operation. The plant contributed 20 billion kilowatthours, or 16 percent of system generation.

Revenues were \$1.967 billion, an increase of 16 percent from the previous fiscal year primarily because of the increased use of electricity.

The \$54 million scrubber for Widows Creek unit 8 began test operation late in the year.

The cost of coal burned in TVA plants continued to increase, reaching \$21 per ton. That increase, however, was offset by the much lower cost of nuclear fuel at Browns Ferry. The system-wide average fuel cost of 8.9 mills per kilowatthour was about the same as in the preceding fiscal year. Fuel and related costs took 52 cents of every revenue dollar.

Newly structured wholesale and resale rate schedules were put in effect in January 1977 to realign power charges with current cost conditions. In addition, rates were adjusted in July to cover overall increases in costs (other than fuel) since the adjustment in January 1975. The adjustment was to provide an additional \$75 million for 1977 to meet revenue requirements.

Average TVA revenues showed little change in 1977. On wholesale sales, revenues averaged 1.62 cents per kilowatthour, 0.03 cent higher than the preceding fiscal year. Residential consumers paid an average of 2.32 cents per kilowatthour for electricity, up from 2.26 cents in fiscal 1976.

Power proceeds available for reinvestment in the power system from the year's operations totaled \$62 million. This amount supplemented a net increase in borrowings of \$995 million.

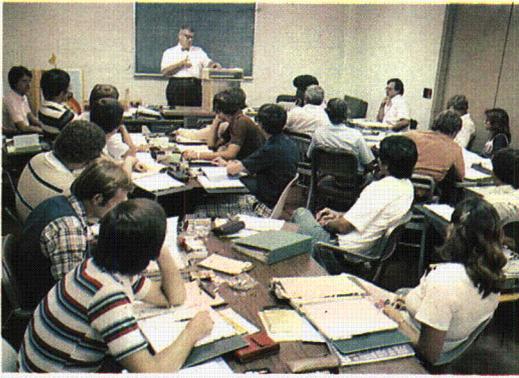
TVA continued its discussions with states and the Environmental Protection Agency to find an acceptable plan for complying with limitations on sulfur dioxide emissions. Work continued on facilities needed to meet clean air standards, and agreements were negotiated for several large new supplies of coal to help meet these standards.

Contents

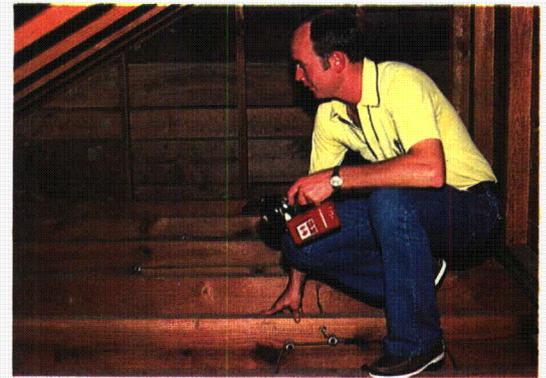
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Adequate insulation saves more energy than anything else at home. Almost 500,000 electrically heated homes and over 300,000 electrically cooled homes in the region do not have adequate attic insulation (insulation courtesy of Callaway Insulation Co., Chattanooga.)





TVA has trained over 230 energy advisors to handle requests for residential energy-efficiency surveys.



This Mississippi home had no attic insulation at all.

Energy Conservation: A Renewed Emphasis

In 1977 TVA began its largest conservation program yet, aimed at getting improved insulation into as many as 800,000 homes and making home energy surveys available to all of the region's two million residential consumers. The agency also announced its willingness to assume a national role in helping demonstrate energy conservation methods and in the national effort to develop energy resources.

For years TVA and power distributors have promoted home weatherization and provided consumers with information on energy-saving steps in the home. But in light of the current energy situation there is a more urgent need to speed up progress on insulating existing homes. Under TVA's new Home Insulation Program, the basic approach is to make available interest-free financing for attic insulation, which is the first and most effective step in home weatherization. These funds are usually repaid along with payments on electric bills. The repayment schedule allows the consumer's added cost to be offset by the savings in electricity requirements as a result of the insulation.

Energy advisors employed by TVA or local power distributors are available across the region to visit any consumer's home on request and identify opportunities to save energy. In addition, consumers with electric heat and inadequate attic insulation are eligible for the interest-free financing to bring attic insulation up to at least the recommended R-19 standard.

There are about 961,000 electrically heated homes in the region, half of which do not have adequate attic insulation. If all of them were insulated to the R-19 minimum, it would save about one billion kilowatthours a year, save about \$20 million annually in fuel costs, and reduce future peak loads by almost half a million kilowatts. That will ultimately produce savings—for all consumers—that will exceed the program's cost to TVA. The program was planned for five years at an estimated total cost of \$23 million. The program will also particularly benefit low-income families who can least afford the initial cost of adequate attic insulation.

The Home Insulation Program was well underway by late summer. Shortly after the end of the fiscal year, the program was expanded to make electric air conditioning users eligible for the insulation financing.

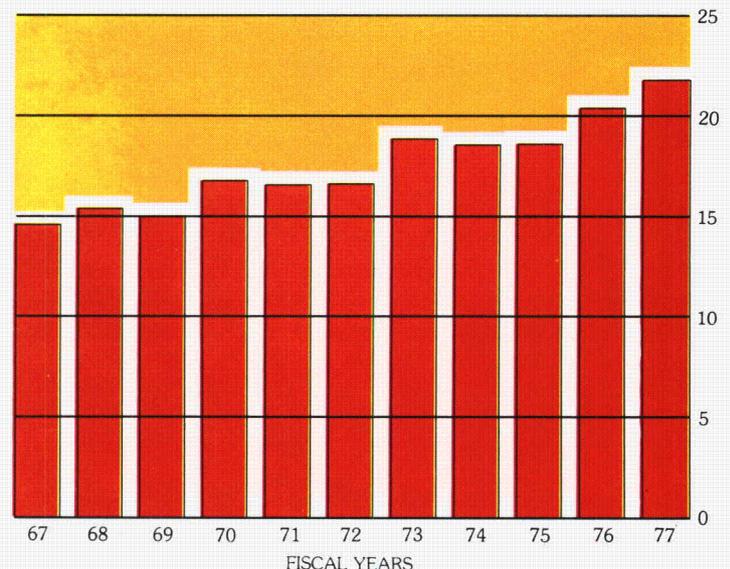
This is expected to save an additional quarter-billion kilowatthours and about \$5 million annually.

The Super Saver Electric Home Program is designed to encourage vastly improved standards for energy efficiency in new homes. Homes built in the coming decades will have the greatest impact on the growth of residential electric use. TVA and many distributors of TVA power are encouraging use of these improved standards, and about 400 Super Saver Electric Homes have been built or planned in the region.

Super Saver homes have unusually heavy insulation, an electric heat pump, and tight window and door design criteria. Dramatic savings can be achieved at little added cost—studies show 65-75 percent savings in energy use for space heating and 25-33 percent for cooling. TVA hopes to stimulate use of the Super Saver in the region and help develop wider national interest in the concept.

Peak Load

millions of kilowatts



About one-fifth of all new single-family homes in America are mobile homes. TVA has worked with manufacturers and trade associations for improved energy efficiency standards for these homes, and hopes to expand work in this field to make existing mobile homes more energy-efficient, to extend Super Saver construction concepts to new mobile homes, and to measure the energy savings. Mobile homes are also eligible under the Home Insulation Program for energy surveys and energy-saving recommendations by trained advisors.

The Certified Electric Heat Pump Installation Program has become more important as an effective tool to encourage conservation. Compared to conventional resistance heat, electric heat pumps can cut energy use for heating in the Valley in half and save consumers substantial sums. TVA and distributors work with dealers to achieve quality heat pump units, installations, and service. About 83,000 are in use in the region, saving more than a half-billion kilowatt-hours a year, and

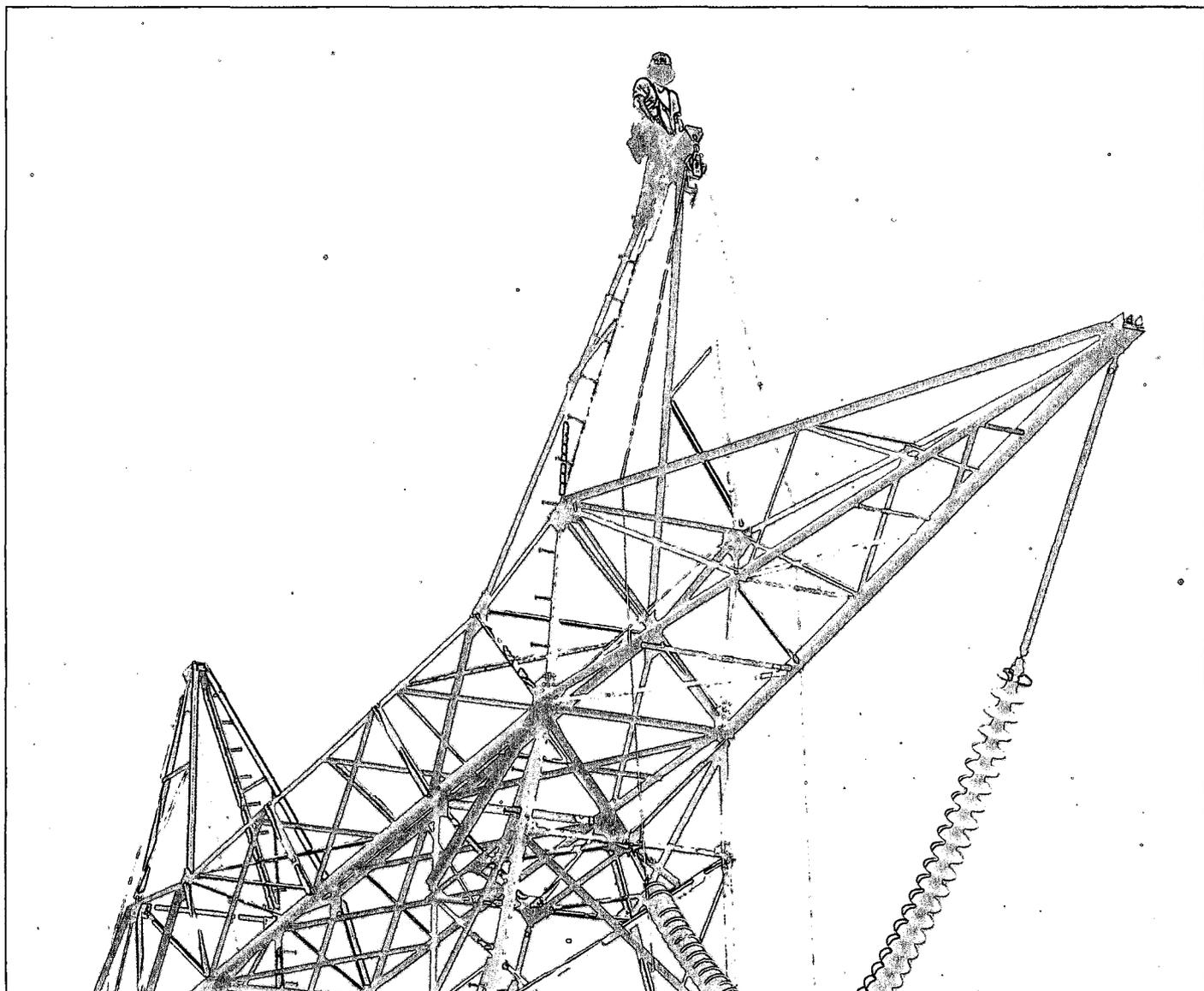
their use is increasing.

TVA and power distributors also work with commercial and industrial power users to help them save energy. TVA is considering new programs in industrial and commercial conservation that could serve as national models.

As part of its broad concern for energy conservation, TVA already has a program in commuter van pooling and has made special arrangements with some local transit authorities for special commuter buses. Other approaches are also under study.

Time-tested activities were continued during the year in support of the conservation effort. These included workshops for teachers; instruction for vocational education teachers and students; consultation arrangements with distributors of TVA power on commercial and industrial use of electricity; educational programs to inform consumers about the best ways to save energy; and a continuation of research and development in home weatherization.

About 154 miles of 500-kV transmission lines were built during year; most of this 39-mile line—between the Watts Bar Nuclear Plant and the new Roane Substation—was also completed.





This expansion of General Motors' plant in Limestone County, Alabama, is one of the major industrial projects announced in 1977.



This new facility at Columbia, Tennessee, is part of an overall effort to streamline field operations.

Heavy Sales Boost Revenues

Spurred by heavy heating and air conditioning use during a very cold winter and a hot summer, and by an improved economy, sales of electric energy reached nearly 122 billion kilowatthours, 12 percent above the previous fiscal year's sales.

The largest part of this increase came from a 15 percent rise in sales to municipal and cooperative distributors of TVA power to 77 billion kilowatthours. The distributors' residential sales of 38 billion kilowatthours accounted for most of this increase. Their sales to commercial and industrial customers, up 13 percent at 34 billion kilowatthours, reflected continuing recovery from the recession of 1974-1975.

Average annual use of electricity by the region's residential consumers rose to a record 16,400 kilowatthours, primarily because of the weather. Average annual use in the United States continued its gradual rise to more than 8,700 kilowatthours. The distributors added 59,000 customers during the fiscal year; about 46,000 were residential.

The 23 billion kilowatthours sold to industries served directly by TVA was 14 percent higher than the previous fiscal year, and approached the level of sales recorded in 1974 before the deadening effects of the recession.

Industrial activity in the region showed a marked growth during the fiscal year. In calendar year 1976, industry announced 160 new operations to be located in the TVA area, and 277 existing plants announced plans for expansion. The total investment represented by those new or expanded plants was estimated to exceed \$860 million and result in over 24,000 new jobs. Preliminary data on new and expanded plants announced during the following nine months showed that industrial growth was continuing in calendar 1977. Substantial commitments have been made in the food, furniture, paper, rubber, primary metals, and transportation equipment industries. Just after the end of the year, Bowater Southern Paper Corporation in Calhoun, Tennessee, announced a \$90 million expansion, which will make it the largest newsprint mill in North America.

Sales to Federal installations, including TVA inter-divisional sales, totaled 23 billion kilowatthours, two percent above the previous fiscal year's sales. The bulk of this power is sold to Department of Energy

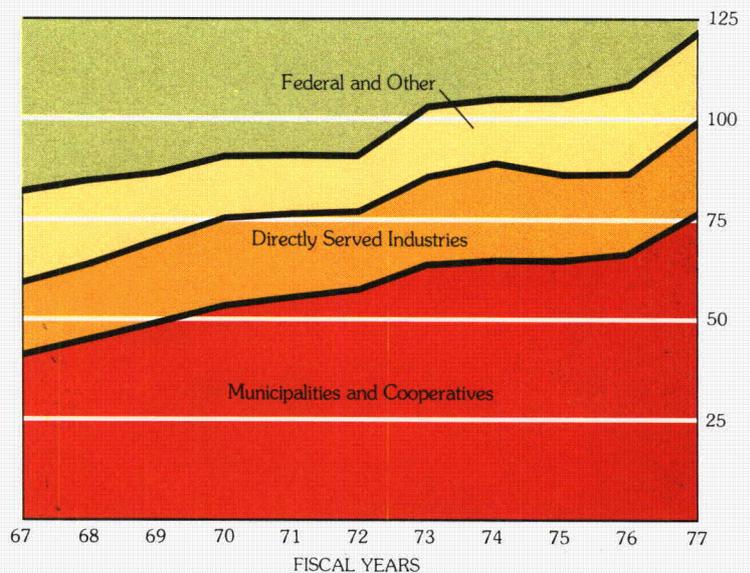
(DOE) uranium enrichment facilities at Oak Ridge, Tennessee, and Paducah, Kentucky. Contractual arrangements call for an increase in DOE's loads in steps to 4,485,000 kilowatts in July 1984.

Apart from weather effects, sales growth compared to the previous fiscal year slightly overstates year-to-year differences because of load growth in the transition period between June 30, 1976, and September 30, 1976. The notes to the financial statements set forth the effect on operations of this transition period.

The jump in energy sales was the main cause of the 16 percent increase in revenues to \$1.967 billion. Revenues from municipalities and cooperatives increased 17 percent to \$1.238 billion. Revenues from industries served directly by TVA also increased 17 percent from the previous fiscal year to \$356 million.

Sales

billions of kilowatthours



Below and above right: Full-time study and practical training are provided for student generating plant operators and instrument mechanics at TVA's training center near Sequoyah. Computerized control room simulators are also used for licensing, testing, and periodic retraining. At year end, 177 full-time students were enrolled.





Revenues from Federal agencies including TVA interdivisional sales rose seven percent, totaling \$328 million.

Total operating expenses for the year were \$201 million higher than the previous fiscal year.

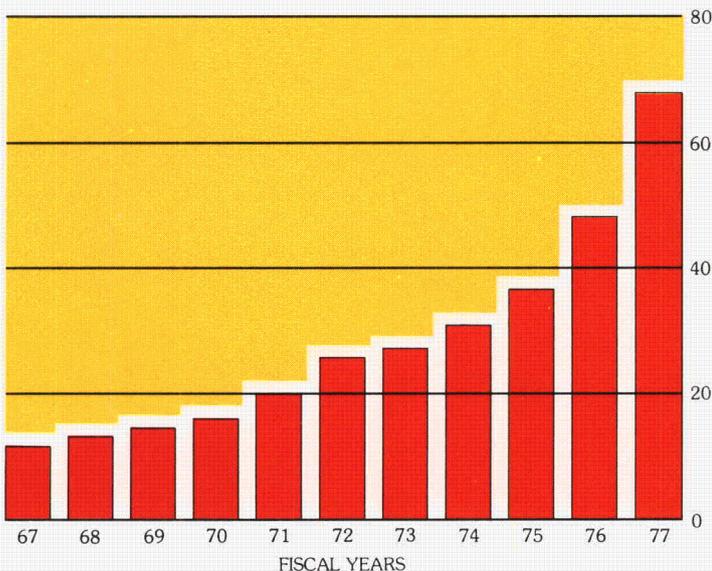
Fuel and power imports together cost \$1.016 billion for fiscal 1977, or 52 cents for each dollar of revenue. With increased thermal generation to meet the greater demand for electricity, fuel expenses increased by \$178 million from the preceding fiscal year. At more than \$21 per ton, the average cost of coal burned was \$2.46 higher than the preceding fiscal year, but that increase was offset this year by the low cost of nuclear fuel. Browns Ferry Nuclear Plant contributed 20 billion kilowatt-hours, or 16 percent of system generation, at an average fuel cost for commercial operation of less than two mills per kilowatt-hour. Because of this large amount of relatively low-cost energy, the system's average cost for all fuel was just 8.9 mills per net kilowatt-hour generated, almost matching the 8.8 mills for 1976. The fuel cost at coal-fired plants was 9.8 mills.

Expenses of \$107 million for imported power were \$112 million less than the year before. The added TVA generation available at relatively low cost made it possible to import less power. Net imports were still substantial, however, reflecting the delays TVA has faced in completing new power plants to help meet demands.

TVA makes payments in lieu of taxes to states and counties equal to five percent of revenues from sales of electric energy for the previous year, excluding revenues from Federal agencies. These payments have increased steeply. In 1977, TVA paid \$68 million to states and counties, close to half again as much as the amount paid in 1976 and about six times the amount paid 10 years ago. Next year these payments will be almost \$80 million. In addition, the 160 municipal and cooperative distributors of TVA power paid \$41 million to states and local governments in taxes and tax equivalents during 1977.

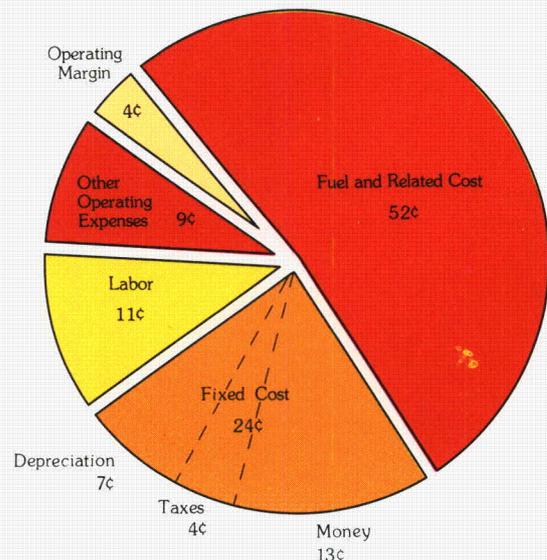
TVA Payments in Lieu of Taxes

millions of dollars



Distribution of TVA Revenue Dollar

FISCAL YEAR 1977



Right: Raccoon Mountain Pumped-Storage Plant at Chattanooga neared completion in 1977. The plant will provide 1,530,000 kilowatts of peaking hydro power and help make more efficient use of large thermal plants.

The capital required for TVA's future power plants is obtained largely from borrowings. Interest payments during the year of \$379 million represented about one-fifth of revenues. Almost \$179 million in interest payments was capitalized leaving about \$200 million of net interest charged to operations.

The TVA Act requires TVA to pay a return or dividend to the U.S. Treasury on outstanding appropriations invested in the power system and repay a portion of the appropriations each year. This year's dividend was \$64 million which, as required by the Act, is based on the average interest rate payable on the Treasury's marketable public obligations at the beginning of the fiscal year—just over 6.59 percent. The repayment amount, also set by the Act, was \$20 million, bringing the total payments to \$84 million.

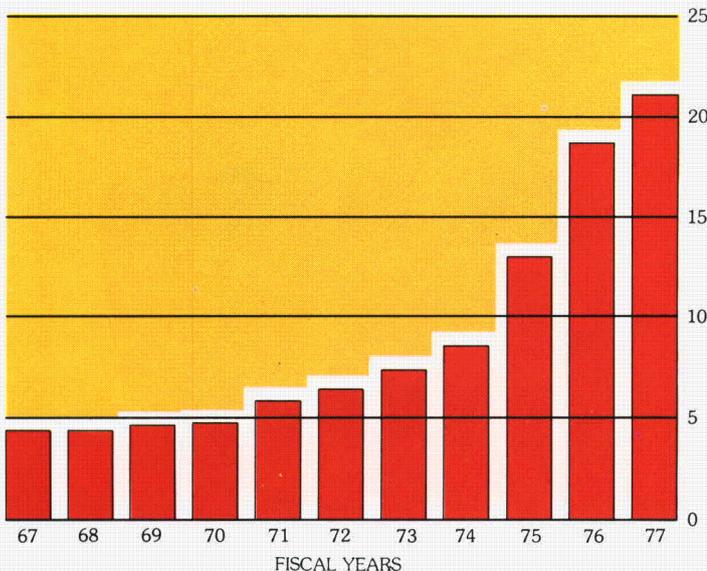
After paying the Treasury dividend or return, retained earnings increased by \$86 million. This increase was greater than fiscal 1976's by \$25 million.

The income statement on page 26, which complies with the Federal Power Commission's Uniform

System of Accounts, does not portray certain financial obligations imposed on TVA by law. Section 15d. of the TVA Act requires that rates be charged which will provide sufficient gross revenues to pay operating expenses, pay interest on outstanding bonds, make in-lieu-of-tax payments to states and counties, meet the required return and repayment obligations to the U.S. Treasury, and provide a margin for reinvestment in power assets and for other power program purposes while keeping rates as low as feasible. Net power proceeds for the year were \$524 million. After meeting debt service of \$379 million and \$84 million in total payments to the U.S. Treasury, \$62 million remained for investment in the power system. This was about three percent of revenues. This \$62 million supplemented an increase in net borrowings of \$995 million for the year. Proceeds available for reinvestment have been considered inadequate in recent years but the beginnings of improvement were made in 1977.

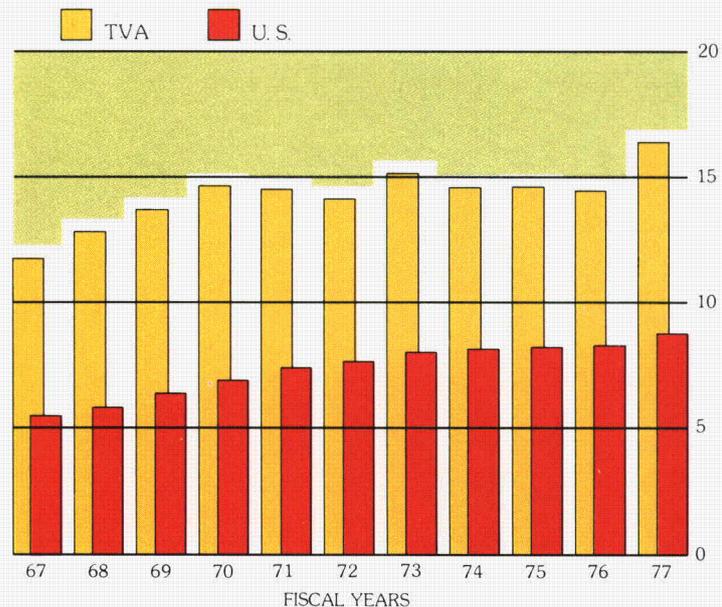
Average Cost of Coal Burned

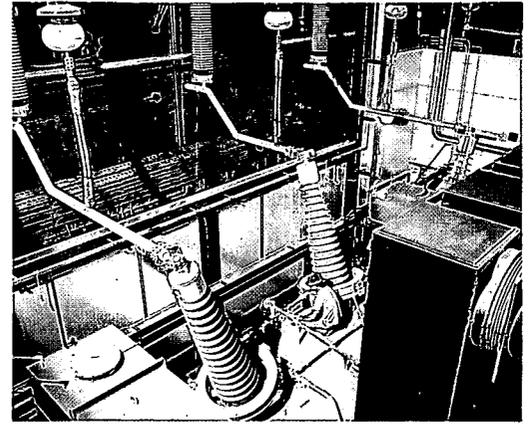
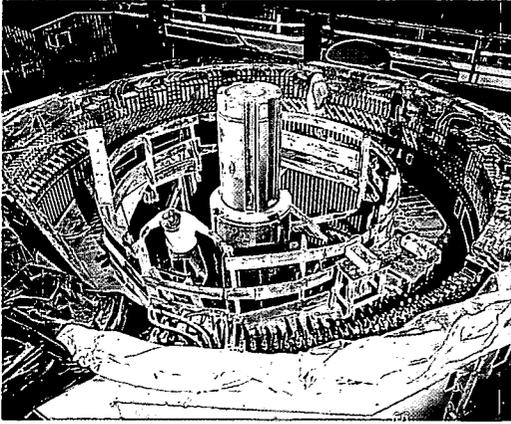
dollars per ton



Average Residential Use

thousands of kilowatthours





Power Supply Tight: Peak Loads Soar

The weather extremes of the past fiscal year furnished an illuminating example of the uncertainties electric systems must prepare to meet. The availability of adequate generating reserves and timely completion of new generating facilities are critical.

Peak Loads

For a few days in January 1977, the low temperatures for this region caused an enormous demand for heating energy. Virtually every electricity supplier in the eastern half of the country was similarly affected at the same time. TVA met its all-time peak demand from the region's consumers of 21.8 million kilowatts on January 10 with four major generating units out of service; power resources were generally scarce. Internal emergency conservation measures were begun and a public appeal was made by TVA and distributors for consumers to voluntarily reduce their use of electricity as much as they could for a temporary emergency. Cooperation from the public, power imports, and the use of interruptible power contract rights allowed TVA to meet power requirements. Also, under the Energy Research and Development Administration's (ERDA's) established procedures, TVA and ERDA agreed to a 900,000 kilowatt reduction in power use at ERDA's Oak Ridge and Paducah facilities for 30 days.

Even colder weather and higher demands occurred a week later (January 17), but then almost every generating unit on the TVA system was available. It was estimated that capacity in the eastern U.S. was 8.6 million kilowatts short of demand, and some systems had to curtail firm load. TVA, however, was able to meet an all-time record peak of 23.3 million kilowatts in total demand including as much as 1.6 million kilowatts supplied to other electric systems.

The following summer was as hot as the winter was cold, leading to a continuing series of record summer demands. The summer peak was 21.2 million kilowatts on September 1. Power supply was adequate without extraordinary conservation measures, but consumers in the Valley were informed that additional conservation was advisable during the hot periods.

An underlying structural weakness in the Browns Ferry cooling towers was revealed when one section of one of the six towers collapsed. Deliberations with the contractor were underway at the end of the year concerning settlement of TVA's claim and to decide on the best rebuilding plan to protect against future breakdowns.

During the early summer, because of high river temperature, extremely adverse weather and cooling tower performance below projections, generation at Browns Ferry Nuclear Plant had to be reduced to comply with plant thermal effluent requirements. EPA and Alabama, with the concurrence of the Nuclear Regulatory Commission, authorized the plant to operate temporarily under less stringent thermal limitations. TVA is investigating possible improvements to the heat dissipation system.

Generation

Units 1 and 2 at Browns Ferry were restarted during the summer of 1976 and unit 3 received its initial fuel load. All three units were operating at full load by winter. The third unit began commercial operation on March 1, 1977.

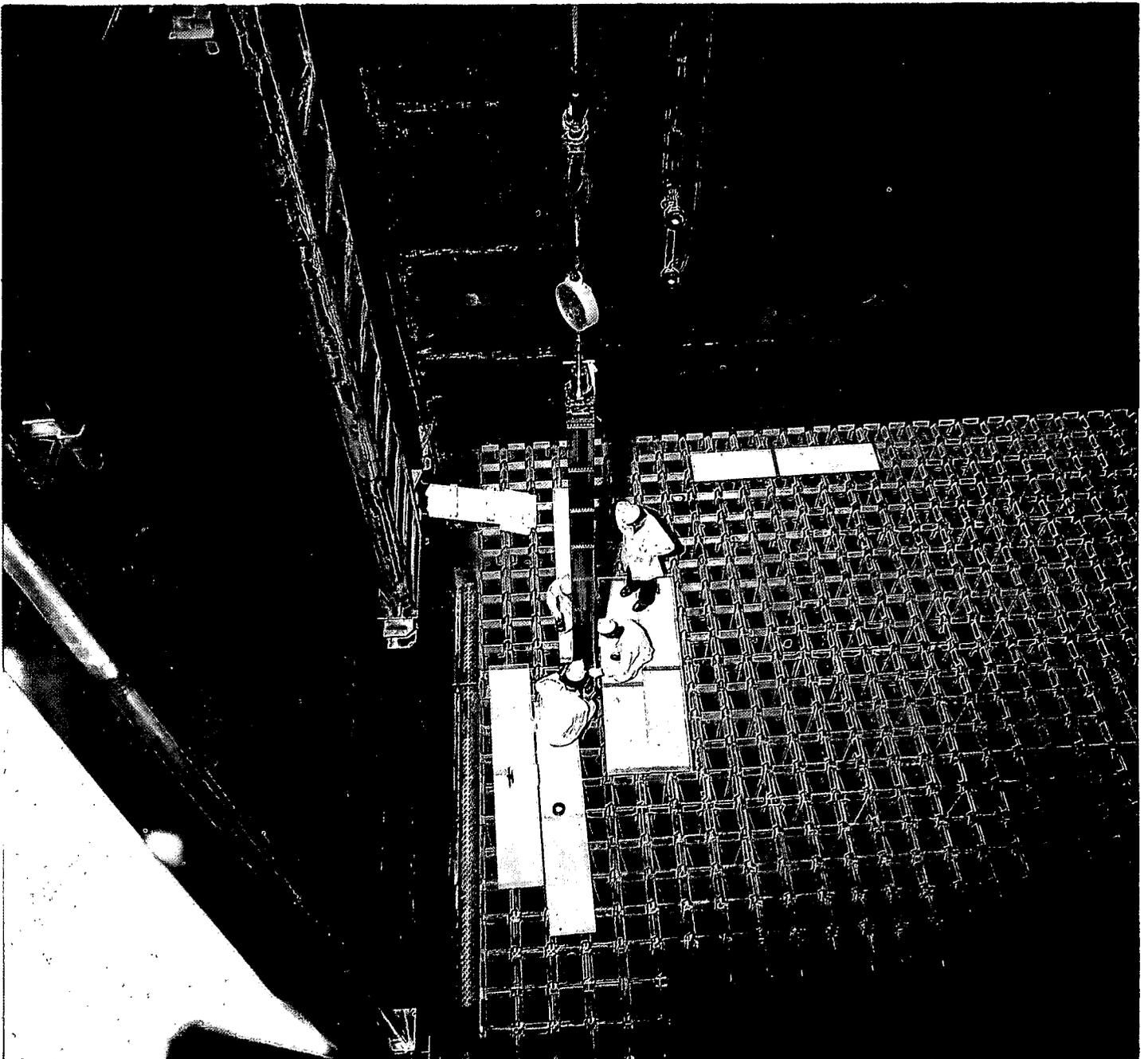
Coal-fired steam plants produced 82 billion kilowatthours, a slight increase from the previous fiscal year and two-thirds of total generation. These plants burned 37.9 million tons of coal.

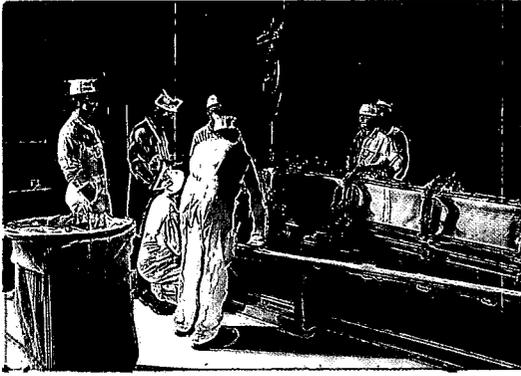
Generation from TVA's combustion turbine units was more than two billion kilowatthours, up sharply from the preceding fiscal year because of the magnitude and frequency of the peak loads these turbines serve. This still was less than two percent of system generation.

Extremely dry weather and low streamflows afflicted the power system in some months, but hydroelectric generation on the whole was about average at 18.2 billion kilowatthours.

Power imported from other electric systems again outweighed exports, but net imports, especially expensive purchases, were down from the two preceding fiscal years. It is sometimes less expensive to import power than to produce it, for example, with oil-fired combustion turbines. This reduces the cost of production and results in direct savings to every consumer of TVA power.

The initial fuel load for Sequoyah Nuclear Plant began arriving onsite during the summer of 1977. Each of the first cores for the two Sequoyah reactors cost about \$50 million and will provide as much electricity as 11.5 million tons of coal. Here fuel is placed in storage.





Sequoyah fuel bundles are removed from casks for storage.



TVA is attempting revegetation at the old uranium mill acquired along with other uranium properties in South Dakota in 1974. Other reclamation is underway in mining areas.

TVA has agreements with several neighboring electric systems to exchange power seasonally, with TVA importing in the winter and exporting in the summer, so that each party can meet its own seasonal peaks without having to build as much capacity to serve them. This is possible because the heaviest demands in the region come in winter while some neighboring systems have their peak demands in summer. TVA's summer peaks, however, have been increasing with the wider use of air conditioning, reducing the gap between typical winter and summer loads. TVA has given notices it will exercise its contractual right to lower seasonal power deliveries by 480,000 kilowatts for the "exchange year" beginning in November 1979 and by 960,000 kilowatts beginning in November 1980, bringing the commitment down to 1,100,000 kilowatts. This summer reduction will increase TVA's winter generation responsibility by the same amount.

Considerable progress has been made on a long-range program to improve components at the fossil-fired plants, particularly boilers and turbine rotors. The current goal is to restore 800,000 kilowatts of derated capacity by the end of fiscal 1978.

Approximately \$3.5 million is being spent to minimize the likelihood that Cumberland Steam Plant—partially an outdoor plant—will be forced out of service during very cold weather, as it was in January 1977.

Coal Supplies

Stockpiles of coal remained at about 12 million tons—a high-level—throughout the year. This is between three and four months' supply for the system overall. An effort was made to keep stockpiles up in anticipation of a United Mine Workers strike in December 1977.

TVA exercised options to buy coal rights on 39,000 acres in southern Illinois containing an estimated 744 million tons of coal at a projected cost of about \$41 million. Closing of the acquisition will take place in 1978. Reserves of mineable coal are acquired to assure a supply of coal in the future. Most coal reserves acquired in the past have either been committed to supply certain plants or are already being mined. Additional reserves were therefore needed.

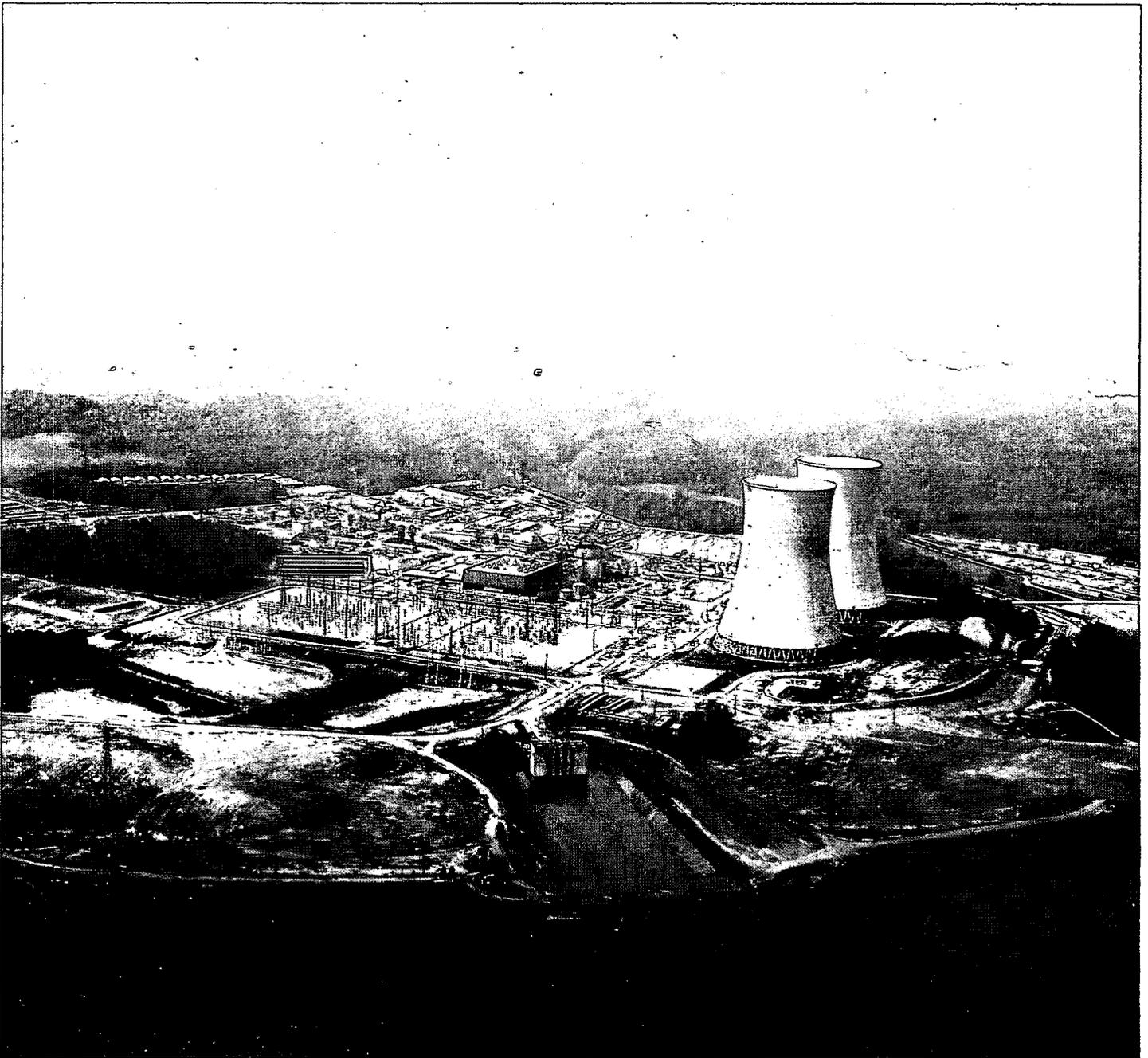
Several major coal purchases to help fill future needs for fuel that is environmentally acceptable were negotiated during the year and formally approved in October 1977.

Nuclear Fuel Supplies

As part of its overall program for assuring an adequate supply of nuclear fuel for future power plants, TVA aims at having a large supply of uranium obtainable from reserves.

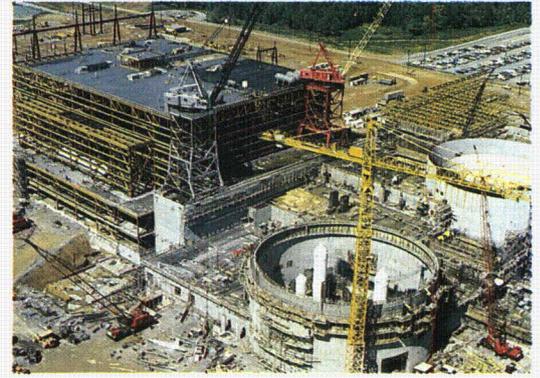
TVA has acquired certain uranium property interests, which include both lands with definite uranium reserves and lands valuable for exploration. These lands are located in Colorado, Michigan, New Mexico, South Dakota, Utah, and Wyoming. TVA has invested about \$65 million in acquiring and developing these interests over the last six years. As with coal lands, it is expected that mining will be performed by private companies. TVA maintains offices in Casper, Wyoming, and Moab, Utah, to oversee the work done under TVA contracts for mineral exploration and production.

The \$1.075 billion Watts Bar Nuclear Plant near Spring City, Tennessee, was 65 percent complete at the end of the fiscal year.





Construction began on the 5,148,000 kilowatt Hartsville Nuclear Plants in Trousdale County in middle Tennessee.



Bellefonte, the fourth TVA nuclear plant, is scheduled to come on line in 1980. Construction started in 1974.

Construction Expenditures Total \$1.3 Billion

TVA has seven generating plants under construction or on order, including over 18 million kilowatts of nuclear capacity and more than 1.5 million kilowatts of pumped-storage peaking capacity.

Construction was well advanced at the Sequoyah, Watts Bar, and Bellefonte Nuclear Plants, which represent an aggregate capacity of 7,646,000 kilowatts scheduled to be put on line through 1981.

Raccoon Mountain Pumped-Storage Plant neared completion after a two-year delay caused by faulty turbine components that were corrected by the manufacturer. Although Raccoon Mountain was not available to meet peaking needs this winter, it is hoped some of the units will be in full commercial operation next summer to help meet growing air conditioning demands. By using surplus off-peak capacity for pumping, hydro generation is made available on-peak, thereby conserving expensive oil used for TVA's combustion turbines.

A construction permit was received in May for the 5,148,000 kilowatt Hartsville Nuclear Plants; the estimated cost of this plant is \$3.5 billion. A limited work authorization was received in October 1977 for the proposed \$1.8 billion Phipps Bend Nuclear Plant. Design changes to improve efficiency, safety, and environmental protection at these plants have been incorporated. The increase in estimated cost for these two plants was \$1.2 billion.

A draft Environmental Impact Statement was released on the proposed Yellow Creek Nuclear Plant in June and was submitted to the appropriate state and Federal agencies. Public hearings were set to begin in December 1977.

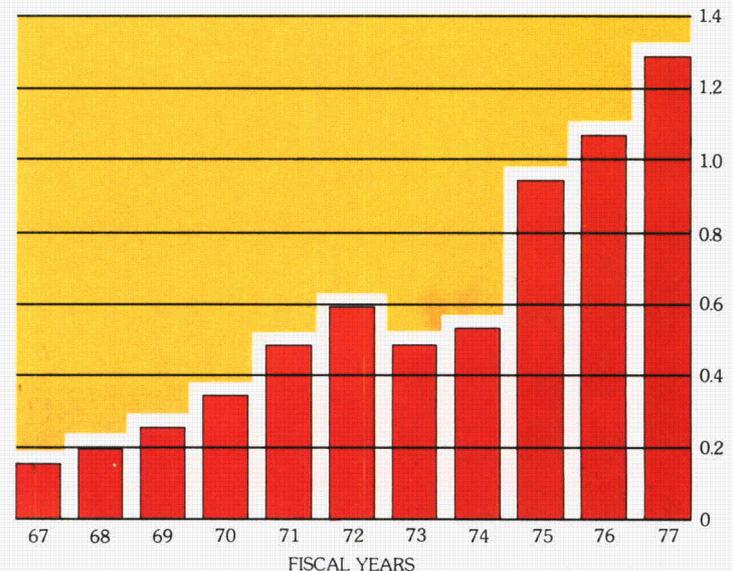
Estimated construction costs for TVA nuclear plants are generally lower on a per-kilowatt basis than typical costs for similar generating units nationwide, and these projects represent the least-cost alternative for new power supply on the TVA system at this time.

The total estimated cost for TVA power projects now under construction or on order is more than \$11 billion. Construction expenditures in 1977 came to almost \$1.3 billion.

The 10-12 years usually needed to plan and build new plants impose serious stress on the planning and construction effort of electric systems. TVA believes the planning, construction, and licensing of new plants should be accelerated without sacrificing safety or efficiency and encourages efforts in this direction.

Construction Expenditures*

billions of dollars



*Includes allowance for funds used during construction

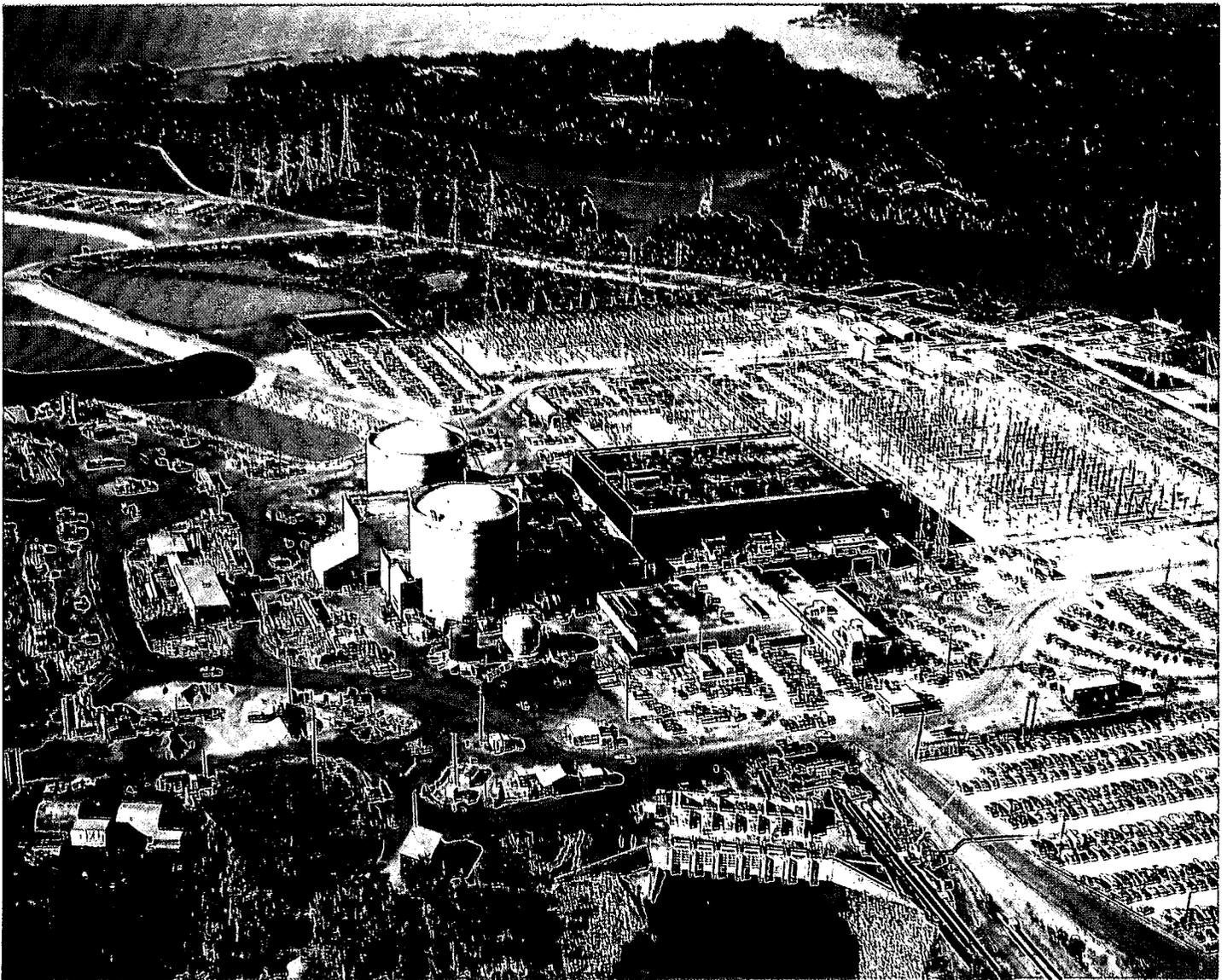
Almost \$1 Billion Added to Borrowings

To provide capital for power assets, principally the new generating capacity, three 25-year bond issues totaling \$900 million were sold to the Federal Financing Bank (FFB) during the fiscal year. The new bond issues were offset in part by the called redemption in December 1976 of all bonds of two high-interest issues totaling \$150 million. The net increase in long-term debt was \$750 million for the year.

Short-term borrowings were increased by \$245 million to a total of \$1.130 billion on September 30. Most short-term financing is through notes issued to the FFB.

This total increase in net borrowings of \$995 million, added to the increase of \$455 million during the transition quarter between 1976 and 1977, brought the TVA's outstanding borrowings to \$5.855 billion at the end of the year. To obtain more favorable interest rates, all long-term and most short-term financing since 1975 has been through the sale of bonds and notes to the FFB, which was established under legislation passed by Congress in 1973.

Sequoyah Nuclear Plant



Rates Relatively Stable; Rate Studies Expand

Wholesale power supplies cost the 160 distributors of TVA power an average of 1.62 cents per kilowatt-hour, only 0.03 cent higher than the preceding fiscal year. Residential consumers paid an average of 2.32 cents per kilowatt-hour, up from the 2.26 cents for the previous fiscal year.

Although there was little increase in average residential rates, monthly electric bills were boosted by exceptionally heavy use. The average annual total for residential bills increased 17 percent to \$380. For those consumers with electric heat, this average annual total jumped from \$428 to \$509, or 19 percent.

Revenue from industries served directly by TVA was 1.56 cents per kilowatt-hour on the average, three percent more than the preceding fiscal year's average of 1.52 cents.

Federal agencies paid 1.45 cents per kilowatt-hour, up 0.06 cent from fiscal 1976.

Two rate actions were taken in the year. After extensive discussions with the distributors of TVA power and other interested parties, wholesale and resale rates were changed effective in January. The purpose of the change was to permit the various rates and charges to reflect current cost conditions, to improve the relationship between rate schedules, and to provide adequate revenues to distributors to cover their increasing costs. As designed, the rate action did not change TVA's revenues significantly.

A rate adjustment, effective in July, was implemented to meet TVA's need for additional revenues to cover higher costs (other than increased fuel-related costs which have been reflected on monthly electric bills). This was the first rate adjustment in two and a half years to cover higher costs for items such as interest, environmental protection, labor, and materials.

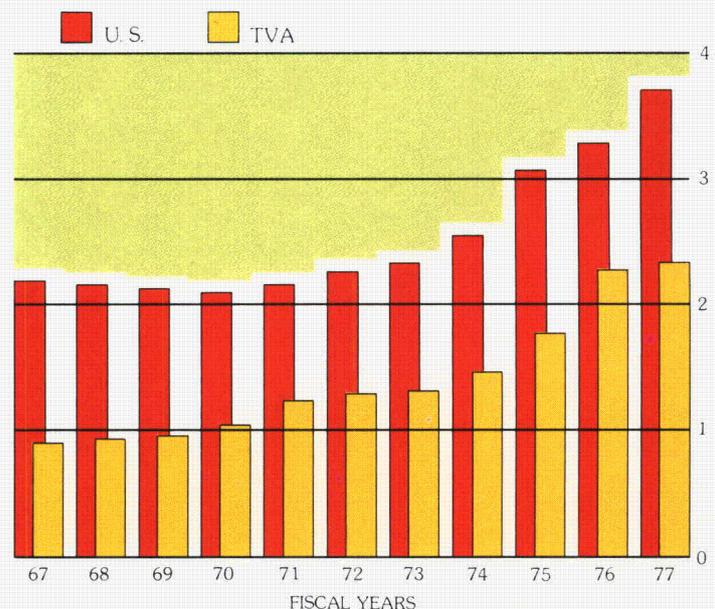
Activities have been intensified in rate and load management research to contribute to the national effort toward energy conservation and management. Many different groups and individuals have proposed changing electric rate schedules to accomplish various and sometimes inconsistent objectives. Much more investigation is needed to evaluate such proposals, including their likely effects on consumers. TVA's activities in these areas will help identify power system costs and benefits that would result from either

changes in rate structures or additional load management activities.

TVA made plans for a \$1.5 million test involving home water heaters to investigate ways to hold down electricity costs for consumers by reducing peak demands. Water heaters appear to offer promising opportunities for load management through remote control and heat storage; this testing will help answer questions about its acceptance by consumers and its practicality in the region. Patterns of electricity use by 400 voluntary participants, including water heater use, will be specially metered. These homes will receive equipment to enable remote shut-off of electricity to their water heaters during peak loads. Another 100 residential consumers will have 120-gallon, well-insulated water heaters installed to test the potentially larger benefits that should occur with increased hot water storage capacity. Heating and cooling are major load components in the Valley and control equipment will also be installed on the space conditioning equipment of 200 of the test participants

Average Residential Rate

cents per kilowatt-hour



Time-of-day meters like the one pictured will be installed on about 220 Knoxville homes to test the usefulness and acceptance of time-of-day rates. Analysis of information from this and other tests of rates in the Valley will help clarify the potential for different kinds of rates in terms of national energy goals.



to determine the feasibility of reducing this electricity use during peak periods.

Data collection continued and some analysis was performed in a load metering study of a cross-section of Chattanooga Electric Power Board customers, which will yield baseline information on patterns of power use. This study will help refine future cost of service studies, load forecasting, and power system planning in addition to rate structure analyses.

A study of experimental time-of-day rates, involving a sample of 220 residential customers of the Knoxville Utilities Board (half of whom will use standard rates as a control), was initiated. Metering equipment for this test was scheduled to be in place by January 1978. This will be the first effort in the Valley to test consumer acceptance of time-of-day pricing. Costs of service vary with time of use; costs tend to be higher during periods of peak demand. Time-of-day rates which reflect these cost variations may encourage consumers to shift some uses to off-peak periods, thereby reducing peak capacity and energy costs. The test should produce information about short-run effects of such a pricing method

and help in designing broader trials to determine long-run effects on consumers and the power system.

TVA is studying other pricing methods and hopes to contribute to the nationwide effort to answer questions about rate structures and related load management ideas.

FAMILY INCOME AND POWER BILLS FOR REGION SERVED WITH TVA POWER

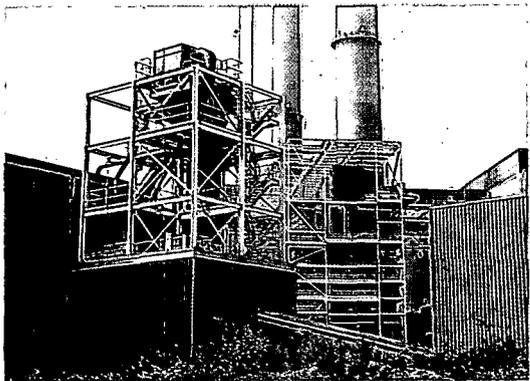
Fiscal Year	Average Home Use (kWh)	Average Home Power Bills For Year	Median Family Income*	Power Bill As Percentage Of Income
1940	1,353	\$ 29	\$ 650	4.5
1950	3,079	46	1,726	2.7
1960	8,806	87	3,674	2.4
1970	14,560	150	7,160	2.1
1976	14,370	325	10,600	3.1
1977	16,400	380	11,800	3.2

*Income for preceding calendar year

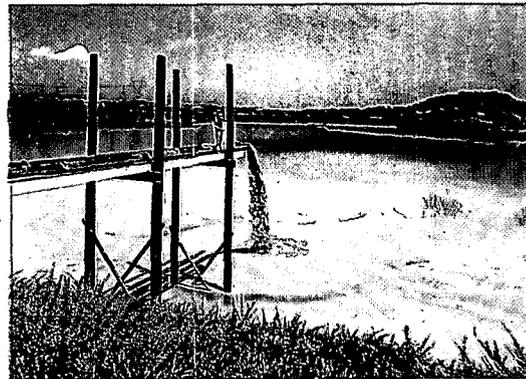
Generally, the home power bill through the years has required a small part of family income. Averages do not portray individual situations, of course, but they do illustrate that electricity has not taken a much bigger part of the typical family's income, in spite of higher rates reflecting the sharply increased costs of recent years.

Power laboratories at Chattanooga are taking advantage of solar energy for hot water, one of several solar tests in TVA. Performance data are being collected and will help in solar development.





This \$54 million scrubber at Widows Creek is providing valuable information while removing sulfur dioxide.



Widows Creek scrubber sludge disposal pond. Other scrubber types may produce salable byproducts and pose fewer land use problems.

Energy Resources: Progress and a Greater Role

TVA spent \$33 million of power proceeds in research and development, of which almost \$13 million was invested in the wet limestone scrubber on Widows Creek 8. Of the \$33 million, \$13 million was cash support of the Electric Power Research Institute (EPRI), an industry-supported research organization which complements research programs carried out by other agencies on national energy problems. TVA personnel serve on EPRI committees and help guide its programs. Also included in expenses was \$2 million for the Clinch River Breeder Reactor Project. Funding from other sources raised TVA's total power-related research activity to \$42 million for the year.

Use of Waste Heat

Heat discharged from steam plants to the air or water is a potentially valuable resource. This heat can be tapped in a number of useful ways, but only with difficulty because the total thermal energy discharged is almost always diluted in an enormous quantity of water (which makes the water warm, not hot). For several years programs have been underway to test ways of using this heat, and these programs can be expanded to demonstrations of national benefit.

A prototype facility at Muscle Shoals has proven the feasibility of greenhouses for using waste heat, producing high yields of tomatoes and cucumbers. A commercial-scale greenhouse is being built at Browns Ferry Nuclear Plant. Catfish production in warmed discharge water has been proven feasible at Gallatin Steam plant, though several problems need to be resolved before commercial catfish raising at steam plants becomes feasible. Heating soil to extend growing seasons, production of aquatic organisms for livestock feed, improvement of organic sewage disposal, and larger greenhouse demonstrations are among other applications of waste heat under study.

The higher prices of energy resources in recent years call for a closer look at cogeneration—the sharing of energy between power generation facilities and other possible users who need heat or process steam. Related possibilities, such as mutual use of coal conversion facilities among power plants and industry, are also being examined and some are under active discussion between TVA and industry.

Coal Utilization

Coal is an energy resource with enormous potential. As supplies of oil and natural gas decline, coal will become an even more vital part of the Nation's energy supply, replacing other fossil fuels as an energy source or chemical feedstock. Serious problems are unsolved, however, in developing coal as a clean fuel. TVA is participating in efforts to address those problems.

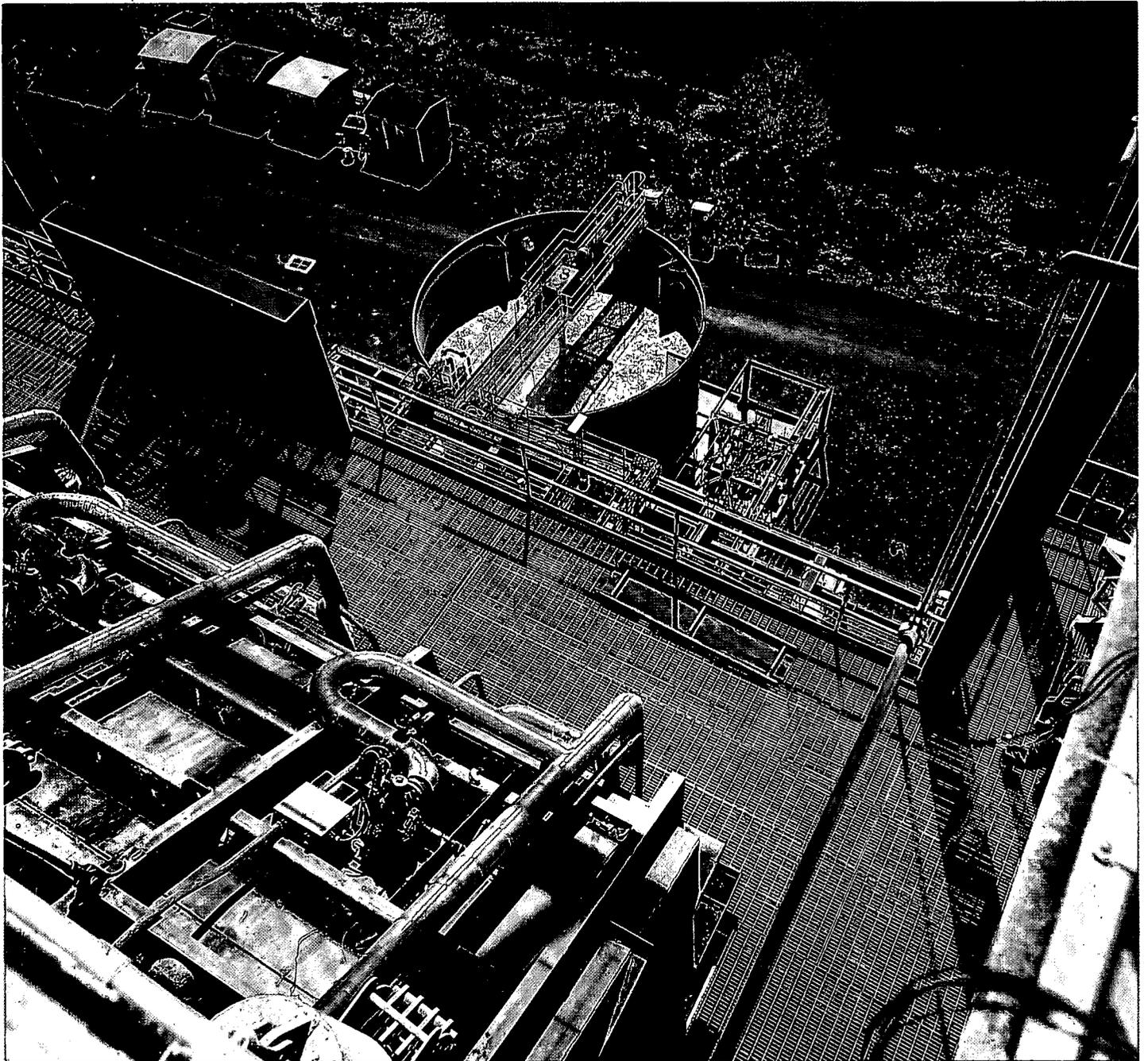
Fluidized Bed Combustion (FBC), which is used to remove polluting materials during the coal-burning process, is a promising approach. It could permit the use of coals high in sulfur and offer other economies, such as the ability to use high-ash coal reliably. In 1976 up to \$4 million was authorized to study the feasibility of an atmospheric FBC plant and do preliminary design, siting, and cost analysis work. Some of the money will be reimbursed through a recent agreement with DOE. Preliminary designs for a 200,000-kilowatt FBC facility were well underway at the end of fiscal 1977. If approved, the plant should provide operating experience by 1983.

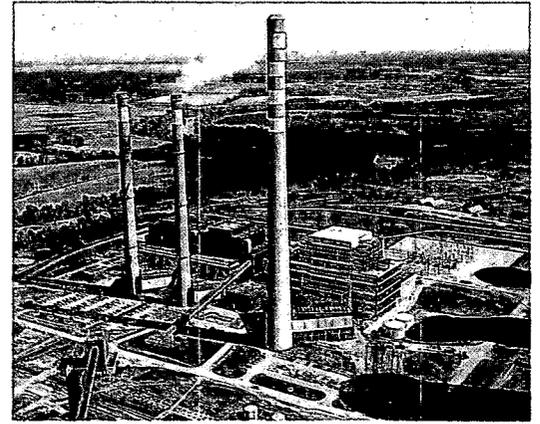
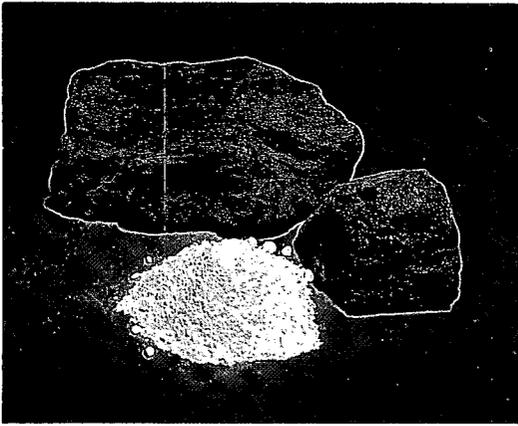
Another promising technology being closely watched is magnetohydrodynamics (MHD), in which hot ionized gases from burning coal generate electricity by moving through a magnetic field. With sufficient technological advances, MHD combined with a conventional steam cycle could produce 50 percent more electricity per pound of coal than conventional steam plants. TVA continued to supply the University of Tennessee Space Institute at Tullahoma with pulverized coal for MHD research and continued to participate in nationwide coordinating and evaluation groups dealing with MHD.

Char, a residue produced when coal is converted to liquid and gaseous fuels under heat, will be tested as a boiler fuel. It also may be an even better MHD fuel than coal.

Coal cleaning prior to use at a steam plant, an established practice in many places, is an important way to increase the country's usable coal reserves by permitting more coal to comply with sulfur dioxide limitations at conventional plants. Coal-washing facilities are being provided for the Cumberland and Paradise Steam Plants. The \$150 million Paradise coal-washing plant—one of the largest of its kind—will

Below: Limestone slurry storage viewed from the Widows Creek scrubber superstructure. Such scrubbers are complex engineering installations. **Above, right:** Most of the sulfur bound in coal must be removed before, during, or after burning to meet air quality standards. Coal cleaning, gasification, and liquifaction do the first; fluidized bed combustion does the second; and flue gas scrubbing does the third. Much development is ahead in all three. **Above, far right:** Paradise Steam Plant, to be site of a \$150 million coal cleaning plant.





remove almost two-thirds of the coal's pyritic sulfur with a relatively small loss of the heat content of the coal. This sulfur removal alone will not be sufficient to meet new sulfur dioxide limitations being considered for Paradise, but will nevertheless be a useful and effective part of sulfur control regardless of standards eventually applied.

The need for a viable substitute for other fossil fuels is particularly acute in industries dependent on natural gas, such as fertilizer production. Design work has been started on a \$34 million ammonia-from-coal plant at Muscle Shoals, under TVA's fertilizer development program, to provide about half of the ammonia requirement for the fertilizer installation.

Stack Gas Cleanup—Compliance Progress

TVA is as devoted to maintaining a quality environment in the region as it is to the development of the region's other natural resources. But some technical and financial problems involved in meeting air quality standards for sulfur dioxide have been troublesome. Until interrupted by litigation, TVA and EPA continued an extended series of discussions on the most appropriate ways to bring 10 TVA steam plants into compliance with sulfur dioxide emission limitations (two plants already comply). EPA, Alabama, and Kentucky joined in Federal lawsuits brought by several environmental groups concerning these plants; discussions of TVA's compliance program are taking place within the context of the litigation. Tennessee has approved TVA's plans for sulfur dioxide control at six plants.

In addition to the limestone scrubber placed in operation on Widows Creek unit 8, a scrubber will be built for Widows Creek unit 7 for a total of one million kilowatts of scrubber capacity at that plant alone. Low-sulfur coal will be used at the other Widows Creek units. At the nine remaining steam plants not in compliance, TVA plans to use the most economical combination of methods available to meet the standards applied to each plant, including low- or medium-sulfur coal, coal-washing facilities, and extensive additional pollution control equipment. Additional scrubbers will probably be needed. This need offers the opportunity to demonstrate scrubbing methods and to explore the market potential for scrubber byproducts.

Construction has been underway since 1975 on larger precipitators for three steam plants to accommodate lower-sulfur coal supplies. The cost of these additions is expected to be \$128 million.

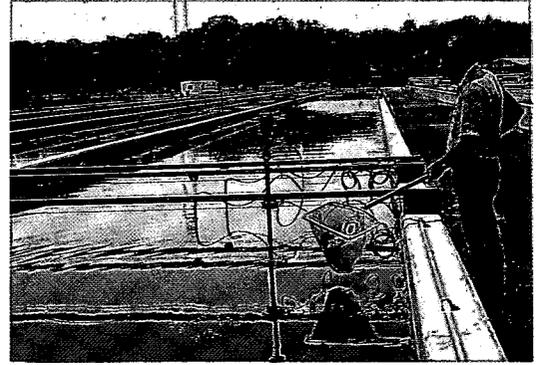
Stack Gas Cleanup—R&D

The \$54 million demonstration scrubber at Widows Creek began operation in early summer and during tests it has scrubbed the entire gas stream from the unit, which has been operating at about 300,000 kilowatts. There have been mechanical difficulties with the scrubber and auxiliary equipment—not unusual with new equipment. Plans call for \$2 million to be spent in research activities involving this facility over the next several years.

Tests on a cocurrent scrubber design (which moves the flue gas and a scrubbing medium in the same direction) validated the design on a small scale at Colbert Steam Plant. If proven out at full scale, the cocurrent scrubber could be built with substantial savings in capital cost, and operation will be easier than with conventional countercurrent scrubbers. The concept will be tested at the 10,000-kilowatt level at Shawnee Steam Plant; the estimated cost of the facility is \$1.6 million, to be funded by EPRI.

TVA is studying and testing various scrubbing processes because plants nationwide face differing economic situations, fuel supplies, market potential for byproducts, and land use problems. TVA plants may be able to use emerging scrubber technology where scrubbing is needed and demonstrate advantages. The double alkali (gypsum byproduct) and the magnesium oxide (sulfuric acid byproduct) processes are particularly interesting. Research and development in other processes is being followed closely.

Improvement of technology in removing sulfur dioxide from flue gases is of critical importance to the Nation's electric systems. Increased coal use is inevitable, but new plants must provide for removing 90 percent of the sulfur dioxide in stack gases. Moreover, existing plants or those to be built in the near future will not be able to take advantage of generating options such as FBC.



The effects of warm water on aquatic life are being studied under controlled conditions at Browns Ferry in cooperation with EPA.

Control of particulates, or fly ash, is a perennial problem at power plants. Both the stringent standards expected for fine particulates and the use of lower-sulfur coals, which aggravate the particulate problem, call for considerable improvement in the techniques of fly ash removal, even though electrostatic precipitators in general use are quite efficient. Based on pilot plant data, design was completed on a \$2 million ionizer system to be installed at Shawnee. The ionizer greatly improves the collection efficiency of existing precipitators, promises to increase removal of the finer particles, and can considerably reduce the capital cost for new precipitators at steam plants. The possibility of using baghouses and larger precipitators for controlling fine particles is also being evaluated. In addition, work continued on determining the role ash particles play overall in air pollution.

During 1977, \$6.3 million was spent on air pollution studies, mostly for scrubber-related research. Of that amount, \$1.7 million came from power proceeds, \$2.1 million was funded by EPRI, and \$2.5 million was funded by EPA.

Many other areas of environmental protection have considerable impact on power system operations and receive appropriate attention, particularly in water quality. For example, progress has been made on processes to control growth of organisms in power plant water lines, such as condenser tubes, without harming river ecology. Work continued on coal pile runoff, ash pond drainage, and other areas.

Solar and Related Technologies

TVA has an active program in demonstrating ways to apply solar energy and is collecting data from solar installations to determine their economy and effectiveness. Use of solar energy taps a virtually unlimited energy resource to the relief of other sources and development of solar use is encouraged.

The most likely near-term use of solar energy is direct application of the sun's heat to space and water heating, and for this reason TVA is accumulating data on the costs, effectiveness, and reliability of those applications. Other developments are continually monitored by TVA researchers including

the more technically sophisticated uses of the sun, such as solar-electric power generation.

Economical and reliable equipment must be available for consumers to begin using solar energy for domestic heating and eventually cooling. Good equipment is now on the market. At present, however, capital costs for installing a solar space and water heating system in a home in the Tennessee Valley tend to discourage general use. TVA is taking part in efforts to make Valley residents familiar with this technology and to make general use of solar heating and water heating easier to accomplish as the economics grow more attractive. Meanwhile, TVA is analyzing the economic aspects of solar energy and seeking ways to improve them. The need to encourage solar use is clear. Regardless of the short-run price disadvantages of installing solar systems, the long-run protection of our exhaustible fuels has a value of its own.

TVA has installed solar energy facilities for test and demonstration purposes, and is participating with others in demonstrating solar installations in the Valley. These demonstrations include primarily water and space heating in offices and other buildings. Participation with ERDA and the University of Tennessee in the operation of a solar house in Knoxville continued. A practical facility continued operation at Norris using solar energy for drying pine cones to extract the seeds. And considerable effort has been devoted to mathematically modeling the load impacts of widespread use of solar space and water heating in the Valley.

Full use of solar and solar-related energy resources, including wind power, ocean thermal gradients, and biomass conversion, will provide a limited but increasing part of the Nation's energy requirements in the years to come. The form solar uses take, however, is highly dependent on geography and regional economics. TVA is helping to develop a base of information that will make optimum use of solar energy possible.

Financial Statements

TENNESSEE VALLEY AUTHORITY: A corporation wholly owned by the United States of America

COOPERS & LYBRAND

CERTIFIED PUBLIC ACCOUNTANTS

IN PRINCIPAL AREAS
OF THE WORLD

To the Board of Directors of
Tennessee Valley Authority:

We have examined the financial statements of TENNESSEE VALLEY AUTHORITY at September 30, 1977 and June 30, 1976 and for the years then ended which appear on pages 23 to 34 herein. Our examinations were made in accordance with generally accepted auditing standards and, accordingly, included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the aforementioned financial statements present fairly:

- (1) the financial position of the Authority at September 30, 1977 and June 30, 1976, and the results of operations and changes in financial position of its several programs for the years then ended; and
- (2) the financial position of the power program of the Authority at September 30, 1977 and June 30, 1976, and the results of operations and changes in financial position of that program for the years then ended,

all in conformity with generally accepted accounting principles applied on a consistent basis.

COOPERS & LYBRAND

New York, November 22, 1977.

Balance Sheets

September 30, 1977 and June 30, 1976 (Note 9)

ASSETS

	Power program		All programs	
	September 1977	June 1976	September 1977	June 1976
	<i>(Thousands)</i>			
Property, Plant, and Equipment				
substantially all at original cost				
Completed plant				
Multipurpose dams; note 1	\$ 494,264	\$ 492,413	\$1,075,850	\$1,070,469
Single-purpose dams	72,809	72,628	72,809	72,628
Steam production plants	2,428,760	2,229,552	2,428,760	2,229,552
Nuclear production plants	853,325	552,357	853,325	552,357
Other electric plant	1,765,136	1,670,031	1,765,136	1,670,031
Other plant	—	—	175,166	185,061
	<u>5,614,294</u>	<u>5,016,981</u>	<u>6,371,046</u>	<u>5,780,098</u>
Less accumulated depreciation and depletion; note 2	1,609,282	1,458,872	1,763,160	1,615,627
Completed plant, net	<u>4,005,012</u>	<u>3,558,109</u>	<u>4,607,886</u>	<u>4,164,471</u>
Construction and investigations in progress; notes 2 and 3	3,280,203	2,470,896	3,449,464	2,588,257
Nuclear fuel	354,164	242,047	354,164	242,047
Less accumulated amortization; note 2	54,614	14,758	54,614	14,758
Nuclear fuel, net	<u>299,550</u>	<u>227,289</u>	<u>299,550</u>	<u>227,289</u>
Total property, plant, and equipment	<u>7,584,765</u>	<u>6,256,294</u>	<u>8,356,900</u>	<u>6,980,017</u>
Current Assets				
Cash	65,170	13,915	143,913	59,600
Accounts receivable	218,581	146,398	226,382	157,324
Inventories, principally at average cost	372,997	377,465	386,281	389,818
Total current assets	<u>656,748</u>	<u>537,778</u>	<u>756,576</u>	<u>606,742</u>
Deferred Charges				
Unamortized debt issue and reacquisition expense; notes 2 and 6	9,905	784	9,905	784
Mine and mill development costs	37,093	8,909	37,093	8,909
Total deferred charges	<u>46,998</u>	<u>9,693</u>	<u>46,998</u>	<u>9,693</u>
Total Assets	<u><u>\$8,288,511</u></u>	<u><u>\$6,803,765</u></u>	<u><u>\$9,160,474</u></u>	<u><u>\$7,596,452</u></u>

The notes on pages 29 through 34 are an integral part of the financial statements.

LIABILITIES

	Power program		All programs	
	September 1977	June 1976	September 1977	June 1976
	<i>(Thousands)</i>			
Proprietary Capital				
Appropriation investment; note 4				
Congressional appropriations	\$1,384,140	\$1,383,644	\$3,017,405	\$2,860,925
Transfers of property from other Federal agencies	23,209	22,529	56,059	55,214
	<u>1,407,349</u>	<u>1,406,173</u>	<u>3,073,464</u>	<u>2,916,139</u>
Less repayments to General Fund of the U.S. Treasury; note 5	455,059	410,059	496,755	451,726
Appropriation investment	<u>952,290</u>	<u>996,114</u>	<u>2,576,709</u>	<u>2,464,413</u>
Requirement for repayment of appropriation investment; note 5	—	20,000*	—	20,000*
Retained earnings reinvested in the power program; page 26	1,072,910	959,403	1,072,910	959,403
Accumulated net expense of nonpower programs; page 27	—	—	794,960*	713,257*
Total proprietary capital	<u>2,025,200</u>	<u>1,935,517</u>	<u>2,854,659</u>	<u>2,690,559</u>
Long-Term Debt				
Principal; note 6	4,725,000	3,575,000	4,725,000	3,575,000
Unamortized discount* and premium, net, note 2	6,918*	7,620*	6,918*	7,620*
Total long-term debt	<u>4,718,082</u>	<u>3,567,380</u>	<u>4,718,082</u>	<u>3,567,380</u>
Current Liabilities				
Short-term debt; note 6				
U.S. Treasury	150,000	150,000	150,000	150,000
Federal Financing Bank	980,000	580,000	980,000	580,000
Long-term debt due July 1, 1976	—	100,000	—	100,000
Short-term debt	<u>1,130,000</u>	<u>830,000</u>	<u>1,130,000</u>	<u>830,000</u>
Accounts payable	292,280	388,455	316,721	409,489
Employees' accrued leave	18,580	15,923	33,087	28,691
Payrolls accrued	15,447	8,166	19,003	12,009
Interest accrued	88,922	58,324	88,922	58,324
Total current liabilities	<u>1,545,229</u>	<u>1,300,868</u>	<u>1,587,733</u>	<u>1,338,513</u>
Commitments; note 3				
Total Liabilities	<u>\$8,288,511</u>	<u>\$6,803,765</u>	<u>\$9,160,474</u>	<u>\$7,596,452</u>

*Deduct

Net Income and Retained Earnings — Power Program

For the Years Ended September 30, 1977 and June 30, 1976 (Note 9)

	September 1977		June 1976	
	kWh	Amount <i>(Thousands)</i>	kWh	Amount
Operating Revenues				
Sales of electric energy; note 2				
Municipalities and cooperatives	76,505,019	\$1,238,326	66,536,938	\$1,057,392
Federal agencies	22,268,048	322,615	21,609,793	300,057
Industries	22,738,679	355,713	19,941,736	303,551
Electric utilities	161,688	2,911	97,131	1,921
Total outside sales	121,673,434	1,919,565	108,185,598	1,662,921
Interdivisional	313,570	5,622	532,853	8,013
Total sales of electric energy	<u>121,987,004</u>	1,925,187	<u>108,718,451</u>	1,670,934
Rents		40,847		20,819
Discounts and penalties		76		53
Other miscellaneous revenues		579		701
Total operating revenues		<u>1,966,689</u>		<u>1,692,507</u>
Operating Expenses				
Production				
Fuel		909,192		731,304
Power purchased and interchanged, net		106,581		219,198
Other		293,429		211,011
Transmission		27,624		24,634
Customer accounts		658		600
Demonstration of power use		2,109		1,373
Administrative and general		59,939		48,620
Payments in lieu of taxes		68,179		48,370
Social security taxes		8,748		6,719
Provision for depreciation		138,398		121,942
Total operating expenses		<u>1,614,857</u>		<u>1,413,771</u>
Operating income		<u>351,832</u>		<u>278,736</u>
Other Income and Deductions				
Interest income		244		65
Other, net		1,625*		340*
Total other income and deductions		<u>1,381*</u>		<u>275*</u>
Income before interest charges		<u>350,451</u>		<u>278,461</u>
Interest Charges				
Interest on long-term debt		336,414		259,735
Other interest expense		41,915		32,096
Allowance for borrowed funds used (construction and nuclear fuel); note 2		178,621*		139,997*
Amortization of long-term debt discount, expense, and premium, net; note 2		928		575
Net interest charges		<u>200,636</u>		<u>152,409</u>
NET INCOME		149,815		126,052
Return on appropriation investment; note 5		<u>64,017</u>		<u>65,056</u>
Increase in retained earnings reinvested		85,798		60,996
Retained earnings reinvested at beginning of period; note 9		987,112		898,407
Retained earnings reinvested at end of period		<u>\$1,072,910</u>		<u>\$ 959,403</u>

*Deduct

The notes on pages 29 through 34 are an integral part of the financial statements.

Net Expense and Accumulated Net Expense — Nonpower Programs

For the Years Ended September 30, 1977 and June 30, 1976 (Note 9)

	<u>September 1977</u>	<u>June 1976</u>
	<i>(Thousands)</i>	
Water Resources Development		
Navigation operations	\$ 7,104	\$ 6,616
Flood control operations	8,021	6,338
Recreation development	3,335	2,864
Regional water quality management	1,226	1,824
Fisheries and waterfowl resources development	789	661
Preliminary surveys and engineering	213	183
Total expense of water resources development	<u>20,688</u>	<u>18,486</u>
Fertilizer Development; note 2		
Research and development	<u>8,870</u>	<u>7,165</u>
Fertilizer introduction		
Fertilizer industry demonstrations	2,648	2,134
Farm test demonstrations outside the Valley	987	856
Net expense of fertilizer introduction	<u>3,635</u>	<u>2,990</u>
Developmental production		
Cost of products distributed	<u>24,061</u>	<u>40,810</u>
General expenses		
Loss on retirements of manufacturing plant and equipment, net	5,650	4,065
Gain on sale of phosphate reserves, net	224*	366*
Writeoff of retired phosphate plant inventories	1,893	—
Administrative and general	555	605
Other	<u>351</u>	<u>1,276</u>
Total general expenses	<u>8,225</u>	<u>5,580</u>
Total production expense	<u>32,286</u>	<u>46,390</u>
Less transfers and sales of products		
Transfers to other TVA programs, at market prices	20,404	34,320
Direct sales	<u>848</u>	<u>1,314</u>
Total transfers and sales	<u>21,252</u>	<u>35,634</u>
Net expense of developmental production	<u>11,034</u>	<u>10,756</u>
Net expense of fertilizer development	<u>23,539</u>	<u>20,911</u>
General Resources Development		
Agricultural projects	1,844	1,612
Waste heat utilization	370	265
Forest and wild land resources development	1,688	1,669
Strip mine reclamation demonstrations	1,410	473
Tributary area development	6,698	3,125
Interagency health services demonstrations	214	168
Regional economic studies	730	710
Townlift community improvement	721	706
Human resources development	940	786
Mass transportation demonstration	499	—
Minerals resources projects	276	302
Environmental quality projects	<u>456</u>	<u>461</u>
Net expense of general resources development	<u>15,846</u>	<u>10,277</u>
Land Between The Lakes Operations	<u>4,251</u>	<u>2,839</u>
Valley Mapping and Remote Sensing	<u>557</u>	<u>547</u>
Other Expense, Net	<u>521</u>	<u>964</u>
NET EXPENSE	65,402	54,024
Accumulated net expense at beginning of period; Note 9	<u>729,558</u>	<u>659,233</u>
Accumulated net expense at end of period	<u>\$794,960</u>	<u>\$713,257</u>

*Deduct

The notes on pages 29 through 34 are an integral part of the financial statements.

Changes in Financial Position

For the Years Ended September 30, 1977 and June 30, 1976 (Note 9)

	Power program		All programs	
	September 1977	June 1976	September 1977	June 1976
	(Thousands)			
Source of Funds				
Program sources				
Net power income; page 26	\$ 149,815	\$ 126,052	\$ 149,815	\$ 126,052
Add items not requiring funds; note a	5,555*	16,404*	5,555*	16,404*
Funds from power operations	144,260	109,648	144,260	109,648
Sale of power facilities	1,290	2,197	1,290	2,197
Funds from power program; note b	145,550	111,845	145,550	111,845
Net expense of nonpower programs; page 27			65,402*	54,024*
Add items not requiring funds; note a			13,145	11,900
Funds used in nonpower operations			52,257*	42,124*
Sale of nonpower facilities			899	895
Funds used in nonpower programs			51,358*	41,229*
Debt sources				
Long-term bonds				
Issues	900,000	800,000	900,000	800,000
Redemptions	150,000*	—	150,000*	—
Short-term notes				
Issues	3,815,000	2,495,000	3,815,000	2,495,000
Redemptions	3,570,000*	2,550,000*	3,570,000*	2,550,000*
Total debt sources	995,000	745,000	995,000	745,000
Other sources				
Congressional appropriations	204	298	125,930	100,025
Property transfers	621	260	744	347
Total other sources	825	558	126,674	100,372
Total source of funds	\$1,141,375	\$ 857,403	\$1,215,866	\$ 915,988
Disposition of Funds				
Expended for plant and equipment, excluding allowance for borrowed funds used	\$1,108,767	\$ 925,500	\$1,161,692	\$ 986,285
Less:				
Depreciation and amortization of nuclear fuel charged to construction and clearing accounts	10,407	2,447	12,370	4,516
Cost of removing retired facilities and salvage from retained materials	895*	764*	965*	918*
	1,099,255	923,817	1,150,287	982,687
Payments to U.S. Treasury; note 5				
Return on appropriation investment	64,017	—	64,017	—
Repayment of appropriation investment	20,000	—	20,029	13
	84,017	—	84,046	13
Requirement for payments to U.S. Treasury; note 5				
Return on appropriation investment	—	65,056	—	65,056
Repayment of appropriation investment	—	20,000	—	20,000
	—	85,056	—	85,056
Unamortized debt discount and expense and other deferred charges				
Mine and mill development cost	25,074	7,216	25,074	7,216
Debt issue and reacquisition expense	9,468	16	9,468	16
	34,542	7,232	34,542	7,232
Changes in working capital (increase or decrease*)				
Cash	92,268*	139,686*	62,711*	135,333*
Accounts receivable	53,792	16,879	47,990	19,662
Inventories	14,930	104,226	17,740	100,741
	23,546*	18,581*	3,019	14,930*
Less other current liabilities (excluding short-term debt)	52,893	140,121	56,028	144,070
	76,439*	158,702*	53,009*	159,000*
Total disposition of funds	\$1,141,375	\$ 857,403	\$1,215,866	\$ 915,988

*Deduct

The notes on pages 29 through 34 are an integral part of the financial statements.

Notes to Changes in Financial Position

a. Items not requiring funds:

	Power		Nonpower	
	September 1977	June 1976	September 1977	June 1976
			<i>(Thousands)</i>	
Provision for depreciation	\$138,398	\$121,942	\$ 7,719	\$ 8,194
Provision for depletion	184	231	—	7
Amortization of nuclear fuel charged to operations	31,931	—	—	—
Net loss on retirements and disposals of property, plant, and equipment	1,625	340	5,426	3,699
Amortization of long-term debt discount, premium, and expense; and deferred charges	928	1,080	—	—
Allowance for borrowed funds used (construction and nuclear fuel)	178,621*	139,997*	—	—
	<u>\$ 5,555*</u>	<u>\$ 16,404*</u>	<u>\$ 13,145</u>	<u>\$ 11,900</u>

b. Net power proceeds (see note 6) may be derived as follows:

	Year ended	
	September 1977	June 1976
	<i>(Thousands)</i>	
Funds from power program	\$145,550	\$111,845
Add back interest charges	378,329	291,831
Net power proceeds	<u>\$523,879</u>	<u>\$403,676</u>

*Deduct

The notes on pages 29 through 34 are an integral part of the financial statements.

Notes to Financial Statements

1. Allocation of cost of multipurpose projects—Section 14 of the TVA Act requires TVA's Board of Directors to allocate the cost of completed multipurpose projects, subject to the approval of the President of the United States. The cost of facilities installed exclusively for a single purpose is assigned directly to that purpose; the cost of multiple-use facilities is allocated among the various purposes served.

The total investment of \$1,075,850,000 in completed multipurpose dams at September 30, 1977, is classified as follows:

	Investment		Total
	Direct	Multiple-use (Thousands)	
Power	\$316,762	\$177,502	\$ 494,264
Navigation	152,422	137,488	289,910
Flood control	61,847	144,856	206,703
Recreation	1,318	41,195	42,513
Tributary area development	19	42,441	42,460
Total	<u>\$532,368</u>	<u>\$543,482</u>	<u>\$1,075,850</u>

2. Summary of significant accounting policies—Power accounts are kept in accordance with the uniform system prescribed for electric utilities by the Federal Power Commission.

Plant additions and retirements—Additions to plant are recorded at cost, which includes material, labor, overhead, and allowance for funds used. The costs of generation including amortization of nuclear fuel, less credit for the fair value of energy generated during preliminary operations prior to commercial acceptance, are also included

Notes to Financial Statements, continued

in the recorded cost of steam and nuclear generating plants. Except for chemical plant, plant retirements (including original cost and removal cost less salvage) are charged against appropriate accumulated depreciation accounts. Because of the experimental nature of fertilizer development, losses on early retirement of chemical plant are included in current year operations.

Depreciation and depletion—Straight-line depreciation is provided for substantially on composite basis. Rates of depreciation are derived from engineering studies of useful life and are reviewed each year. Depletion of coal land and land rights and phosphate land and mineral rights is provided on a unit of production basis.

Allowance for funds used—The practice of capitalizing an allowance for funds used during construction and during the fabrication of nuclear fuels is followed in the power program. Beginning in July 1976 the method of calculating the amount charged to construction was changed. Previously a rate was established at the beginning of each six-month period on the basis of the cost of borrowings during the preceding twelve months. The current method is to capitalize each month the interest on the most recent debt issues that are equivalent to the average construction work in progress and nuclear fuel in fabrication base. Under the previous method the rates for the two six-month periods during the 1977 fiscal year would have been 7 percent and 6.5 percent, respectively, and the amount of interest capitalized would have been \$170,336,000. The actual amount capitalized was \$178,621,000 and the equivalent monthly rates ranged from a high of 7.34 percent to a low of 6.68 percent.

Repairs and maintenance—The cost of current repairs and minor replacements is charged to appropriate operating expense and clearing accounts, and the cost of renewals and betterments is capitalized.

Nuclear fuel amortization—The amortization of nuclear fuel is provided on a unit of production basis. Rates are established to amortize the costs over the useful life.

Operating revenues and energy costs—Revenues from the sale of electric energy, including amounts resulting from the application of an adjustment addendum providing for monthly billing charges to reflect increases or decreases in fuel and purchased power costs, are recorded only when billed. Costs of fuel consumed and of purchased power are reflected in operating expenses as incurred. About \$112.7 million of these costs recorded in fiscal year 1976 were used in calculating the adjustment to power billings for July and August 1976; and about \$49.7 million of these costs recorded in fiscal year 1977 were used in calculating the adjustment to power billings for October and November 1977.

Borrowing expenses—Issue and reacquisition expenses, discounts, and premiums on power borrowings from the public are amortized on a straight-line basis over the term of the related securities. Issue expenses on power borrowings from Federal Financing Bank are amortized over a five year period except that amounts under \$6,000 are expensed.

Research and development—Research and development costs are expensed as incurred (approximately \$25,224,000 in 1977 and \$18,738,000 in 1976) except for those costs which relate to specific power program capital projects.

Sales of fertilizer—Sales of fertilizer materials are not made on a commercial basis, but are made to organizations collaborating in an experimental and educational program aimed at improving the manufacture, distribution, and use of fertilizers.

3. Construction projects, commitments, and rental expenses—The construction budgets for fiscal year 1978 are \$1,664,515,000 for power projects and \$76,304,000 for multipurpose and nonpower projects. Substantial commitments have been incurred for these projects.

The total rentals charged to power operating expenses and other operating clearing accounts for the years ending September 30, 1977, and June 30, 1976, amounted to approximately \$17,990,000 and \$13,843,000, respectively. At September 30, 1977, the aggregate minimum gross rental commitments of TVA under all noncancelable leases for the periods shown are as follows:

<u>Year</u>	<u>Amount</u> (Thousands)	<u>Years</u>	<u>Amount</u> (Thousands)
1978	\$13,078	1983-87	\$34,386
1979	12,868	1988-92	15,697
1980	12,673	1993-97	11,297
1981	11,545	Thereafter	288
1982	11,041		

Notes to Financial Statements, continued

Minimum gross rental commitments include rentals paid under agreements with the City of Memphis, Tennessee, which provide that (1) TVA sells to the City all the power and energy requirements of its electric distribution system, and (2) the City leases to TVA the Thomas H. Allen steam-electric generating plant with an installed capacity of 990,000 kilowatts. Each agreement is for a term of 20 years, beginning January 1, 1965. The lease agreement provides for annual rental payments of \$6,900,000 and grants TVA an option to buy the plant for \$2,000,000 at the end of the lease term.

4. Appropriation investment—Changes in appropriation investment during the years ended September 30, 1977, and June 30, 1976, were as follows:

	Power program		All programs	
	September 1977	June 1976	September 1977	June 1976
	(Thousands)			
Congressional appropriations, net	\$ 394	\$ 54	\$ 125,930	\$ 100,025
Transfers of property from other Federal agencies	<u>621</u>	<u>260</u>	<u>744</u>	<u>347</u>
	1,015	314	126,674	100,372
Less repayments to General Fund of the U.S. Treasury	<u>20,000</u>	<u>—</u>	<u>20,029</u>	<u>13</u>
Increase or decrease* for the period	18,985*	314	106,645	100,359
Balance, beginning of period	<u>971,275</u>	<u>995,800</u>	<u>2,470,064</u>	<u>2,364,054</u>
Balance, end of period	<u><u>\$952,290</u></u>	<u><u>\$996,114</u></u>	<u><u>\$2,576,709</u></u>	<u><u>\$2,464,413</u></u>

* Deduct

During the transition quarter, TVA received \$30,651,000 in Congressional appropriations and property transfers, including \$161,000 applicable to the power program, and made repayments to the U.S. Treasury required of the power program of \$25,000,000 resulting in a net increase of \$5,651,000 in all programs appropriation investment and a net decrease in power program appropriation investment of \$24,839,000.

An appropriation of \$138,510,000 was made by Public Law 95-96, approved August 7, 1977, for the fiscal year beginning October 1, 1977.

5. Payments to the U.S. Treasury—Section 15d of the TVA Act requires the payment from net power proceeds of a return on the net appropriation investment in power facilities plus repayments of such investment, beginning with fiscal year 1961. The amount of return payable during each year is based on the appropriation investment as of the beginning of that year and the computed average interest rate payable by the U.S. Treasury on its total marketable public obligations as of the same date. The repayment schedule calls for payment of not less than \$10 million for each of the first five years (1961-1965), \$15 million for each of the next five years (1966-1970), and \$20 million for each year thereafter until a total of \$1 billion shall have been repaid. The payments required by Section 15d may be deferred under certain circumstances for not more than two years.

Required payments have been made as follows:

	Return	Repayment (Thousands)	Total
Total to September 30, 1976	\$839,171	\$250,000	\$1,089,171
Year ended September 30, 1977	<u>64,017</u>	<u>20,000</u>	<u>84,017</u>
	<u><u>\$903,188</u></u>	<u><u>\$270,000</u></u>	<u><u>\$1,173,188</u></u>

Due to the change in the required payment date, \$65,056,000 for the return on the appropriation investment and \$20,000,000 for the repayment for fiscal year 1976 was accrued at that date but not paid until September 30, 1976.

Notes to Financial Statements, continued

For fiscal year 1978 the required payments will be \$61,716,000 as a return on the appropriation investment at the computed average interest rate of 6.4808 percent and \$20,000,000 as a repayment, a total of \$81,716,000.

In addition to the payments from net power proceeds, \$29,000 of nonpower proceeds was paid to the U.S. Treasury in fiscal year 1977 under the provisions of Section 26 of the TVA Act. This brought the total payments from nonpower proceeds to \$41,696,000.

Prior to 1961, under then existing legislation, TVA paid to the Treasury \$185,059,000 of power proceeds. In addition to the repayments indicated in Exhibit I, \$65,072,000 of bonds sold to the Treasury and Reconstruction Finance Corporation in fiscal years 1939-1941 have been fully repaid from power proceeds. Section 26 of the TVA Act provides for annual payments to the Treasury of any power or nonpower proceeds not needed for the operation of dams and reservoirs, the conduct of the power program, and the manufacture and distribution of fertilizers.

6. Borrowing authority—Section 15d of the TVA Act authorizes TVA to issue bonds, notes, and other evidences of indebtedness up to a total of \$15 billion outstanding at any one time to assist in financing its power program. Debt service on these obligations, which is payable solely from TVA's net power proceeds, has precedence over the payment to the U.S. Treasury described in note 5. Issues outstanding on September 30, 1977, consisted of the following:

	(Thousands)
Long-term debt	
4.40% 1960 Series A, due November 15, 1985	\$ 50,000
4-5/8% 1961 Series A, due July 1, 1986	50,000
4-1/2% 1962 Series A, due February 1, 1987	45,000
5.70% 1967 Series A, due May 15, 1992	70,000
6-3/8% 1967 Series B, due November 1, 1992	60,000
8-1/4% 1969 Series B, due October 15, 1994	100,000
7.30% 1971 Series B, due October 1, 1996	150,000
7% 1972 Series A, due January 1, 1997	150,000
7.35% 1972 Series B, due May 1, 1997	150,000
7.35% 1972 Series C, due July 1, 1997	150,000
7.40% 1972 Series D, due October 1, 1997	150,000
7.35% 1973 Series A, due January 1, 1998	100,000
7.35% 1973 Series B, due April 1, 1998	150,000
7-3/4% 1973 Series C, due July 1, 1998	150,000
7.70% 1973 Series D, due October 1, 1998	100,000
8.05% 1974 Series A, due January 1, 1999	100,000
8.10% 1974 Series B, due April 1, 1979	100,000
8.50% 1974 Series C, due October 31, 1979 (FFB)	300,000
8.05% 1975 Series A, due January 31, 1990 (FFB)	200,000
8.70% 1975 Series B, due March 31, 2000 (FFB)	100,000
8.35% 1975 Series C, due May 31, 1988 (FFB)	200,000
8.47% 1975 Series D, due July 31, 2000 (FFB)	200,000
8.485% 1975 Series E, due October 31, 2000 (FFB)	300,000
8.175% 1976 Series A, due February 28, 2001 (FFB)	300,000
7.97% 1976 Series B, due November 30, 2001 (FFB)	400,000#
7.625% 1976 Series C, due January 31, 2002 (FFB)	200,000##
7.975% 1977 Series A, due February 28, 2002 (FFB)	300,000##
7.935% 1977 Series B, due May 31, 2002 (FFB)	400,000##
Total long-term debt	4,725,000
Short-term debt	
U.S. Treasury	150,000
Federal Financing Bank (FFB)	980,000
Total short-term debt	1,130,000
	\$5,855,000

Issued during transition quarter

Issued during fiscal year 1977

Notes to Financial Statements, continued

In December 1976, \$100,000,000 of 9 percent bonds and \$50,000,000 of 9-1/4 percent bonds, both issues due in 1995, were redeemed. The resulting call premium of \$9,450,000 is being amortized over the remaining lives of the refunded issues.

An additional bond issue, eight percent 1977 Series C, due October 31, 2002, in the amount of \$400,000,000 was sold to the Federal Financing Bank in October 1977.

7. Retirement plan—TVA has a contributory retirement plan which covers substantially all of its salaried employees. The cost of currently accruing benefits is funded currently. The cost of the plan to TVA was \$30,426,000 in fiscal year 1977 and \$24,892,000 in fiscal year 1976, including amortization of unfunded prior service costs over a period of 29 and 30 years, respectively. The total pension fund assets as of September 30, 1976, the latest actuarial valuation date, exceeded the actuarially computed value of vested benefits of the plan, which were calculated on the basis of an eight percent interest factor which is considered representative of current market conditions.

8. Litigation—On October 20, 1975, TVA filed suit against Westinghouse Electric Corporation in the United States District Court for the Eastern District of Tennessee. The suit arises from Westinghouse's repudiating in major part certain contracts for the sale of nuclear fuel to TVA for the Sequoyah and Watts Bar Nuclear Plants. Westinghouse bases its repudiation on the doctrine of "commercial impracticability" found in Uniform Commercial Code § 2-615. TVA brought the action seeking, in addition to injunctive relief, a declaratory judgment as to the continuing validity, effectiveness, and enforceability of these contracts; in the alternative the action requests the court to adopt an allocation for the nuclear fuel presently under Westinghouse's control which is fair and reasonable to all Westinghouse customers as of September 8, 1975, the date of the repudiation. The case was transferred and consolidated for discovery with similar cases brought by other utilities to the Eastern District of Virginia under 28 U.S.C. § 1407. Trial of the case began on September 12, 1977.

A class action suit, filed in state court on April 4, 1975, and removed to the United States District Court for the Middle District of Tennessee, challenged as illegal and unconstitutional TVA's method of implementing that portion of its January 1, 1975, adjustment addendum covering changes in TVA's costs of fuel and purchased power. Plaintiff contended that proration of the monthly amounts is required. On August 13, 1976, the court entered summary judgment on defendants' motion dissolving an injunction previously issued by the state court and dismissing the action. The court's opinion upholds the constitutionality of and the statutory authority for the adjustment addendum procedure and finds it to be "a pragmatic, logical, and economically justified method" of complying with the mandates of the TVA Act. This decision has been appealed by the plaintiff.

Suit was filed on February 18, 1976, in the United States District Court for the Eastern District of Tennessee by three individuals and two organizations to enjoin further construction of the Tellico Dam project on the grounds that the reservoir clearing and impoundment of the lower Little Tennessee River were illegal and in violation of the Endangered Species Act of 1973, in that these activities would modify or destroy the habitat of the snail darter or otherwise jeopardize the continued existence of this fish, which was listed as an endangered species effective November 9, 1975. A preliminary injunction was denied, and, after the trial on the merits, the action was dismissed. The district court upheld TVA's position that the Endangered Species Act did not prevent completion of the Tellico project, which was about 75 percent completed at the time the fish was listed as endangered. Plaintiffs appealed to the United States Court of Appeals for the Sixth Circuit. On January 31, 1977, the appeals court reversed the trial court's decision and ordered an injunction halting all activities incident to the Tellico project which may destroy or modify the critical habitat of the snail darter. On May 1, 1977, TVA and the Solicitor General joined in a petition to the Supreme Court to review the decision of the Sixth Circuit. The Supreme Court granted TVA's petition for writ of certiorari on November 14, 1977.

On April 20, 1976, a suit was filed in the United States District Court for the Middle District of Tennessee seeking to enjoin TVA from carrying out, at the site of its Hartsville Nuclear Plant on the Cumberland River, activities which were authorized by the Nuclear Regulatory Commission and seeking a declaratory judgment that construction of the plant outside the Tennessee River watershed is illegal. On January 11, 1977, the court granted TVA's motion to dismiss, holding that TVA is not limited to sites on the Tennessee River and its tributaries in the selection of locations for its power plants. Plaintiffs' appeal to the United States Court of Appeals for the Sixth Circuit is now pending.

In June 1977, six suits were filed against TVA in six different district courts under the Clean Air Act, alleging that the sulfur dioxide emissions from ten of TVA's coal-fired steam plants and the particulate emissions from one unit at TVA's Widows Creek Steam Plant violate the emission standards set by the states. Five of the cases have been consolidated in the United States District Court for the Middle District of Tennessee and one is pending in the United States District Court for the Northern District of Alabama. Plaintiffs are asking that the courts order TVA to comply with the applicable emission standards as expeditiously as possible. In addition, the State of Alabama is specifically asking the court to restrict operation of Widows Creek and Colbert Steam Plants until final compliance is

Notes to Financial Statements, continued

achieved and seeking a penalty of \$10,000 per day for each day the Widows Creek and Colbert units have operated in violation of the Clean Air Act and the Alabama air pollution standards. TVA has asked the courts to find that its present compliance schedules are the most expeditious possible, and to determine that the State of Alabama is not entitled to a penalty against TVA.

A class action suit on behalf of approximately 250 TVA nuclear operators was filed on March 17, 1977, in the United States District Court for the Northern District of Alabama. The nuclear operators alleged that they were being deprived of from \$1,000 to \$4,000 per year in wages by TVA's and their union's alleged erroneous application of Section 3 of the TVA Act, which requires payment of not less than the prevailing rate of wages for work of a similar nature prevailing in the vicinity. It is TVA's position that under section 3 of the TVA Act the court is without jurisdiction of this complaint, since exclusive jurisdiction over this issue is with the Secretary of Labor whose determination is final. TVA has moved to dismiss the case.

9. Change in fiscal year—The United States Government has changed its fiscal year from a period of July 1 to June 30 to a period of October 1 to September 30. The condensed results of operations of the Power and Nonpower programs for the transition quarter from July 1, 1976, to September 30, 1976, are as follows:

Power Program	(Thousands)
Operating revenues	<u>\$483,110</u>
Operating income	<u>\$ 87,217</u>
Net income	\$ 44,043
Return on appropriation investment	16,334
Increase in retained earnings reinvested	<u>27,709</u>
Retained earnings reinvested, June 30, 1976.	<u>959,403</u>
Retained earnings reinvested, September 30, 1976.	<u>\$987,112</u>
Nonpower Programs Net Expense	
Water resources development	\$ 5,525
Fertilizer development	4,369
General resources development	5,043
Other	1,364
Net expense	<u>16,301</u>
Accumulated net expense, June 30, 1976	<u>713,257</u>
Accumulated net expense, September 30, 1976	<u>\$729,558</u>

Operating Statistics

TENNESSEE VALLEY AUTHORITY: A corporation wholly owned by the United States of America

Power Earnings

(Millions)

OPERATING REVENUES	<u>1977</u>	July-Sept <u>1976</u>	<u>1976</u>	<u>1975</u>	<u>1974</u>
Sales of electric energy					
Municipalities and cooperatives	\$1,238.3	\$295.9	\$1,057.4	\$ 737.2	\$556.1
Federal agencies	322.6	84.2	300.1	182.5	121.5
Industries	355.7	95.5	303.6	227.6	179.8
Electric utilities	2.9	.4	1.9	1.6	1.2
Interdivisional	5.6	1.4	8.0	6.7	5.0
Total sales of electric energy	<u>1,925.1</u>	<u>477.4</u>	<u>1,671.0</u>	<u>1,155.6</u>	<u>863.6</u>
Rents and other miscellaneous revenues	41.6	5.7	21.5	20.7	20.0
Total operating revenues	<u>1,966.7</u>	<u>483.1</u>	<u>1,692.5</u>	<u>1,176.3</u>	<u>883.6</u>
OPERATING EXPENSES					
Production	1,309.2	323.3	1,161.5	750.8	494.2
Transmission	27.6	6.3	24.6	22.2	20.8
Customer accounts	.7	.2	.6	.5	.5
Demonstration of power use	2.1	.4	1.4	1.3	1.3
Administrative and general	60.0	12.7	48.6	34.0	29.9
Payments in lieu of taxes	68.2	19.6	48.4	36.8	31.1
Social security taxes	8.7	1.8	6.7	5.2	4.6
Depreciation	138.4	31.6	122.0	110.3	97.1
Other	—	—	—	—	—
Total operating expenses	<u>1,614.9</u>	<u>395.9</u>	<u>1,413.8</u>	<u>961.1</u>	<u>679.5</u>
Operating income	351.8	87.2	278.7	215.2	204.1
Other Income and Deductions (see note)	<u>1.4*</u>	<u>.1*</u>	<u>.3*</u>	<u>.2*</u>	<u>.4</u>
Income before interest charges and extraordinary item	350.4	87.1	278.4	215.0	204.5
Interest Charges (see note)	<u>200.6</u>	<u>43.1</u>	<u>152.4</u>	<u>111.6</u>	<u>98.4</u>
Income before extraordinary item	149.8	44.0	126.0	103.4	106.1
Extraordinary Item	—	—	—	—	—
Net Income	<u>\$ 149.8</u>	<u>\$ 44.0</u>	<u>\$ 126.0</u>	<u>\$ 103.4</u>	<u>\$106.1</u>
NET POWER PROCEEDS FROM OPERATIONS					
Income before interest charges and extraordinary item	\$ 350.4	\$126.9	\$ 278.4	\$ 215.0	\$204.5
Add back noncash items (see note)	172.2	7.5*	123.1	117.9	97.1
Total	<u>\$ 522.6</u>	<u>\$119.4</u>	<u>\$ 401.5</u>	<u>\$ 332.9</u>	<u>\$301.6</u>

*Deduct

NOTE: Amounts on these lines from prior periods have been recast to reflect current practice arising from changes in the FPC Uniform System of Accounts effective in January 1977.

Fiscal Years

<u>1973</u>	<u>1972</u>	<u>1971</u>	<u>1970</u>	<u>1969</u>	<u>1968</u>	<u>1967</u>	<u>1966</u>	<u>1965</u>	<u>1964</u>
\$476.3	\$415.3	\$379.2	\$285.5	\$222.2	\$197.2	\$172.0	\$158.2	\$136.8	\$118.2
103.2	73.3	61.9	59.4	63.6	78.9	83.9	84.0	82.4	100.7
144.7	124.3	125.0	106.0	92.2	84.2	79.6	71.5	67.1	59.7
.8	6.3	10.1	7.6	7.3	8.6	10.1	7.9	4.8	3.1
4.0	3.4	3.1	3.0	2.8	2.7	3.1	3.0	3.0	2.8
<u>729.0</u>	<u>622.6</u>	<u>579.3</u>	<u>461.5</u>	<u>388.1</u>	<u>371.6</u>	<u>348.7</u>	<u>324.6</u>	<u>294.1</u>	<u>284.5</u>
20.3	19.2	18.7	18.1	15.2	12.1	2.4	2.2	1.9	1.9
<u>749.3</u>	<u>641.8</u>	<u>598.0</u>	<u>479.6</u>	<u>403.3</u>	<u>383.7</u>	<u>351.1</u>	<u>326.8</u>	<u>296.0</u>	<u>286.4</u>
408.7	325.6	306.1	246.1	210.3	191.1	187.8	170.4	139.9	134.3
18.9	17.8	16.9	15.1	14.3	13.9	12.9	12.4	12.2	12.0
.5	.4	.4	.3	.3	.2	.2	.2	.2	.3
1.3	1.2	1.2	1.1	1.0	1.0	.9	.8	.8	.8
27.4	24.0	22.0	18.0	15.6	14.4	13.3	12.1	11.5	10.9
27.3	25.7	20.0	16.1	14.5	13.1	11.9	10.5	9.1	8.2
3.8	3.2	2.9	2.4	2.2	1.8	1.7	1.2	1.0	1.0
89.5	83.4	80.0	75.1	71.6	70.7	65.7	62.6	59.1	56.8
—	—	—	—	—	—	—	—	—	—
<u>577.4</u>	<u>481.3</u>	<u>449.5</u>	<u>374.2</u>	<u>329.8</u>	<u>306.2</u>	<u>294.4</u>	<u>270.2</u>	<u>233.8</u>	<u>224.3</u>
171.9	160.5	148.5	105.4	73.5	77.5	56.7	56.6	62.2	62.1
.4	.1*	.1	—	—	—	—	—	—	—
172.3	160.4	148.6	105.4	73.5	77.5	56.7	56.6	62.2	62.1
65.9	48.3	29.6	30.8	22.8	18.4	16.0	8.7	7.2	3.9
<u>106.4</u>	<u>112.1</u>	<u>119.0</u>	<u>74.6</u>	<u>50.7</u>	<u>59.1</u>	<u>40.7</u>	<u>47.9</u>	<u>55.0</u>	<u>58.2</u>
—	—	—	—	—	\$ 10.3*	—	—	—	—
<u>\$106.4</u>	<u>\$112.1</u>	<u>\$119.0</u>	<u>\$74.6</u>	<u>\$ 50.7</u>	<u>\$ 48.8</u>	<u>\$ 40.7</u>	<u>\$ 47.9</u>	<u>\$ 55.0</u>	<u>\$ 58.2</u>
\$172.3	\$160.4	\$148.6	\$105.4	\$ 73.5	\$ 77.5	\$ 56.7	\$ 56.6	\$ 62.2	\$ 62.1
89.4	83.8	140.0	75.1	71.6	70.7	65.7	62.6	59.1	56.8
<u>\$261.7</u>	<u>\$244.2</u>	<u>\$228.6</u>	<u>\$180.5</u>	<u>\$145.1</u>	<u>\$148.2</u>	<u>\$122.4</u>	<u>\$119.2</u>	<u>\$121.3</u>	<u>\$118.9</u>

Net Power Assets

(Millions)

NET ASSETS	At September 30				
	1977	1976	1975	1974	1973
Completed plant	\$5,614.3	\$5,017.0	\$4,778.6	\$4,061.9	\$3,820.5
Less accumulated depreciation	<u>1,609.3</u>	<u>1,458.9</u>	<u>1,344.4</u>	<u>1,242.4</u>	<u>1,156.2</u>
Net completed plant	4,005.0	3,558.1	3,434.2	2,819.5	2,664.3
Construction in progress	3,280.2	2,470.9	1,714.2	1,552.0	1,318.6
Nuclear fuel	299.6	227.3	169.0	129.9	93.1
Inventories	373.0	377.4	273.2	128.7	140.8
Other current assets less other current liabilities	131.5*	290.6*	47.6*	22.6	17.4*
Deferred charges, net	<u>53.9</u>	<u>17.3</u>	<u>11.2</u>	<u>23.9</u>	<u>15.0</u>
Total	<u>\$7,880.2</u>	<u>\$6,360.4</u>	<u>\$5,554.2</u>	<u>\$4,676.6</u>	<u>\$4,214.4</u>
DERIVED FROM					
U.S. Treasury funds, gross	\$1,472.5	\$1,471.1	\$1,470.9	\$1,470.3	\$1,469.9
Less Treasury funds repaid	<u>520.2</u>	<u>475.1</u>	<u>475.1</u>	<u>455.1</u>	<u>435.1</u>
Net U.S. Treasury funds	952.3	996.0	995.8	1,015.2	1,034.8
Long-term debt	4,725.0	3,575.0	2,875.0	2,125.0	1,775.0
Short-term notes payable to U.S. Treasury	150.0	150.0	150.0	100.0	100.0
Short-term debt payable to others	980.0	680.0	635.0	570.0	480.0
Advances and contributions	—	—	—	—	.9
Retained earnings	<u>1,072.9</u>	<u>959.4</u>	<u>898.4</u>	<u>866.4</u>	<u>823.7</u>
Total	<u>\$7,880.2</u>	<u>\$6,360.4</u>	<u>\$5,554.2</u>	<u>\$4,676.6</u>	<u>\$4,214.4</u>

Note: In all years, the amounts for "U.S. Treasury funds, gross" include the full \$65.1 million of bonds issued by TVA to the Treasury and to the RFC, and the amounts for "Less Treasury funds repaid" include the amounts redeemed. All of these bonds were redeemed by June 30, 1956.

*Deduct

At June 30

1972	1971	1970	1969	1968	1967	1966	1965	1964
\$3,404.4	\$3,317.9	\$3,202.9	\$2,977.3	\$2,900.7	\$2,792.5	\$2,602.6	\$2,466.8	\$2,335.2
1,075.4	998.0	924.5	856.0	789.3	727.2	671.9	614.3	563.8
<u>2,329.0</u>	<u>2,319.9</u>	<u>2,278.4</u>	<u>2,121.3</u>	<u>2,111.4</u>	<u>2,065.3</u>	<u>1,930.7</u>	<u>1,852.5</u>	<u>1,771.4</u>
1,294.3	822.4	481.9	386.4	216.3	150.0	203.5	220.6	259.0
63.9	41.5	24.8	13.2	—	—	—	—	—
109.3	83.1	37.5	44.2	51.5	44.9	32.4	39.1	33.3
26.3*	34.9*	16.6	2.2	3.6	23.8	7.3	8.4	5*
11.5	10.0	6.8	6.9	5.1	3.3	2.5	1.4	1.1
<u>\$3,781.7</u>	<u>\$3,242.0</u>	<u>\$2,846.0</u>	<u>\$2,574.2</u>	<u>\$2,387.9</u>	<u>\$2,287.3</u>	<u>\$2,176.4</u>	<u>\$2,122.0</u>	<u>\$2,064.3</u>

\$1,470.0	\$1,466.4	\$1,463.5	\$1,462.0	\$1,461.0	\$1,455.2	\$1,455.1	\$1,454.7	\$1,454.4
415.2	395.2	375.2	360.1	345.1	330.1	315.1	300.1	290.1
<u>1,054.8</u>	<u>1,071.2</u>	<u>1,088.3</u>	<u>1,101.9</u>	<u>1,115.9</u>	<u>1,125.1</u>	<u>1,140.0</u>	<u>1,154.6</u>	<u>1,164.3</u>
1,225.0	675.0	675.0	375.0	275.0	215.0	145.0	145.0	145.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.0	85.0
630.0	680.3	321.0	352.7	250.0	202.2	140.0	80.0	35.0
.9	.8	.8	.7	.7	.7	.7	.7	.6
771.0	714.7	660.9	643.9	646.3	644.3	650.7	646.7	634.4
<u>\$3,781.7</u>	<u>\$3,242.0</u>	<u>\$2,846.0</u>	<u>\$2,574.2</u>	<u>\$2,387.9</u>	<u>\$2,287.3</u>	<u>\$2,176.4</u>	<u>\$2,122.0</u>	<u>\$2,064.3</u>

System Input, System Output

(Millions of kilowatthours)

SYSTEM INPUT	1977	July-Sept 1976	1976	1975	1974
System generation					
Hydro					
TVA plants	14,318.0	3,744.6	14,606.8	17,176.0	17,485.3
ALCOA plants	1,949.4	609.7	2,048.3	2,393.4	2,408.0
Cumberland plants	1,929.7	296.3	2,541.7	3,380.7	3,643.0
Total hydro	<u>18,197.1</u>	<u>4,650.6</u>	<u>19,196.8</u>	<u>22,950.1</u>	<u>23,536.3</u>
TVA coal-fired plants	82,493.1	23,572.4	81,764.8	71,699.4	84,084.1
TVA nuclear plants	20,003.2	242.2	(100.1)	7,429.0	1,947.6
Combustion turbine plants	2,111.9	344.4	1,119.9	506.8	291.7
Total net generation	<u>122,805.2</u>	<u>28,809.6</u>	<u>101,981.4</u>	<u>102,585.3</u>	<u>109,859.7</u>
Purchased	601.8	1,310.0	4,952.3	5,276.4	1,046.7
Interchange received	10,949.8	1,204.2	11,373.7	8,150.0	8,520.9
Total input	<u>134,356.9</u>	<u>31,323.8</u>	<u>118,307.4</u>	<u>116,011.7</u>	<u>119,427.3</u>
SYSTEM OUTPUT					
Sales					
Municipalities and cooperatives	76,505.0	17,002.4	66,536.9	64,468.1	64,182.5
Federal agencies	22,268.0	5,482.7	21,609.8	19,389.3	17,388.1
Industries	22,738.7	5,689.1	19,941.7	21,822.4	23,790.1
Electric utilities	161.7	18.1	97.1	115.8	122.2
Total outside sales	<u>121,673.4</u>	<u>28,192.3</u>	<u>108,185.5</u>	<u>105,795.6</u>	<u>105,482.9</u>
Interdivisional	313.6	72.4	532.9	637.6	661.8
Total sales	<u>121,987.0</u>	<u>28,264.7</u>	<u>108,718.4</u>	<u>106,433.2</u>	<u>106,144.7</u>
Returned to ALCOA*	1,709.0	470.5	1,844.8	1,718.8	1,849.5
Interchange delivered	7,228.8	1,863.6	4,666.1	4,738.0	8,408.2
Losses	3,432.1	725.0	3,078.1	3,121.7	3,024.9
Total output	<u>134,356.9</u>	<u>31,323.8</u>	<u>118,307.4</u>	<u>116,011.7</u>	<u>119,427.3</u>
Generating capacity, fiscal year end—kilowatts	28,294,960		27,071,480	26,726,630	23,319,030
Area peak load—kilowatts	21,803,000		20,381,000	18,633,000	18,611,000
Monthly billing demands, 12 months— megawatts**	233,421		210,753	206,833	205,730

*In return for energy delivered to the TVA system from the ALCOA plants.

**The sum of the monthly billing demands of power sold by TVA.

Fiscal Years

<u>1973</u>	<u>1972</u>	<u>1971</u>	<u>1970</u>	<u>1969</u>	<u>1968</u>	<u>1967</u>	<u>1966</u>	<u>1965</u>	<u>1964</u>
18,141.5	15,915.2	12,733.6	12,313.2	11,595.4	15,187.8	13,317.9	11,024.4	14,615.5	13,255.3
2,623.2	2,119.7	1,811.7	1,779.3	1,813.3	2,283.8	1,868.9	1,777.1	2,163.0	2,044.4
3,693.1	3,257.7	2,737.1	2,447.2	1,579.2	3,361.6	2,555.3	1,338.0	2,023.6	1,532.6
<u>24,457.8</u>	<u>21,292.6</u>	<u>17,282.4</u>	<u>16,539.7</u>	<u>14,987.9</u>	<u>20,833.2</u>	<u>17,742.1</u>	<u>14,139.5</u>	<u>18,802.1</u>	<u>16,832.3</u>
84,384.0	73,439.8	74,332.1	76,144.6	75,600.9	69,619.4	68,114.0	67,941.9	55,651.7	56,535.5
—	—	—	—	—	—	—	—	—	—
253.9	71.1	18.3	—	—	—	—	—	—	—
<u>109,095.7</u>	<u>94,803.5</u>	<u>91,632.8</u>	<u>92,684.3</u>	<u>90,588.8</u>	<u>90,452.6</u>	<u>85,856.1</u>	<u>82,081.4</u>	<u>74,453.8</u>	<u>73,367.8</u>
670.3	266.1	593.2	459.2	4.3	—	79.7	23.7	—	—
7,288.0	7,075.4	8,889.6	8,141.8	7,354.8	5,156.2	5,141.0	2,676.9	2,765.4	3,041.2
<u>117,054.0</u>	<u>102,145.0</u>	<u>101,115.6</u>	<u>101,285.3</u>	<u>97,947.9</u>	<u>95,608.8</u>	<u>91,076.8</u>	<u>84,782.0</u>	<u>77,219.2</u>	<u>76,409.0</u>
63,822.0	57,820.3	55,534.6	53,692.9	49,008.2	44,575.0	40,705.9	37,783.5	32,161.3	27,848.1
17,112.5	12,501.8	11,773.5	13,069.6	14,826.9	18,801.8	20,226.3	20,638.2	20,391.9	25,361.8
21,864.7	19,592.0	21,278.3	22,012.6	20,568.1	19,213.4	18,589.8	16,765.1	15,773.7	14,077.4
92.1	539.7	1,407.3	1,273.7	1,300.5	1,462.1	1,768.1	1,150.1	769.8	441.8
<u>102,891.3</u>	<u>90,453.8</u>	<u>89,993.7</u>	<u>90,048.8</u>	<u>85,703.7</u>	<u>84,052.3</u>	<u>81,290.1</u>	<u>76,336.9</u>	<u>69,096.7</u>	<u>67,729.1</u>
581.3	636.6	653.9	673.5	670.2	667.8	796.6	768.4	764.1	720.7
<u>103,472.6</u>	<u>91,090.4</u>	<u>90,647.6</u>	<u>90,722.3</u>	<u>86,373.9</u>	<u>84,720.1</u>	<u>82,086.7</u>	<u>77,105.3</u>	<u>69,860.8</u>	<u>68,449.8</u>
1,820.3	1,857.6	1,846.7	1,847.5	1,756.2	1,863.5	1,688.1	1,694.7	1,638.5	1,865.7
8,202.7	5,998.1	5,049.4	5,379.7	6,808.5	6,204.9	4,614.3	3,430.6	3,490.4	3,839.0
3,558.4	3,198.9	3,571.9	3,335.8	3,009.3	2,820.3	2,687.7	2,551.4	2,229.5	2,254.5
<u>117,054.0</u>	<u>102,145.0</u>	<u>101,115.6</u>	<u>101,285.3</u>	<u>97,947.9</u>	<u>95,608.8</u>	<u>91,076.8</u>	<u>84,782.0</u>	<u>77,219.2</u>	<u>76,409.0</u>
21,892,480	19,880,420	19,828,380	19,422,480	18,239,280	18,202,090	18,111,860	17,149,500	14,675,615	13,353,615
18,888,000	16,664,000	16,745,000	16,797,000	15,017,000	15,266,000	14,634,000	14,263,000	12,801,000	12,218,000
197,137	178,179	176,610	174,030	163,861	160,932	157,203	145,557	133,691	126,046

Customer Statistics

In the following tables, the sales and related statistics for TVA and for the local distributors have been combined to portray total sales to ultimate customers.

Ultimate Customers

<u>SEPT</u>	<u>TOTAL</u>	<u>RESIDENTIAL</u>	<u>COMMERCIAL AND INDUSTRIAL</u>	<u>FEDERAL AGENCIES</u>	<u>OUTDOOR LIGHTING</u>
1977	2,601,415	2,316,414	281,906	11	3,084
<u>JUNE</u>					
1976	2,521,956	2,248,475	270,532	11	2,938
1975	2,458,822	2,192,972	263,056	11	2,783
1974	2,401,581	2,139,476	259,417	11	2,677
1973	2,325,134	2,068,150	254,423	11	2,550
1972	2,236,153	1,987,724	245,965	11	2,453
1971	2,158,423	1,919,208	236,687	11	2,517
1970	2,096,544	1,863,578	230,654	11	2,301
1969	2,047,338	1,817,982	227,179	11	2,166
1968	1,994,065	1,769,141	222,870	11	2,043
1967	1,946,594	1,726,382	218,257	11	1,944
1966	1,895,082	1,679,342	213,927	11	1,802
1965	1,840,791	1,630,547	208,533	10	1,701
1964	1,589,238	1,408,899	178,821	9	1,509

Electricity Sales—Millions of kilowatthours

<u>FISCAL YEAR</u>	<u>TOTAL</u>	<u>RESIDENTIAL</u>	<u>COMMERCIAL AND INDUSTRIAL</u>	<u>FEDERAL AGENCIES</u>	<u>OUTDOOR LIGHTING</u>
1977	117,764	37,648	56,552	22,582	982
1976	104,925	31,985	49,884	22,143	913
1975	102,778	31,785	50,117	20,027	849
1974	102,618	30,602	53,125	18,050	841
1973	99,670	30,637	50,557	17,694	782
1972	87,333	27,474	46,005	13,138	716
1971	85,930	27,291	45,553	12,427	659
1970	86,380	26,835	45,200	13,743	602
1969	82,111	24,449	41,610	15,497	555
1968	80,600	22,174	38,448	19,470	508
1967	77,708	19,945	36,276	21,023	464
1966	73,649	18,736	33,087	21,407	419
1965	67,050	16,501	29,043	21,156	350
1964	66,149	15,069	24,722	26,082	276

Revenue from Electric Sales—Thousands of dollars

<u>FISCAL YEAR</u>	<u>TOTAL</u>	<u>RESIDENTIAL</u>	<u>COMMERCIAL AND INDUSTRIAL</u>	<u>FEDERAL AGENCIES</u>	<u>OUTDOOR LIGHTING</u>
1977	2,324,976	873,061	1,087,537	328,237	36,141
1976	1,978,805	724,011	915,431	308,071	31,292
1975	1,448,320	559,439	672,806	189,187	26,888
1974	1,138,887	442,644	545,319	126,544	24,380
1973	992,421	398,253	465,323	107,154	21,691
1972	860,669	352,116	412,374	76,685	19,494
1971	796,426	332,544	381,299	65,010	17,573
1970	667,418	277,153	312,574	62,459	15,232
1969	576,589	231,391	265,294	66,323	13,581
1968	539,668	206,112	239,740	81,669	12,147
1967	492,374	177,055	217,543	87,026	10,750
1966	464,555	168,902	199,281	86,981	9,391
1965	418,705	151,007	174,808	85,344	7,546
1964	397,474	138,555	149,638	103,503	5,778

Residential Statistics

FISCAL YEAR	AVERAGE ANNUAL USE	AVERAGE ANNUAL BILL	AVERAGE RATE
1977	16,400 kWh	\$380.34	2.32¢
1976	14,370	325.35	2.26
1975	14,540	255.92	1.76
1974	14,480	209.37	1.45
1973	15,080	196.07	1.30
1972	14,040	179.92	1.28
1971	14,400	175.53	1.22
1970	14,560	150.39	1.03
1969	13,600	128.71	.95
1968	12,668	117.74	.93
1967	11,680	103.68	.89
1966	11,294	101.81	.90
1965	10,831	99.12	.92
1964	10,818	99.47	.92

Notes: 1. The City of Memphis ceased to be a regular distributor of TVA power in 1958 and its customer statistics are excluded beginning in fiscal year 1959. The City again became a regular distributor January 1, 1965, and its customers' statistics are included thereafter.

2. Federal agencies include only TVA's direct service and interdivisional sales.

3. To avoid overstating the number of customers in the region, the number of Outdoor Lighting customers excludes the customers who supplement regular service with the special outdoor lighting fixture. Only public street lighting and athletic field lighting customers are counted. However, the energy sales and revenue figures under Outdoor Lighting do include data for the special fixtures.

Fuel Statistics

Fuel Burned	1977	1976	1975	1974	Fiscal Years 1973
Steam plants					
Coal—tons	37,946,797	37,158,293	33,139,949 ⁶	37,367,286 ^{1,3}	35,412,573 ^{4,5}
Oil—gallons	13,887,791	13,762,479	14,447,738	11,816,450	9,247,951
Gas—MCF	—	—	—	9,207,045	10,976,396
Total fuel expense	\$809,284,973	\$699,978,978	\$435,157,927	\$327,662,665	\$267,648,942
Coal expense per ton	\$21.177	\$18.715	\$12.993	\$8.611	\$7.425
Oil expense per gallon	\$.408	\$.333	\$.316	\$.247	\$.141
Gas expense per MCF	—	—	—	\$.325	\$.311
Nuclear plants					
Total fuel expense	\$32,023,437	\$118,052 ⁹	\$7,109,516	—	—
Gas turbine plants					
Oil—gallons	193,032,102	102,083,371	47,090,948	26,854,964	18,382,686
Gas—MCF	—	—	—	443,725	911,478
Total fuel expense	\$67,883,653	\$31,206,773	\$13,116,621 ⁷	\$4,676,032	\$2,436,855
Oil expense per gallon	\$.352	\$.306	\$.278	\$.167	\$.114
Gas expense per MCF	—	—	—	\$.431	\$.369
Fuel Ratios					
Steam plants					
Fuel expense per kWh generation—mills	9.810	8.561	6.069	3.927	3.351
Btu per kWh net generation	10,120	9,960	9,880	9,770	9,770
Cents per million Btu burned	96.96	85.91	61.41	40.18	34.29
Btu per pound of coal fired	10,970	10,940	10,660	10,760	10,840
Gas turbine plants					
Fuel expense per kWh net generation—mills	32.145	27.864	25.879	16.033	9.596
Btu per kWh net generation	12,760	12,640	12,950	14,510	13,830
Cents per million Btu burned	251.80	220.39	199.86	110.51	69.38
Nuclear plants					
Fuel expense per kWh net generation—mills	1.856	—	1.525	—	—
Btu per kWh net generation	10,720	—	10,570	—	—
Cents per million Btu burned	17.32	241.02 ⁹	14.42	—	—
Coal received					
Tons	37,284,557	40,907,840	36,717,599 ⁸	34,060,316 ²	40,155,580 ⁵
Mine cost plus transportation	\$781,474,331	\$767,163,347	\$539,980,917	\$290,693,725	\$298,831,623
Cents per million Btu	97.75	85.68	68.89	39.69	34.44

1. Includes 44,464 tons of petroleum coke costing \$449,838, which is estimated at 14,160 Btu per pound.

2. Includes 111,045 tons of petroleum coke costing \$1,193,630.

3. Does not include 291,537 tons burned during initial operation of unit 2 of Cumberland Steam Plant.

4. Does not include 2,096,524 tons burned during initial operation of Cumberland Steam Plant.

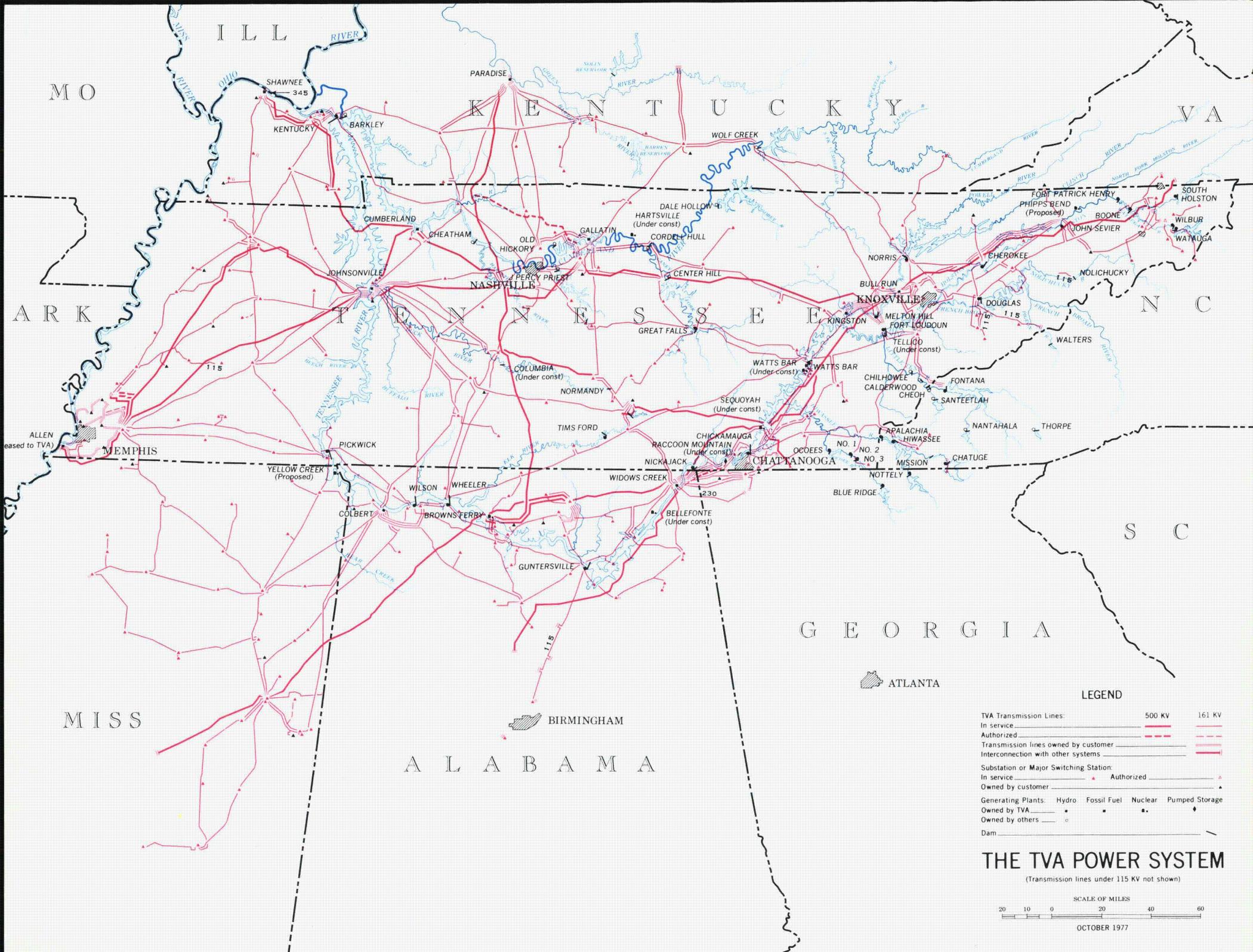
5. Coal burned and coal receipts include 10,044 tons of petroleum coke costing \$79,873.86, which is estimated at 14,200 Btu per pound.

6. Includes 62,006 tons of petroleum coke costing \$673,924, which is estimated at 13,780 Btu per pound.

7. Includes \$47,054 amortization for Allen Gas Turbine Plant pipeline cost.

8. Includes 14,693 tons of petroleum coke costing \$197,689.

9. Cost of fuel oil fired for auxiliary steam and testing of emergency generators.



MO

ILL

KENTUCKY

VA

ARK

TENNESSEE

NC

MISS

ALABAMA

GEORGIA

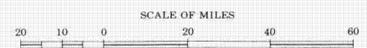
SC

LEGEND

- TVA Transmission Lines: 500 KV (thick red line), 161 KV (thin red line)
- In service (solid red line)
- Authorized (dashed red line)
- Transmission lines owned by customer (thin black line)
- Interconnection with other systems (dotted black line)
- Substation or Major Switching Station:
 - In service (solid black square)
 - Authorized (dashed black square)
 - Owned by customer (open black square)
- Generating Plants: Hydro (blue triangle), Fossil Fuel (black square), Nuclear (black circle), Pumped Storage (black diamond)
- Owned by TVA (solid black square)
- Owned by others (open black square)
- Dam (black line with a vertical bar)

THE TVA POWER SYSTEM

(Transmission lines under 115 KV not shown)



OCTOBER 1977