1980

Tennessee Valley Authority

Power Program Summary

Power Program Summary

For the fiscal year ended September 30, 1980
Tennessee Valley Authority
A corporation wholly owned by the United States of America

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 almost 2.8 million customers in parts of seven states. TVA also supplies power directly to 50 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 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.

This report, published in two volumes, provides a summary of TVA Power and distributor operations in fiscal year 1980. Volume I data is based on the TVA fiscal year ending September 30, 1980, unless otherwise noted. Volume II data is based on the distributors' fiscal year ending June 30, 1980.

Cover—
An aggressive maintenance program brought the availability of TVA coal-fired plants from 79 percent in 1977 to 83.3 percent in 1980 and saved consumers $78 million dollars. The burning coal on the cover symbolizes that savings and the all-out effort throughout Power to deliver economic, efficient performance . . . by people and machines.

TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

A REVIEW OF POWER ACTIVITIES FOR 1980

Enclosed is your copy of the Power Program Summary Volume I outlining TVA electric power activities for fiscal year 1980. Previously you received the Volume II of this publication which contained the financial and operating reports of the local distributors of TVA power. As noted in the introduction to the Volume II, we have combined three former publications in our ongoing efforts to reduce costs. Information formerly carried in the Power Annual Report, the Municipal and Cooperative Distributors Operations Report, and the OEDC Annual Report has been streamlined and combined into the Power Program Summary.

We hope you will find it to be convenient and useful.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

Hugh G. Parris

H. G. Parris
Manager of Power

Contents

Statistical Summary

	Fiscal Year	
	1980	1979
Sales (billion kWh)*	121	118
Revenues (millions)	$ 3,204	$ 2,657
Payments in Lieu of Taxes to States and Counties (millions)	$ 114	$ 100
Total Operating Expenses (millions)	$ 2,278	$ 2,008
Net Interest Charges (millions)	$ 727	$ 505
Net Income (millions)	$ 201	$ 137
Increase in Retained Earnings (millions)	$ 123	$ 68
Total Payments to U.S. Treasury (millions)	$ 98	$ 89
Total Assets (millions)	$13,883	$12,059
Average Annual Residential Use (kWh)	15,130	14,680
Average Cost per Residential Kilowatthour (cents)	3.29	3.10

**Represents total TVA sales at the delivery point to distributors, industries and Federal agencies. The 1980 total sales to ultimate customers is 115 billion kWh. For 1979 total sales to ultimate customers was 113 billion kWh. The difference represents power lost in distribution facilities.*

TVA/OP/PINF-81/2

Hugh Parris, Manager of Power

"Only by reducing the increases in rates can we adequately serve the electricity consumer and maintain the region's energy advantage. By maintaining the region's energy price and availability advantages, the Power program can most appropriately contribute to future regional economic growth and ensure jobs for our expanding population."

Executive Summary—1981
Long Range Plan for the Office of Power

"We are going to have as few people as we can, but the best utility people in the world. They will be producers.

We are going to buy only what we need and have to have. And make those materials count.

We are going to buy only the services we have to have.

We are going to put our consumers' capital in existing machines and power plants only when spending money on them makes them better or last longer.... and in new machines only when they are better."

Hugh G. Parris

Viewpoint

The gauntlet is down.
We have picked it up.
The contest has begun.
It's as simple as this—the lifestyle and the economic development of the Tennessee Valley depend upon how we do our jobs. Whether we have the energy—whether we have enough energy—whether we have energy at a price our consumers can afford to pay—all are affected by how well we fulfill our primary function of ensuring an adequate supply of electric energy at the lowest possible cost.

The year 1980 is a classic exposition of the conflict, with good news and bad news, inspired and inspiring performance by TVA people and plants, and heartbreaking impacts from the economy.

It began on an auspicious note, the welcome news that a 10.8-percent rate increase scheduled for October 1979 could be effectively deferred for consumers until April 1980. The first Power Credit in the history of TVA was declared primarily because of the excellent hydro power resulting from above normal rainfall and outstanding plant performance at Browns Ferry Nuclear Plant. With the $163 million credit, we were able to buy a 15-month hiatus in rate increases between January 1979 and April 1980.

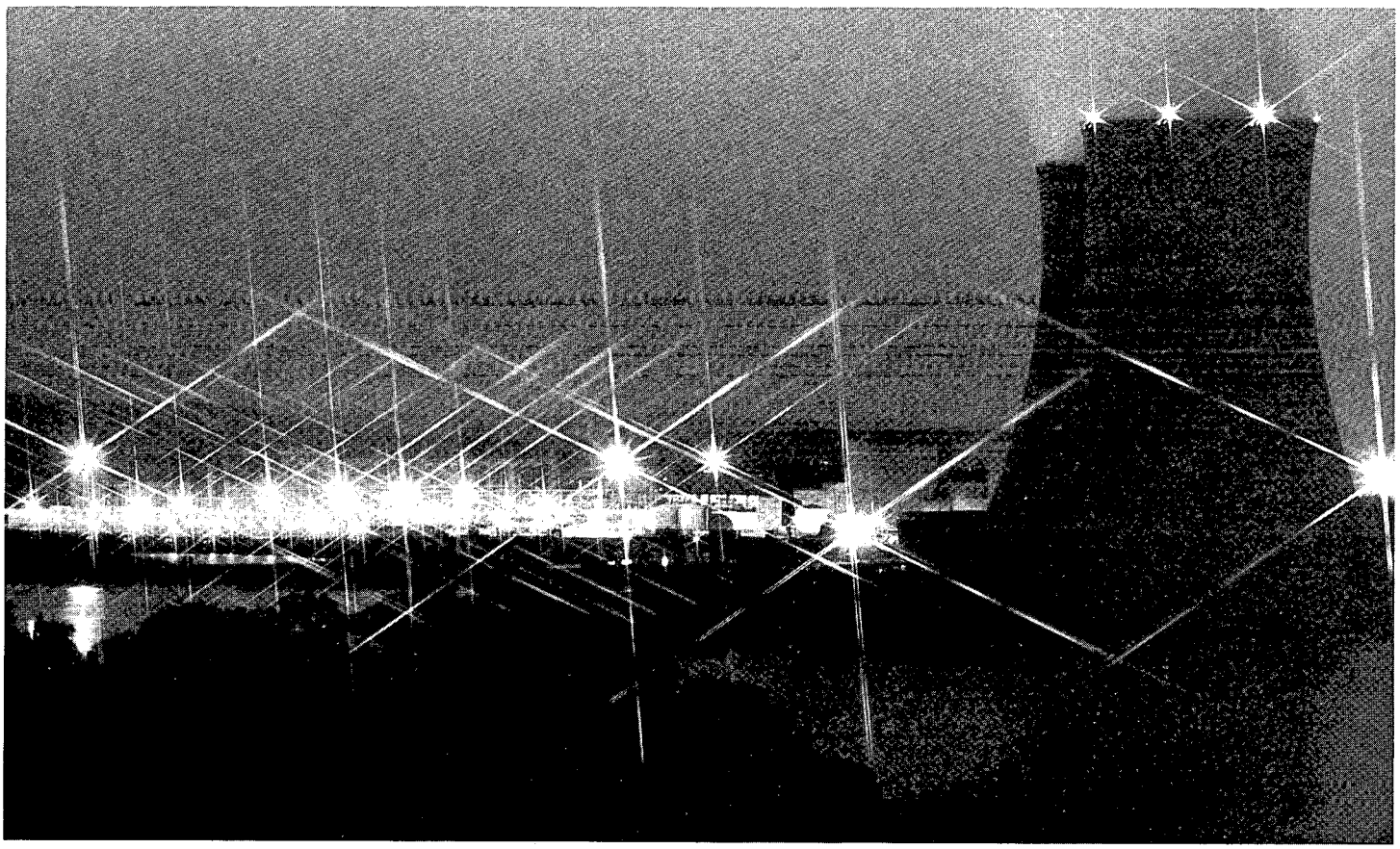
There was more good news in early 1980. The rainfall continued, making 1980 the third year in a row for above average hydro generation. Low cost hydro power provided 18 percent of the generation in 1979 and 17 percent in 1980. And the people at Browns Ferry kept up the good work, providing 15 percent of the total generation for TVA, down about one percent from the previous year.

The year ended with the promise of even more nuclear power for the near future with the licensing of Sequoyah Nuclear Plant in September 1980.

A major commitment made in 1978 to increase the reliability and availability at the coal-fired plants paid off throughout the year. The 82.6 billion kilowatthours generated by coal was the highest since 1974. The improvement program brought the availability of coal-fired plants from 79 percent in 1977 to 83.3 percent in 1980. The value of that improvement in capacity during 1980 was $48 million.

Improving the heat rate at the coal-fired plants in 1980 meant that 490,000 fewer tons of coal was needed to produce the same amount of power—a $16 million saving.

We were also able to make substantial improvements in labor utilization. In 1980 we operated with an overtime rate three percentage



September brought the promise of additional low-cost generation in the near future with the licensing of Sequoyah Nuclear Plant.

points below that experienced the two previous years for an estimated saving of $12 million in power operations. And we produced four and one-half billion kilowatthours more than the previous year. But, we did it with one and one-fourth million fewer hours.

Quite a performance by TVA people!

The excellent hydro and nuclear production in 1980 resulted in a continued downward trend in purchased power and combustion turbine generation. Purchased power was down $1 million from the previous year to $65 million. And combustion turbines provided only 0.1 percent of power for the year compared with 0.4 percent in 1979.

Sales were up in 1980, after being flat from 1978 to 1979. This modest growth of 2.5 percent in sales came principally from the residential customers who were faced with the recordbreaking heat of the summer. TVA saw a new summer peak of 22,607 megawatts set during July as consumers struggled to mitigate the extreme temperatures with fans and air conditioners. Also, helping the growth in sales was a 5-percent increase in sales to the Department of Energy (DOE) for uranium enrichment.

Reducing the impact of residential and Federal sales increases were decreases in sales to directly served industries and sales by distributors to commercial and industrial customers. These were down as businesses across the Valley were trying to deal with a sluggish economy.

TVA's Home Insulation Program passed the 115,000 insulated homes mark, producing a saving of 430 million kilowatthours in 1980. The Commercial and Industrial Energy Management plans delivered 223 million kilowatthours in saving.

The years 1979 and 1980 were ones in which we honed and refined our forecasting, taking into account the savings available through conservation, the economy, and the national energy situation. As we worked to more accurately predict the needs of the future, we took a close look at our nuclear construction program well aware of the fine line between providing power today at affordable rates and ensuring economic growth tomorrow. In 1979 we had deferred the construction of four nuclear units in order to bring the construction program in line with new forecasts. During 1980 we continued to review and evaluate the situation but decided to continue construction of the 10 remaining units. Net borrowings to finance new power plants and other power facilities increased by $1.8 billion to a total of $10.8 billion.

Operating expenses in 1980 increased by $271 million over the previous year. The largest contributor to this increase was coal costs which rose from $29.65 per ton in 1979 to $34.13 per ton in 1980. Interest charges increased $223 million to a record $882 as interest rates rose rapidly because of continued inflation.

So even though we enjoyed a banner year in terms of plant and employee performance, we saw a year when the economy nationwide had a devastating effect that wiped out all but $57 million of our gains. This $57 million is being used to offset the April 1981 rate increase. Revenues grew to a record $3.2 billion with the increases demanded largely by interest expense and fuel costs.

I am of the opinion that the challenge in 1980 was well met. Without the performance of our people, the record would have been bleak indeed. But with that performance, we are meeting the challenge.

And not only meeting it for today but looking to the future with long-range programs to ensure economic production and usage of power.

Construction began on the 20 megawatt Atmospheric Fluidized Bed Combustion Pilot Plant near Paducah, Kentucky, offering the promise of more efficient, environmentally clean combustion of our most plentiful fuel, coal.

New policy for dispersed power production was developed making it possible for some individuals, industries, municipalities, and cooperatives to install small power generating facilities and efficiently utilize process energy for power production.

Construction neared completion on an electric vehicle testing facility in Chattanooga to assist in the evaluation of electric and hybrid vehicles.

Only such productive performance—as demonstrated by Power people—can preserve the yardstick function that TVA has maintained in the past. Just as TVA led the Nation, first in the development of an integrated hydro system dedicated to the social and economic growth of the Valley in the 30's and 40's, then with the development of the large, efficient coal-fired generating plants in the 50's and 60's, most recently with the nuclear construction program and the conservation programs in the 70's; TVA can point the way for the Nation in the 80's with increasing efficiency, economy, and productivity.

We will be extremely conservative in the evaluation of our programs. Programs will have to be efficient. They will have to demonstrate both restraint and increasing productivity.

We will take every route to ensure maximum efficiency and productivity throughout Power with a reduction in costs and in the manpower requirements to achieve program objectives.

It is the responsible direction for energy in the 80's.

Hugh G. Parris

Sales

Power sales in the TVA area were up 2.5 percent at 120.6 billion kilowatthours in 1980 compared to 117.7 billion kilowatthours in 1979.

Sales to Federal agencies were up by 752 million kilowatthours over 1979 levels to 16.9 billion kilowatthours because of higher sales to the U.S. Department of Energy uranium enrichment plants. DOE has, through contractual agreement, reduced loads since 1978 during the winter and summer which has reduced demand during peak load periods.

Sales to directly served industries decreased 4.2 percent or 1 billion kilowatthours for a total of 23.9 billion kilowatthours in 1980.

Sales to municipal and cooperative electric systems in 1980 totaled 78.7 billion kilowatthours compared to 76.0 billion the preceding year, an increase of 3.6 percent.

Paper industries in the area operated at higher levels during the year with a 37.3-percent increase in kilowatthours purchased over 1979.

All other segments of the industrial sector were down in 1980 as compared to 1979:

Aluminum	**down**	**2.8%**
Chlorine	**down**	**1.0%**
Ferroalloys	**down**	**17.8%**
Phosphorous	**down**	**7.3%**
Other	**down**	**11.8%**

Unusually hot weather during summer 1980 increased cooling demands, contributing to an increase in sales to residential customers. Residential sales were up 1.881 billion kilowatthours over 1979 levels. The average annual residential use rose from 14,680 kilowatthours in 1979 to 15,130 in 1980. There was a slight increase in the national residential average—from 8,834 kilowatthours in 1979 to 8,944 in 1980.

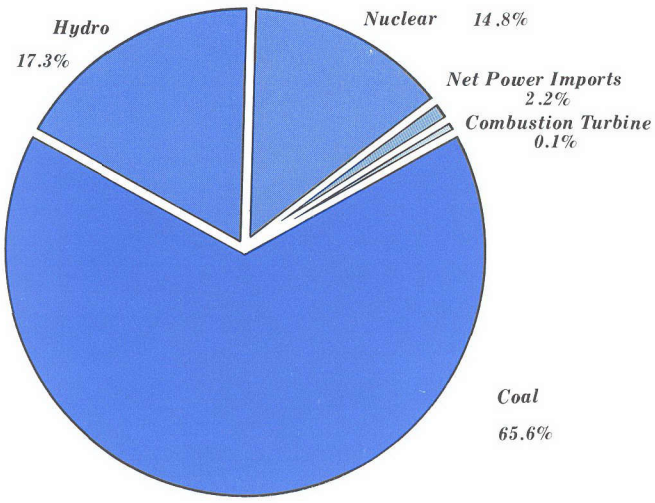
Electrically heated homes used an average of 19,320 kilowatthours, this up slightly from the 19,290 for FY 1979. The average should decrease, however, after adjusting for weather variations, as more and more residents take advantage of TVA's energy conservation programs.

Power distributors' commercial and industrial sales increased slightly to 35.646 billion kilowatthours from 35.598 billion in 1979.

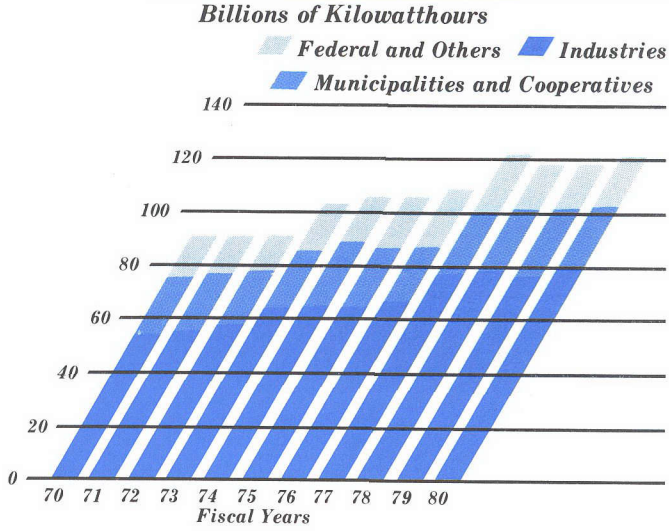
TVA Data

Based on fiscal years ending June 30 through 1976 and fiscal years ending September 30 from 1977 through 1980.

TVA Power Supply



Sales



Revenues and Expenses

TVA's revenues increased $547.4 million over the preceding year to cover rising interest expense and fuel costs, totalling $3.2 billion.

The best performance by coal-fired plants since 1974 combined with excellent performance at Browns Ferry Nuclear Plant and a better-than-normal hydro year combined to reduce the need for purchased power and combustion turbine operation while still meeting a 3.2 billion kilowatt-hour increase in total system output.

Imported power expenses of $65 million were $1 million less than the year before. Oil-fired combustion turbine generation was reduced slightly from less than 0.5 percent in 1979 to 0.1 percent in 1980.

Coal costs continued to rise from an average cost of $29.65 per ton in 1979 to $34.13 per ton in 1980. About 35.8 million tons of coal were burned in 1980 compared to 34.7 million in 1979. The improved efficiency and reliability of coal-fired plants and improved coal quality have contributed significantly to an overall increase in energy production for 1980. As a result, coal-fired production was 82,562 million kilowatthours in 1980, up from 78,081 kilowatthours generated in 1979.

Hydroelectric plants, for the third year in a row, provided for above normal amounts of low-cost generation. Hydro contributed 17.3 percent of the power produced by the system or 21.7 billion kilowatthours.

Browns Ferry Nuclear Plant accounted for 14.8 percent of total production, down slightly from last year's 16 percent contribution. Nuclear generation for FY 1980 was 18.6 billion kilowatthours compared to 19.8 in FY 1979.

Overall system fuel expense was 12.83 mills per kilowatt generated, up from 11.27 mills per kilowatt in 1979.

Production expenses increased from $1.6 billion in 1979 to $1.8 billion in 1980, a $218 million increase.

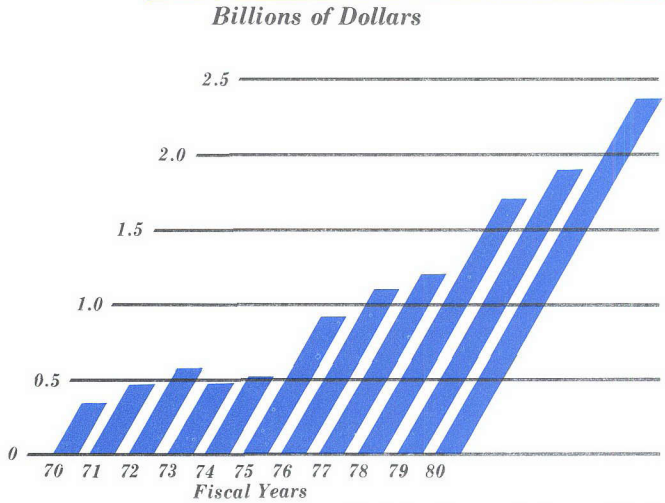
TVA makes payments in lieu of taxes to States and counties equal to 5 percent of revenues from sales of electric energy for the previous year, excluding revenues from Federal agencies. As revenues increase, these payments increase. In 1980, TVA paid $114 million to States and counties. In addition, the municipal and cooperative distributors of TVA power paid $60 million to States and local governments in taxes and tax equivalents during their fiscal year for a total of $174 million in payments to State and local governments.

TVA also paid $98 million to the Federal Government. The TVA Act requires TVA to pay a return to the U.S. Treasury on the outstanding appropriation investment in the power system as well as repaying the portion of the appropriations invested in power facilities. This year's return on the appropriation investment was $78 million and the repayment amount was $20 million.

Interest payments on the borrowed capital came to $882 million. Of that amount, $727 million was allocated to operations.

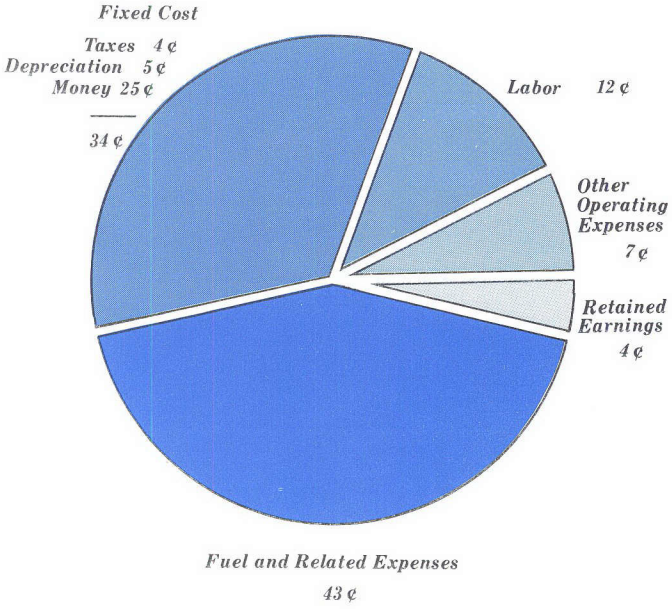
TVA Data

Construction Expenditures*



*Includes allowance for borrowed funds used during construction

Distribution of TVA Revenue Dollar



Revenues and Expenses Continued

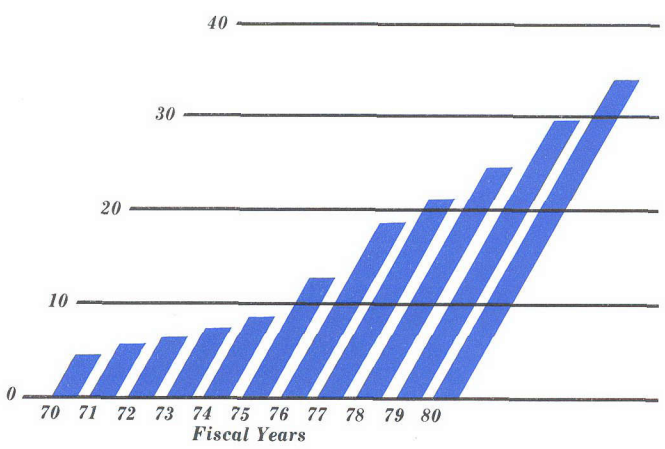
Improving the heat rate at TVA coal-fired plants in 1980 meant that 490,000 less tons of coal were needed to produce the same amount of power—a $16 million saving.

Net income increased from $137 million in 1979 to $201 million in 1980. Retained earnings increased by $55 million or 1.7 percent of revenues.

Operating income (operating revenues less operating expenses) was equal to 105 percent of current-year interest charges, up from about 100 percent in the previous year. This represented a significant improvement and established a positive trend toward TVA's target of bringing operating revenues to 110 percent of interest charges.

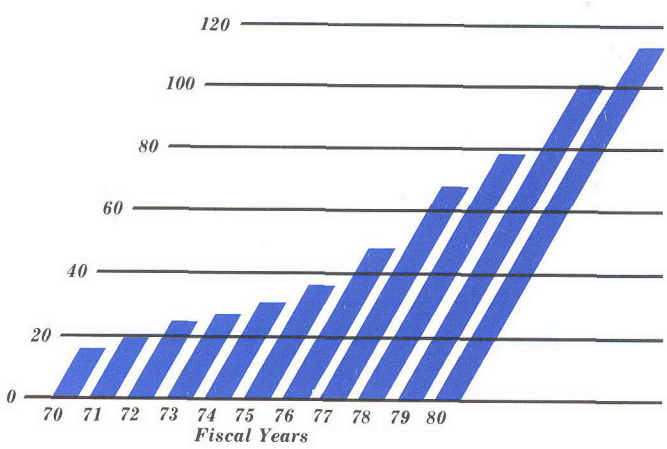
Average Cost of Coal Burned

Dollars per Ton



TVA Payments in Lieu of Taxes

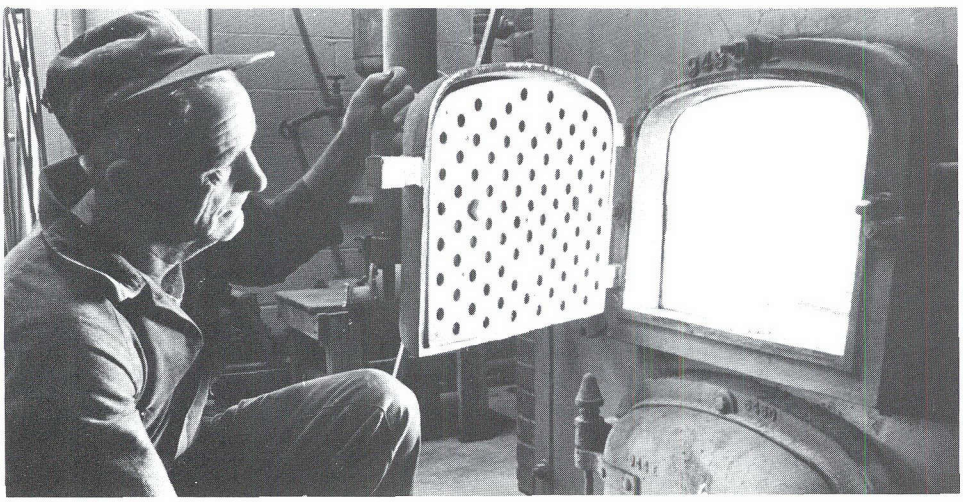
Millions of Dollars

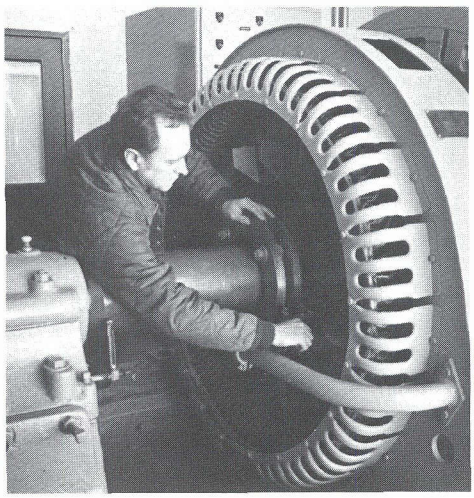


Financing

Net borrowings to finance new power plants and other assets increased $1.810 billion during the year to a total of $10.810 billion outstanding. Five bond issues were sold to the Federal Financing Bank. All five bond issues were for 25-year terms: one for $400 million at 10.545 percent and four for $500 million each at rates of 11.225 percent, 12.955 percent, 10.475 percent, and 10.890 percent. A 5-year $300 million bond issued to the Federal Financing Bank in 1974 was paid at maturity in October 1979. Short term debt was reduced by $290 million during the year.

On October 31, 1979, TVA entered into a nuclear fuel sale/leaseback arrangement with the Seven States Energy Corporation, which finances its purchases of nuclear fuel from TVA with borrowings from the Federal Financing Bank. TVA makes lease payments as the fuel is consumed. On September 30, 1980, Seven States Energy Corporation had borrowings outstanding from the FFB of $685 million to finance its purchases of nuclear fuel from TVA.

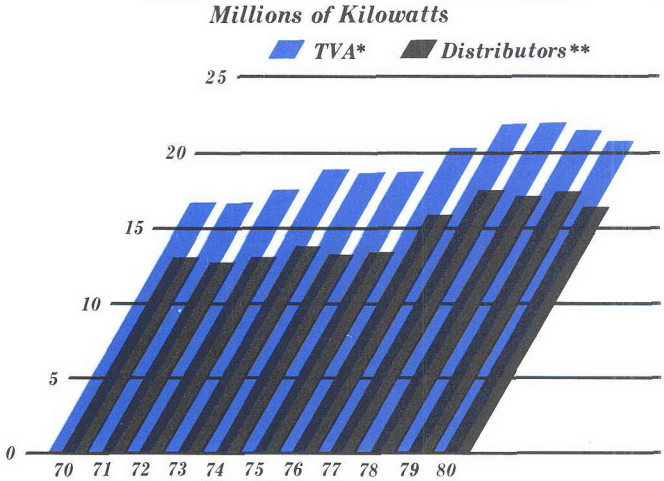




New policy for dispersed power production was developed, enabling some individuals, industries, municipalities, and cooperatives to install small power generating facilities and efficiently utilize process energy for power production.

TVA Data

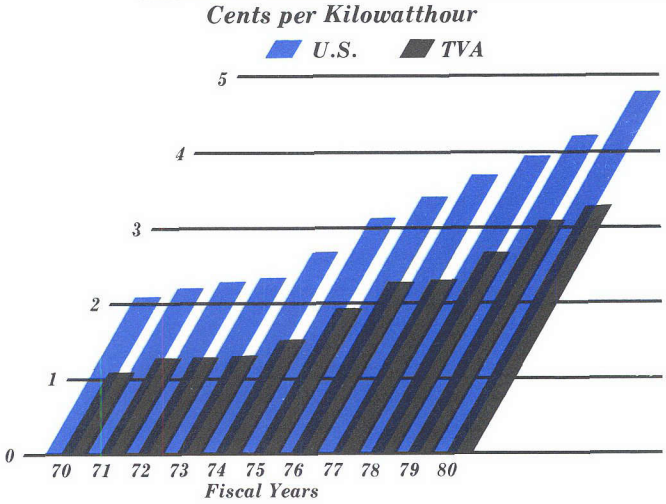
Peak Load



*TVA figures ending June 30 for 1970-1976 and September 30 for 1977-1980

**Distributor figures ending June 30

Average Residential Rate



Distributor Concerns

Lease and Optional Purchase Program

Through a lease and optional purchase program instituted several years ago, TVA distributors can acquire TVA's high-voltage substations and transmission lines and thereby enhance their long-range planning and systems design and operation. The resulting savings in construction and operating costs can be passed on to their customers. In 1980, 112 distributors were active in taking high-voltage service, including 101 under the lease program.

Rate Changes

Distributors were adversely affected financially during the year by the leveling of sales and the resulting higher unit operating costs. The effects of general inflation pushed costs even higher. Such cost increases are customarily covered through shifting to higher levels of rates in the series of 12 standard levels that TVA makes available.

During 1980, 44 distributors took action to apply higher levels of rates and seven adopted lower levels. A one-level change in rates amounts to about a two-percent change in consumer bills.

Industrial Development

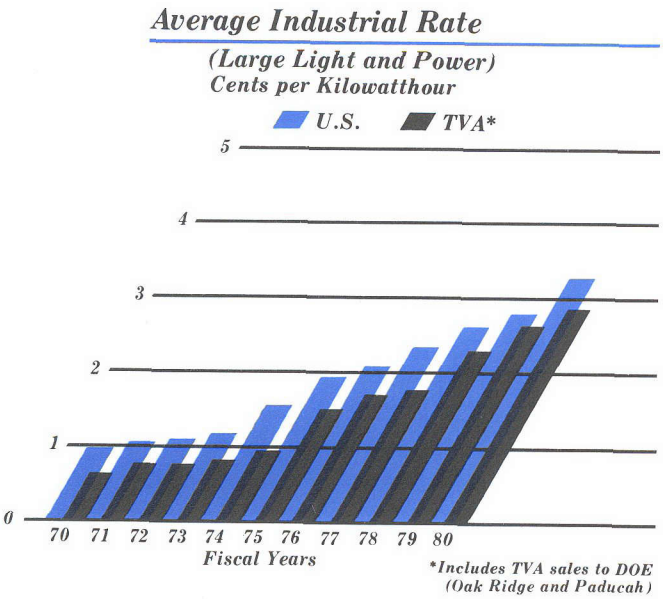
TVA increased its industrial development activities in the region with excellent results. Announcements of investments in 142 new and 241 expanding industrial plants totaled approximately $2.6 billion. More than 23,000 new jobs were created.

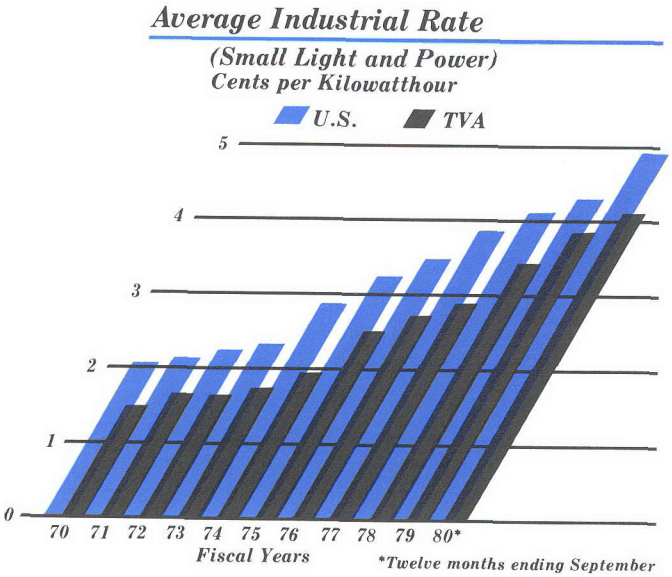
Cogeneration and Dispersed Power Program

TVA is encouraging industrial plants in the TVA service area to install in-plant cogeneration facilities. Cogeneration results in improved efficiency by either sharing heat or steam from a power plant or by generating electricity from waste fuels, waste heat or process steam before or after industrial processes. In addition to the improved efficiency of fuel sources which result from this program, increased cogeneration will also help TVA to defer the installation of expensive new capacity.

At the close of calendar year 1980, the amount of cogeneration capacity was about 111 MW in six industrial plants that were operated in parallel with the TVA system.

During 1980, a policy for dispersed power production and interim program and guidelines for implementation was proposed. This program would combine features of the TVA Act and the Public Utility Regulatory Policies Act to make it possible for individuals, industries, municipalities, and cooperatives to install all forms of small power generating facilities integrated with production of process steam or to install other renewable energy generating facilities such as windmills, photovoltaic equipment, biomass-fueled plants, and small hydro plants.





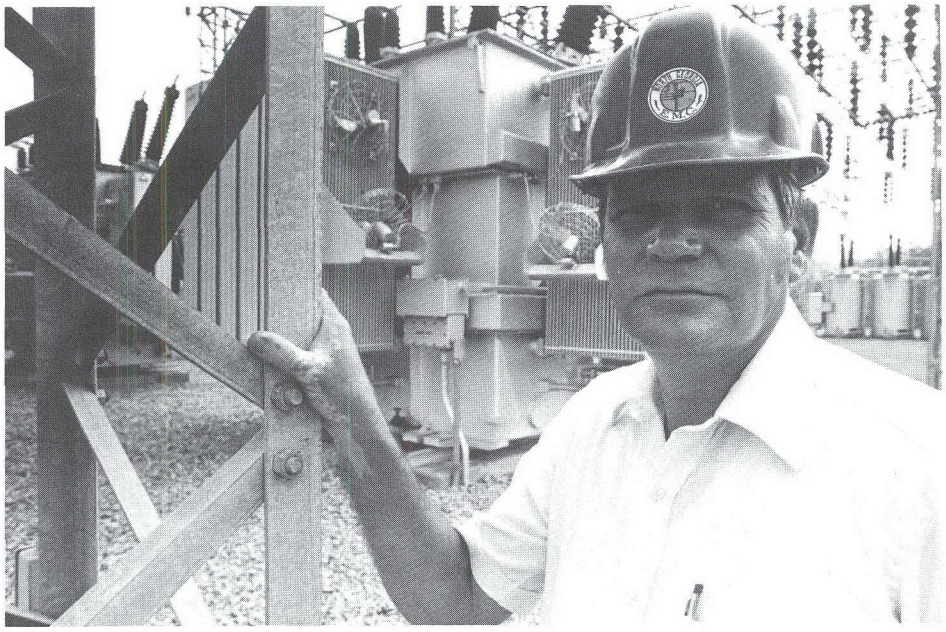
Rates

The first power revenue credit in TVA's 47-year history, a $163 million power credit from FY 1979 operations, was returned to customers in FY 1980 in the form of credits against wholesale power bills. It deferred the effects of an October 1979 rate increase of 10.9 percent until April 1980.

Wholesale costs to municipal and cooperative distributors of TVA power averaged 2.56 cents per kilowatthour up .017 cents from 1979. Distributor's residential customers paid an average of 3.29 cents per kilowatthour compared to 3.10 cents in 1979. The national average was 4.78 cents.

Industries directly served by TVA paid an average 2.60 cents per kilowatthour compared to 2.40 cents in 1979. Federal agencies paid 2.43 cents compared to 2.28 cents in 1979. All 1980 figures include the power credit.

Throughout 1980, there was extensive public involvement in a review of rate design standards proposed in the Public Utility Regulatory Policies Act of 1978 (PURPA). PURPA proposes alternative electric rate structures that encourage conservation and the equitable allocation of costs of energy to all customers.



Through a lease and optional purchase program, TVA distributors may acquire TVA's high voltage substations and transmission lines. The resulting saving in construction and operating costs can be passed on to their customers.

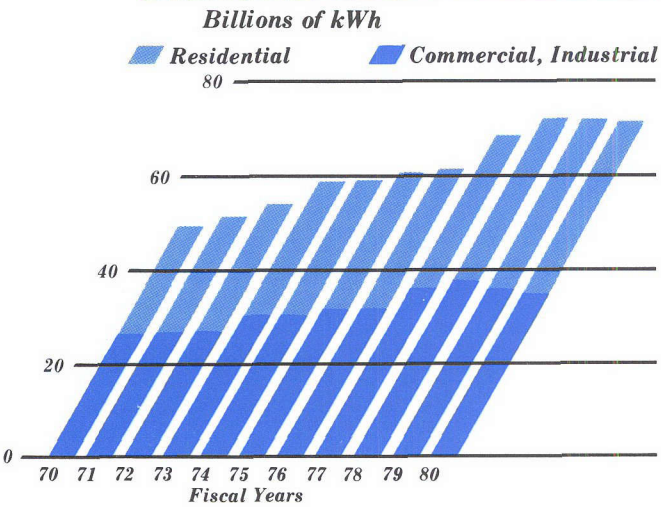
The six PURPA rate standards and an additional standard proposed by TVA were evaluated by the TVA staff with input from distributors, consumer interest groups, special consultants retained to facilitate public input, legal service organizations, manufacturing associations, and representatives of industry.

The TVA Board was expected to issue the final determinations on rate reform under PURPA in 1981.

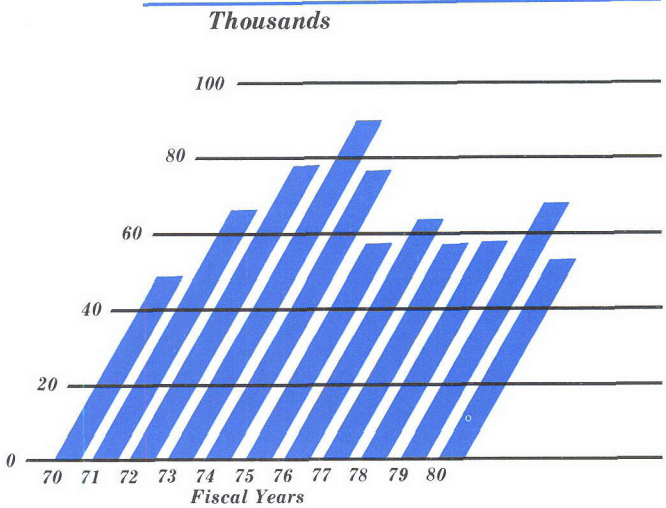
Distributor Data

Based on fiscal years ending June 30

Distributor Sales



Customers Added by Distributors



Fuel and Power Supply

The use of TVA resources to meet load requirements for fiscal year 1980 was improved over recent years due to operation of the Raccoon Mountain Pumped-Storage Plant and above normal generation from the conventional hydro system during the first part of the year. As a consequence of this favorable power supply and excellent performance from the fossil plants and Browns Ferry Nuclear Plant, net power imports dropped 14 percent for the year compared to fiscal year 1979; and the use of high-cost oil-fired resources decreased 67 percent.

The generation at steam plants of 82.6 billion kilowatthours was the highest level of generation since fiscal year 1974.

After more than 10 years of construction, Sequoyah Nuclear Plant unit 1 was fuel loaded and began low power testing in March 1980 and received its full power license in September 1980.

The Sequoyah Nuclear Plant is to be a 2-unit facility. Each unit uses a pressurized water reactor and at full power, each will have an electrical output of about 1,148 megawatts. Unit 2 is expected to begin operation in FY 1981.

The facility is located northeast of Chattanooga near Daisy in Hamilton County, Tennessee.

Improvements in Operations of Generating Facilities

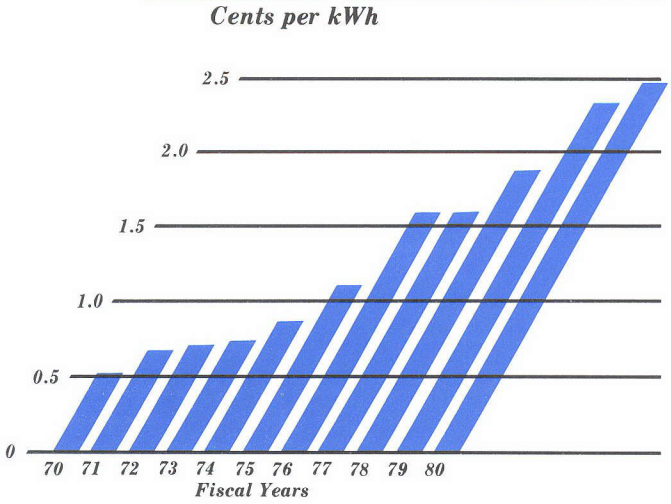
The availability and reliability improvement program, designed to keep TVA generating units available for service more of the time, produced money-saving results in 1980. Bull Run Steam Plant near Oak Ridge, Tennessee is one example of how the program improved operations. Before TVA began the improvement program, Bull Run was available less than 83 percent of the time because of various equipment failures. After a major boiler rehabilitation, Bull Run was available to generate electricity more than 94 percent of the time, setting a record in fiscal year 1980 by generating more electricity than any other TVA coal-fired unit in history. Overall, improved availability of coal-fired plants saved consumers an estimated $48 million in fiscal year 1980.

Another $16 million saving to the consumers results from improving the operating efficiency of the coal-fired plants. Prior to the program, it took 10,190 Btu's of heat to produce one kilowatthour of electricity. Through a combination of lower ash coal and improved operation and maintenance practices, that average was reduced in fiscal year 1980 to 10,050 Btu's. In one year, that means about 490,000 tons less coal was needed to produce the same amount of power.

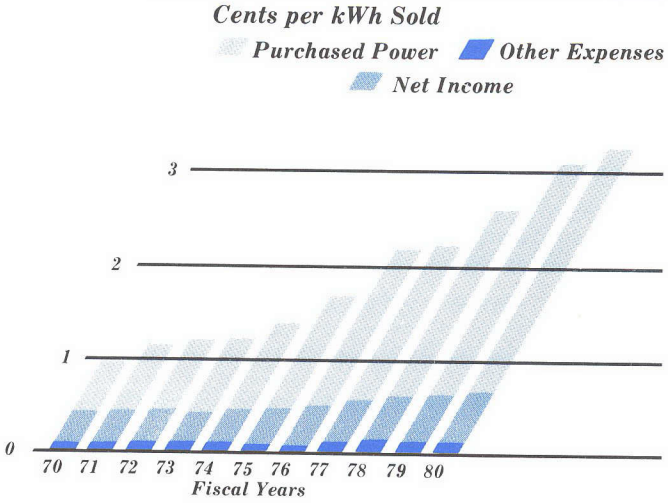
Transmission System Upgrated

During fiscal year 1980, the transmission system was upgraded to assure continuance of reliability. The internal system was greatly strengthened with the upgrading of facilities at the Shawnee Steam Plant, and the completion of new 500-kV substations in the Oak Ridge and Knoxville areas.

Wholesale Power Costs



Distribution of Distributor Revenue



Fuel and Power Supply Continued

Major work to reinforce the transmission system in the Western area was continued. A new 500-kV substation is nearing completion at Memphis, a 500-kV line connection with Alabama Power Company will strengthen the Mississippi area, and work is proceeding on a 500-kV line connecting Browns Ferry Nuclear Plant to the Memphis area. All of these facilities provide additional capability to transfer large blocks of power and at the same time minimize power losses.

During 1980, agreement was reached with Kentucky Utilities and American Electric Power Company to establish better interchange capability with the construction of 500-kV interconnecting lines.

Environmental Compliance Status

In 1980, a decision was made, based upon a projected reduction in the capacity factor at Johnsonville Steam Plant, to use lower-sulfur coal instead of sulfur dioxide recovery scrubbers to achieve the established standard of 3.4 lb SO_2 per million Btu's. The TVA power system is experiencing a much lower load growth than projected in earlier studies. And, as a result the older, less efficient plants, such as Johnsonville, will be required to serve only intermediate loads in the future. With the expected lower use of the plant, the use of low-sulfur coal becomes more economical since compliance costs are incurred in direct proportion to the operation of the plant. As a result, the very large capital costs for scrubbers are avoided.

Construction continued on two large coal-washing plants which will be among the largest in the Nation. The plants at Camp Breckenridge, Kentucky, and at the Paradise Steam Plant, nearing completion, will remove sulfur and other impurities from the coal being supplied to the Cumberland and Paradise Steam Plants.

Construction began on limestone sulfur dioxide scrubbers for Paradise. During the year, construction was continued on new electrostatic precipitators at the Cumberland Steam Plant and others were completed at Paradise Steam Plant unit 3.

Several units of the Nation's largest utility baghouse installation were completed at Shawnee Steam Plant.

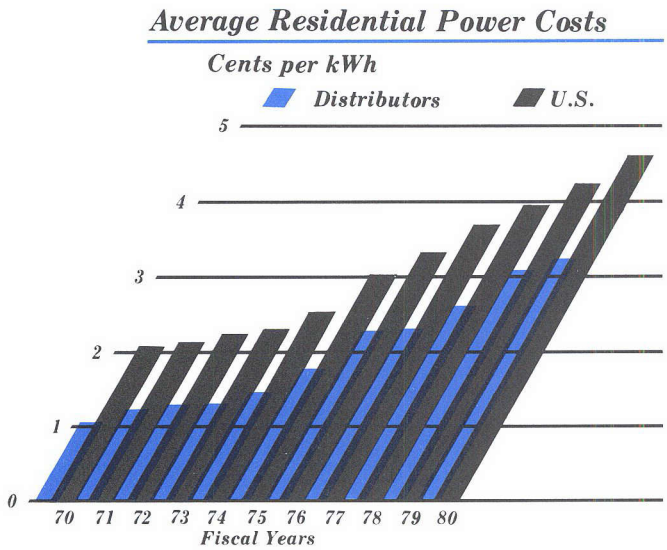
Nuclear Fuel

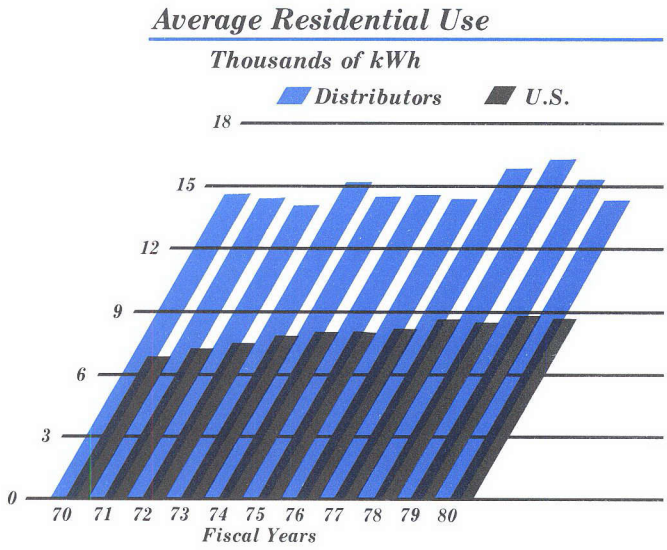
To provide fuel for its nuclear power plants, TVA purchases uranium concentrates from various suppliers and invests in uranium exploration and production facilities.

Long-term procurement contracts were in effect in 1980 with four corporations to provide for the delivery of 2.2 million pounds of uranium concentrates.

TVA invested $47 million in acquiring and developing property interests in 1980, bringing the net total for the past nine years to $276 million. As a result of declining uranium market prices and TVA nuclear plant construction schedule slippages during 1980, overall uranium supply plans are being reassessed. Some curtailments of exploration and production activities are expected.

Distributor Data





Spent Fuel Management

As an outcome of TVA's September 1979 summary report on spent fuel management, several activities to evaluate, support, and demonstrate emerging technologies for fuel storage have been initiated.

Rod consolidation, which permits the storage of up to twice the spent fuel in the same space, appears to have the greatest immediate potential. Studies and plans are underway involving other industry organizations and the Department of Energy (DOE) to develop both rod consolidation and several dry storage concepts to a level that these can be confidently considered as alternatives to new pool storage.

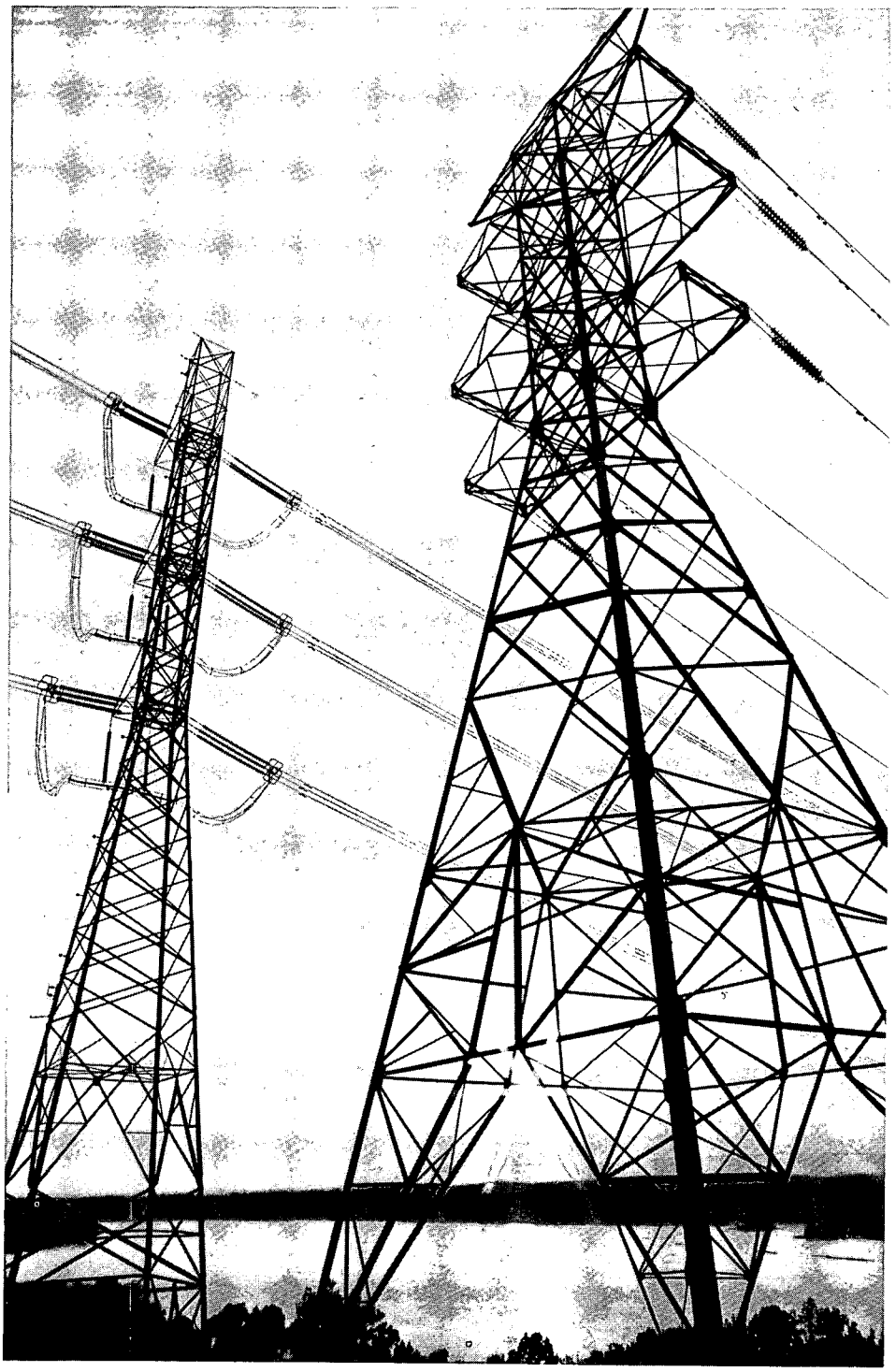
Regardless of which onsite storage concept is used, a safe, efficient way of transporting the spent fuel from the reactor storage pool to the onsite facility is necessary. TVA initiated contract activities to evaluate the design of a new or modified onsite shipping cask for the onsite transport of spent fuel.

Fossil Fuel

TVA burned 35.8 million tons of coal in 1980 compared with 34.7 million in 1979 and continued the trend of producing more electrical energy for each pound of coal burned. In 1980, each pound of coal burned averaged 11,550 Btu compared with 11,300 Btu's in 1979, and 10,920 Btu's in 1978. Total production for all coal-fired plants was 82,562 million kilowatthours in 1980, which was 4,481 million kilowatthours more than in 1979.

During 1980, TVA acquired the coal rights to 2,800 acres of properties located in southern Illinois from the Ewing-Northern Coal Association (ENCA) at a cost of $2.4 million. This brings the total acquisitions of these properties, which were initiated by TVA in 1976, to 42,962 acres or about 91 percent complete. Current plans are to acquire 46,000 acres by 1983.

Including the estimated 370 million tons of coal at the ENCA properties, TVA currently owns or controls reserves totaling more than 650 million tons of minable coal.



New transmission facilities provide additional capability to transfer large blocks of power and minimize power losses.

Cost Control

To offset rising costs of fuel, interest, materials, and services, TVA is taking aggressive steps to cut costs in areas where control can be maintained. During fiscal year 1980, manpower controls were implemented to more effectively allocate the use of labor on a straight-time and overtime basis. Control of overtime in power operations (a reduction of 4 percent in fiscal year 1980, from the fiscal year 1979 level) resulted in a $15 million saving.

Realizing that improved materials management could be accomplished by more closely identifying management's responsibility and emphasizing controls, an improved materials cost control program has been established.

The use of word processing equipment installed in the Office of Power in mid-1980 will save an estimated $2.2 million in the first year of operation.

About a $25 million saving resulted from a decrease in supplies and materials used primarily at the operating plants.

The nuclear fuel leasing arrangement has enabled additional cost control by TVA. Under the arrangement, TVA is reimbursed for certain expenditures for nuclear fuel materials and thereby is permitted to delay interest payments on the nuclear fuel until the time when the fuel is actually burned. Prior to this arrangement, TVA's power customers were paying the financing costs for fuel which would be burned several years from now. By deferring the financing costs for nuclear fuel, bills to power consumers were about $56 million lower in fiscal year 1980 than would have been the case without the lease.

TVA's most successful conservation effort is the Home Insulation Program which provides free home energy audits and no-interest financing for weatherization. The program provided an estimated saving of 430 million killowatthours in 1980.

Energy Conservation

Throughout 1980, TVA's energy conservation programs continued to help Valley consumers combat the rising costs of energy. By reducing energy waste, the programs benefit not only ratepayers but the power system as well. Begun in 1977, TVA's conservation efforts involve weatherization, solar, and load management techniques.

Ratepayers are getting financial and technical assistance from many programs. The result? Often, lower utility bills due to increased energy efficiency of homes, businesses, and industries. For TVA, conservation means reduced demand for new generating facilities, and less need to operate the expensive fuel-oil-fired turbines or buy imported power during periods of peak usage. The programs are projected to save 5 to 10 billion kilowatthours annually by 1990.

Home Insulation Program

TVA's most successful conservation program to date is the Home Insulation Program. The largest in the Nation, the program provides free home energy audits and no-interest financing for weatherization measures. Homeowners, tenants, landlords, and mobile home residents are eligible for participation through any of TVA's 160 power distributors. By the end of September 1980, over 267,000 homes had been surveyed and over 115,000 customers had received loans averaging $1,000 each. The project goal is to weatherize over 500,000 homes to TVA standards by 1987.

Heat Pump Financing Program

A companion program to the Home Insulation Program, the Heat Pump program also encourages home energy savings. Low-interest loans for heat pump purchase and installation are available through any of the 119 distributors offering the program in the TVA service area. An electric heat pump is projected to save 50 percent of the electricity normally used by central electric resistance heat.

As of September 1980, almost 11,000 heat pump recommendations had been completed and approximately 4,300 loans had been made averaging a little over $3,000 each. TVA is expected to save $12 million on reduced energy supply costs as a result of the Heat Pump program.

Commercial and Industrial Conservation Programs

More than half of all TVA power is used by commercial and industrial facilities. To promote conservation by these customers, TVA in fiscal year 1980 conducted 2,048 free energy management surveys of C&I customers' facilities, identifying 8,705 opportunities for the elimination of energy waste. Implementation of all the recommendations for energy conservation would result in a capacity savings to TVA of 100 megawatts. Annual energy savings would be 223 million kilowatthours. Preliminary followup by TVA survey teams has indicated that customers have either implemented or planned to start 75 percent of the measures recommended.

In addition, TVA provides financing for improvements that conserve electrical energy in physical features or operations.

Residential Conservation Service

Planning continued in 1980 for TVA's role in the Residential Conservation Service (RCS). RCS is part of a nationwide effort to improve residential energy efficiency. Required by the National Energy Conservation Policy Act of 1978, the program involves all distributors with annual sales of 750 million kilowatthours or more. Thirteen of TVA's 160 distributors fall into this category—9 in Tennessee, 3 in Alabama, and 1 in Georgia.

Under RCS, free home energy surveys will be expanded. These surveys will in the future also yield useful information on potential for use of active and passive solar systems, and other methods and techniques that reduce energy waste.

Load Management Programs

Energy production costs vary from about one-tenth of a cent per kilowatthour for hydro power to nearly 10 cents per kilowatthour for oil-fired combustion turbines. In operating the power system efficiently and economically, TVA brings on the least expensive base load generation first and uses the more costly power plants last. Two major daily power peaks of usage are caused primarily by residential consumers. A major goal has been to design programs to aid in leveling those demands by lowering the peaks without inconveniencing the consumer.

One program—offered in 1980—cycles central air-conditioners on and off. The consumer will be virtually unaware of the effects, yet TVA will shave thousands of expensive kilowatts off the total power demand.

TVA is also implementing a 3-year test on thermal storage systems through eight distributors. In this program, thermal storage units store heat during power system offpeak hours and release that heat during peak hours to warm homes.

Solar Applications

Under the Solar Applications program, TVA is demonstrating the use of various renewable energy sources.

A program to place 1,000 solar water heaters in Memphis homes continued in 1980 with 743 systems being installed. Estimates are that customers can save up to 65 percent annually on their cost for heating water with the addition of a solar water heater.

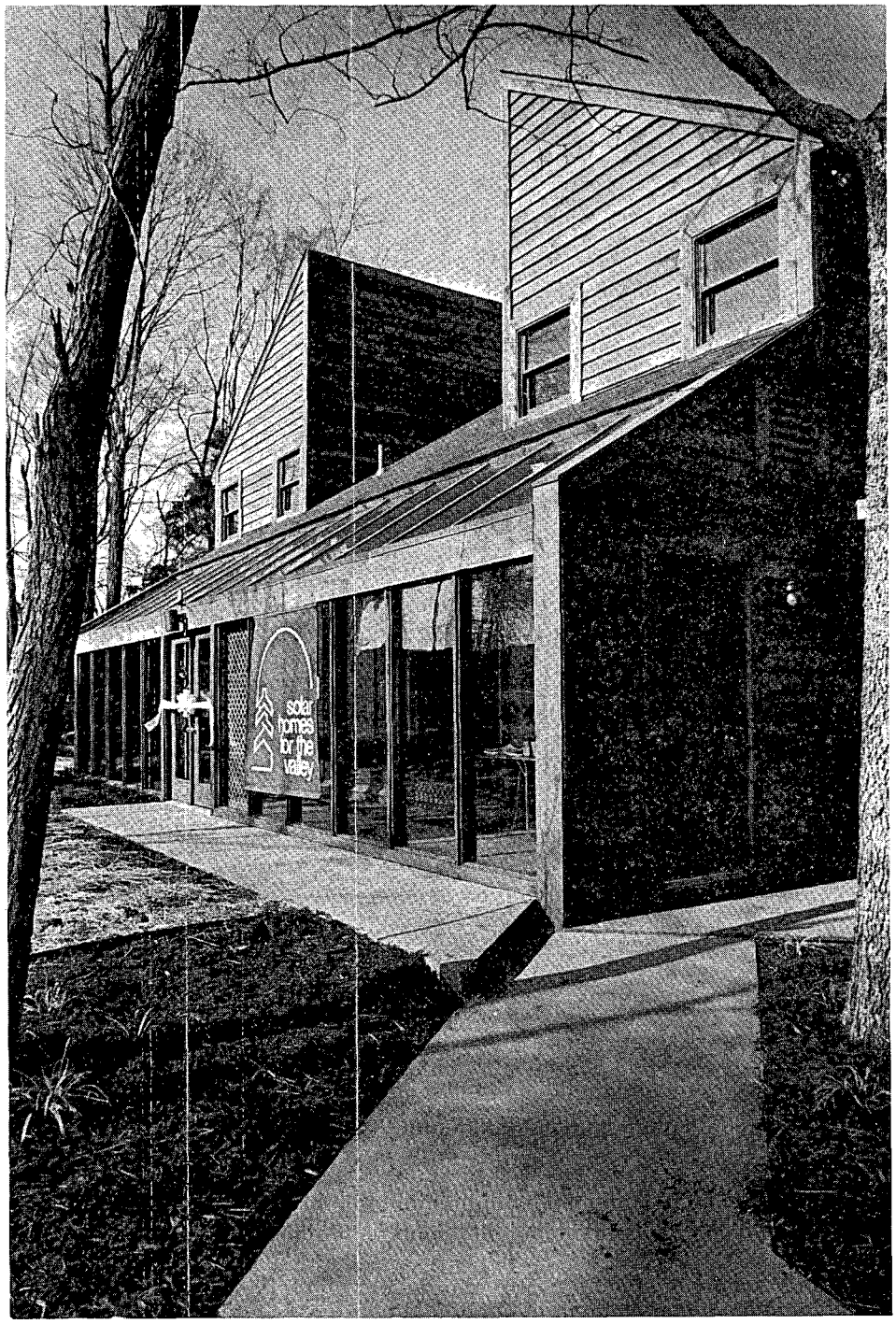
TVA's solar hot water programs were expanded to offer 10,000 domestic solar water heaters in Nashville by December 1983. A further extension of the program will provide another 1,000 solar water heaters for four counties in the rural Middle Tennessee area.

For customers who live in rural areas with access to wood, TVA is sponsoring a wood heater demonstration program that will provide users up to 50-percent reduction in heating costs, according to TVA estimates. Through this program, customers served by participating power distributors can receive a no-interest loan of up to $800 for the purchase and installation of an approved wood heater. Twenty-seven power distributors are involved in the Wood Heater program.

Under the Solar Homes for the Valley program, TVA constructed 34 passive solar homes in 1980, bringing the total to 41. Sited in areas of varying climate and terrain, 11 different houses were designed to incorporate passive solar energy techniques to provide maximum efficiency in energy use at a construction cost not significantly different from nonsolar homes.

During 1980, TVA's first modular solar home was opened as part of the Solar Modular Project. One hundred and thirty of the prefabricated homes, designed to use passive solar designs, will be located throughout the Tennessee Valley. The moderately priced homes are being designed and sold through private manufacturers.

TVA will demonstrate the energy savings and potential of solar applications for major office construction with its own proposed 1.3-million-square-foot Chattanooga Solar Office Complex. Combining solar techniques with utilization of computer waste heat, the solar-assisted building will cut typical energy costs by 70 percent.



TVA built 34 solar homes in 1980 to demonstrate the economic benefits of passive solar energy techniques.

Energy Demonstrations and Technology

Energy technologies must offer not only reliable service, but also be environmentally acceptable. Much of the research underway today is directed towards developing new and improved uses for coal—our most abundant domestic energy resource. Because coal presents difficult environmental problems when burned in conventional steam plants, researchers are developing new energy technologies that offer reliable and clean operation.

Atmospheric Fluidized Bed Combustion

In 1980, TVA continued development of atmospheric fluidized bed combustion technology (AFBC). AFBC is a promising, near-term alternative to conventional coal-fired plants. By burning coal and limestone together, sulfur pollutants are captured and other pollutants are greatly diminished. TVA's activities in AFBC took a step forward in 1980 with the commencement of construction of the 20MW AFBC pilot plant at the Shawnee Steam Plant reservation near Paducah, Kentucky. The pilot plant will be used to resolve many uncertainties that remain with this emerging technology. The pilot plant should be operational by the middle of 1982.

Fuel Cells

Another coal related technology under scrutiny by TVA is the fuel cell. Unlike conventional steam plants, fuel cells produce electricity through a chemical reaction that is similar to the storage battery. This past year, TVA began design plans for a phosphoric-acid fuel cell pilot plant that would be built at the ammonia-from-coal gasifier in Muscle Shoals, Alabama.

Environmental Controls

While alternative energy technologies like AFBC and fuel cells will offer many benefits, they will not replace conventional steam plants for many years to come. To protect the environment and generate electricity from burning coal, TVA is actively developing advanced environmental control technologies in cooperation with the Department of Energy and the Electric Power Research Institute.

The operation of the full-scale wet limestone scrubber at the Widows Creek Steam Plant, along with other activities, may lead to advanced flue gas desulfurization technologies that will be able to remove sulfur dioxide and produce a potentially usable byproduct.

The control of fine particulate emissions is to be tested by two developing technologies at Shawnee Steam Plant, a high-intensity ionizer and a pilot-scale electrotube facility at Shawnee.

TVA has also developed means of controlling power plant liquid effluents to protect ambient water resources. Concerns over coal-pile drainage and ash-pond leaching have evolved in the study. Results will hopefully enable TVA to design improved systems for controlling these pollutants better.

Energy from Waste

The development of new energy technologies and advanced environmental controls will directly improve the generation of electricity by TVA and other utilities in the country. In addition to these activities, TVA is developing means to make the most out of previously wasted resources through the waste management and waste heat utilization programs.

Waste management is the careful consideration of solid waste (garbage) planning for cities and communities in the Tennessee Valley region. Each year, more than 5.8 million tons of garbage are produced in the region. Most of this garbage is disposed of in landfills and ravines. Researchers are working to find better ways of using this waste.

A direct result of this effort is the cooperative program between TVA and the Sumner County Resource Authority to build a solid waste cogeneration facility. When completed, the facility will be able to process up to 200 tons of garbage each day. TVA is working with other communities in the region to design cost-effective and environmentally clean solid waste management plans.

Electric Transportation

TVA is also involved in the encouragement of electric transportation as a means of reducing the Nation's need for petroleum fuels. TVA's goal is to help make the large-scale use of electric vehicles compatible with utility and consumer requirements.

The widespread use of electric vehicles could enable TVA to make much more efficient use of existing generating facilities. Charging the vehicles' batteries would build offpeak load for the TVA system, adding to power revenues without requiring additional construction expenditures.

In the past year, TVA has evaluated the performance characteristics of almost 50 electric vehicles of many types and purposes. TVA is participating in joint electric vehicle programs sponsored by the Electric Power Research Institute and the Department of Energy.

Construction neared completion of an electric vehicle test facility near Chattanooga, Tennessee. The facility features a one-mile test track and is designed to meet national specifications for a primary electric vehicle demonstration site.

Electrification of Railroads

TVA is also exploring the possibility of demonstrating the electrification of railroads. The benefits in terms of reducing the Nation's dependence on foreign oil are substantial, and the technology for the program is available. The major benefit to TVA would be the potential for increased load on the system. There is also a possibility that TVA could maintain more constant shipping charges for coal by shipping on the completed system. The most probable route for the demonstration is the heavily used 500-mile stretch of track between Cincinnati and Atlanta.

In 1980, TVA worked with the railroads to explore financing and power supply proposals which might make the investment attractive and feasible for railroads and utilities.

Above—*Open pit mining operations continued at the Gas Hills, Wyoming project in 1980. TVA received almost 575,000 pounds of uranium concentrate from this project during the year.*

Right—*TVA is evaluating the performance of electric vehicles in an effort to reduce the Nation's dependence on foreign oil. The construction of an electric vehicle test facility near Chattanooga neared completion in 1980.*

Generating Capacity on September 30, 1980

TVA Hydro Plants	No. Units	Installed Capacity-kW
Apalachia	2	82,800
Blue Ridge	1	20,000
Boone	3	75,000
Chatuge	1	10,000
Cherokee	4	135,180
Chickamauga	4	120,000
Douglas	4	120,600
Fontana	3	238,500
Fort Loudoun	4	139,140
Fort Patrick Henry	2	36,000
Great Falls	2	31,860
Guntersville	4	115,200
Hiwassee	2	117,100
Kentucky	5	175,000
Melton Hill	2	72,000
Nickajack	4	100,350
Norris	2	100,800
Nottely	1	15,000
Ocoee #1	5	18,000
Ocoee #2	2	21,000
Ocoee #3	1	28,800
Pickwick	6	220,040
South Holston	1	35,000
Tims Ford	1	45,000
Watauga	2	57,600
Watts Bar	5	166,500
Wheeler	11	359,100
Wilbur	4	10,700
Wilson	21	629,840
Total	109	3,296,110

TVA Coal-Fired Plants	No. Units	Installed Capacity-kW
Allen	3	990,000
Bull Run	1	950,000
Colbert	5	1,419,750
Cumberland	2	2,600,000
Gallatin	4	1,255,200
John Sevier	4	846,500
Johnsonville	10	1,485,200
Kingston	9	1,723,250
Paradise	3	2,558,200
Shawnee	10	1,750,000
Watts Bar	4	240,000
Widows Creek	8	1,977,985
Total	63	17,796,085

TVA Nuclear Plants		
Browns Ferry	3	3,456,000

TVA Pumped Storage		
Raccoon Mountain	4	1,530,000

TVA Combustion Turbine Plants	No. Units	Installed Capacity-kW
Allen	20	620,800
Colbert	8	476,000
Gallatin	4	325,200
Johnsonville	16	1,088,000
Total	48	2,510,000
Alcoa Dams		
(12)		423,715
Corps of Engineers Dams (8)		853,000

Total System in Service	29,864,910

Plants Under Construction

In an effort to bring TVA's construction program into line with forecasts of load growth, four nuclear units were deferred in 1979. The units were deferred to reduce costs and, therefore, hold rate increases to a minimum. The four units which are presently deferred are under continual review and evaluation because of TVA's dual objectives of keeping costs and rates at an absolute minimum while at the same time providing an adequate and reliable power supply in support of the strong commitment to future economic growth of the region.

Units Under Construction

		Capacity-kW	Percent Complete*	Commercial Operation*
Sequoyah Nuclear Plant	Unit 1	1,221,000	100	10/80
	Unit 2	1,221,000	94	1/82 - 7/82
Watts Bar Nuclear Plant	Unit 1	1,270,000	84	5/82 - 11/82
	Unit 2	1,270,000	70	2/83 - 8/83
Bellefonte Nuclear Plant	Unit 1	1,332,000	69	12/84 - 12/85
	Unit 2	1,332,000	54	8/85 - 9/86
Hartsville Nuclear Plant	A-1	1,287,000	29	10/87 - 7/88
	A-2	1,287,000	21	7/88 - 4/89
Phipps Bend Nuclear Plant	Unit 1	1,287,000	14	9/88 - 2/89
Yellow Creek Nuclear Plant	Unit 1	1,375,000	15	4/87 - 4/88
Total additional capacity by 1990		**12,882,000**		

Deferred Units

Hartsville Nuclear Plant	B-1	1,287,000	17
	B-2	1,287,000	7
Phipps Bend Nuclear Plant	Unit 2	1,287,000	4
Yellow Creek Nuclear Plant	Unit 2	1,375,000	3

**Actual/Estimates September 1980.*

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

COOPERS & LYBRAND
CERTIFIED PUBLIC ACCOUNTANTS

A MEMBER FIRM OF
COOPERS & LYBRAND (INTERNATIONAL)

To the Board of Directors of
Tennessee Valley Authority:

We have examined the financial statements of *Tennessee Valley Authority* at September 30, 1980 and 1979 and for the years then ended which appear on pages 22 through 33 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, 1980 and 1979, 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, 1980 and 1979, 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 26, 1980

Balance Sheets

September 30, 1980 and 1979

Assets	Power program		All programs	
	1980	1979	1980	1979
	(Thousands)			
Property, Plant, and Equipment,				
(substantially all at original cost)				
Completed plant				
Multipurpose dams; note 1	$ 503,880	$ 496,488	$ 1,253,201	$ 1,120,750
Single-purpose dams	352,331	346,052	352,331	346,052
Steam production plants	2,754,449	2,634,519	2,754,449	2,634,519
Nuclear production plants	890,428	888,350	890,428	888,350
Other electric plant	2,139,924	2,071,199	2,139,924	2,071,199
Other plant	—	—	206,576	198,303
	6,641,012	6,436,608	7,596,909	7,259,173
Less accumulated depreciation and depletion; note 2	2,041,570	1,897,514	2,225,767	2,071,427
Completed plant, net	4,599,442	4,539,094	5,371,142	5,187,746
Construction and investigations in progress; note 3	7,702,771	5,832,368	7,880,321	6,063,741
Nuclear fuel	226,284	631,102	226,284	631,102
Less accumulated amortization and allowance for disposal of spent fuel; note 2	215,819	183,033	215,819	183,033
Nuclear fuel, net	10,465	448,069	10,465	448,069
Total property, plant, and equipment	12,312,678	10,819,531	13,261,928	11,699,556
Current Assets				
Cash	3,060	1,902	179,953	114,930
Accounts and loans receivable	531,306	421,573	545,759	434,272
Inventories, principally at average cost	745,039	610,991	766,661	628,637
Total current assets	1,279,405	1,034,466	1,492,373	1,177,839
Deferred Charges				
Unamortized debt issue and reacquisition expense; note 2	8,254	8,788	8,254	8,788
Energy conservation costs; note 2	18,883	—	18,883	—
Mine and mill development costs; note 2	263,404	196,115	263,404	196,115
Total deferred charges	290,541	204,903	290,541	204,903
Total assets	$13,882,624	$12,058,900	$15,044,842	$13,082,298

Liabilities and Capitalization	Power program		All programs	
	1980	1979	1980	1979
	(Thousands)			
Proprietary Capital				
Appropriation investment; note 4				
Congressional appropriations	$ 1,390,675	$ 1,384,043	$ 3,533,118	$ 3,310,446
Transfers of property from other Federal agencies	23,808	23,644	57,785	57,352
	1,414,483	1,407,687	3,590,903	3,367,798
Less repayments to General Fund of the U.S. Treasury; note 5	515,059	495,059	556,774	536,769
Appropriation investment	899,424	912,628	3,034,129	2,831,029
Retained earnings reinvested in the power program	1,418,223	1,295,631	1,418,223	1,295,631
Accumulated net expense of nonpower programs	—	—	1,035,226*	949,294*
Total proprietary capital	2,317,647	2,208,259	3,417,126	3,177,366
Long-Term Debt				
Principal; note 6	9,025,000	6,625,000	9,025,000	6,625,000
Less unamortized discount; note 2	5,675	6,050	5,675	6,050
Total long-term debt	9,019,325	6,618,950	9,019,325	6,618,950
Current Liabilities				
Short-term debt; note 6				
U.S. Treasury	150,000	150,000	150,000	150,000
Federal Financing Bank	1,635,000	1,925,000	1,635,000	1,925,000
Long-term debt due within one year	—	300,000	—	300,000
Short-term debt	1,785,000	2,375,000	1,785,000	2,375,000
Accounts payable	523,493	668,396	560,644	702,248
Employees' accrued leave	27,485	22,461	45,297	37,705
Payrolls accrued	24,345	26,322	32,121	31,517
Interest accrued	185,329	139,512	185,329	139,512
Total current liabilities	2,545,652	3,231,691	2,608,391	3,285,982
Commitments; note 3				
Total liabilities and capitalization	$13,882,624	$12,058,900	$15,044,842	$13,082,298

Notes 1 through 9 following the exhibits are an integral part of the financial statements.

**Deduct*

Net Income and Retained Earnings
Power Program

For the years ended September 30, 1980 and 1979

	1980		1979	
	kWh	Amount	kWh	Amount
		(Thousands)		
Operating Revenues				
Sales of electric energy				
Municipalities and cooperatives	78,682,740	$2,130,799	75,936,357	$1,810,848
Federal agencies	16,922,647	429,137	16,169,981	368,741
Industries	23,862,225	647,523	24,912,785	598,180
Electric utilities	707,890	20,666	171,642	4,722
Interdivisional	394,696	12,326	497,510	12,813
Revenue credit due customers; note 8	—	57,000*	—	163,000*
Total sales of electric energy	120,570,198	3,183,451	117,688,275	2,632,304
Rents		19,175		23,483
Discounts and penalties		194		108
Other miscellaneous revenues		1,459		994
Total operating revenues		3,204,279		2,656,889
Operating expenses				
Production				
Fuel		1,301,221		1,108,674
Other		511,344		485,332
Transmission		34,355		31,875
Customer accounts		818		767
Demonstration of power use		14,181		12,114
Administrative and general		116,698		93,556
Payments in lieu of taxes		113,569		100,024
Social security taxes		17,182		14,633
Provision for depreciation		169,032		160,573
Total operating expenses		2,278,400		2,007,548
Operating income		925,879		649,341
Other income and deductions				
Interest income		8,874		740
Other, net		6,597*		7,959*
Total other income and deductions		2,277		7,219*
Income before interest charges		928,156		642,122
Interest charges				
Interest on long-term debt		673,296		478,986
Other interest expense		207,563		179,153
Allowance for borrowed funds used during construction; note 2		154,666*		153,749*
Amortization of long-term debt discount and expense; note 2		958		995
Net interest charges		727,151		505,385
Net Income		201,005		136,737
Return on appropriation investment; note 5		78,413		68,868
Increase in retained earnings reinvested		122,592		67,869
Retained earnings reinvested at beginning of period		1,295,631		1,227,762
Retained earnings reinvested at end of period		$1,418,223		$1,295,631

Notes 1 through 9 following the exhibits are an integral part of the financial statements.

**Deduct*

Net Expense and Accumulated Net Expense Nonpower Program

For the years ended September 30, 1980 and 1979

	1980	1979
	(Thousands)	
Regional Resources Development		
Navigation operations	$ 7,478	$ 7,709
System flood control operations	6,448	6,016
Recreation development	5,687	4,747
Local economic development	2,468	3,209
Environmental protection of public lands and water	870	—
Quality growth management	778	—
Rivers program	270	—
Regional water quality management	1,648	1,815
Fisheries and wildlife resources development	1,505	1,459
Environmental education	713	493
Valley agricultural development	3,683	2,720
Forest resources development	1,381	2,247
Land reclamation	458	2,041
Community health services	845	606
Regional planning	657	775
Townlift community improvement	863	750
Manpower planning	862	764
Community energy	387	—
Special opportunities cities and counties program	1,319	484
Minority economic development	1,747	677
Local flood damage prevention operations	4,898	8,869
Other regional resources development projects	1,247	825
Net expense of regional resources development	46,212	46,206
Fertilizer development; note 2		
Research and development	14,610	11,065
Fertilizer introduction		
Fertilizer industry demonstrations	3,106	2,737
Farm test demonstrations outside the Valley	1,321	1,126
Net expense of fertilizer introduction	4,427	3,863
Developmental production		
Cost of products distributed	31,394	28,716
General expenses		
Loss on retirements of manufacturing plant and equipment, net	444	417
Gain on sale of phosphate reserves, net	313*	71*
Administrative and general	218	226
Other	1,427	890
Total general expenses	1,776	1,462
Total production expense	33,170	30,178
Less transfers and sales of products		
Transfers to other TVA programs, at market prices	24,473	21,687
Direct sales	483	151
Total transfers and sales	24,956	21,838
Net expense of developmental production	8,214	8,340
Net expense of fertilizer development	27,251	23,268
National energy demonstrations	4,375	4,698
Land Between The Lakes operations	6,158	5,547
Valley mapping and remote sensing	977	1,012
Other expense, net	959	1,188
Net expense	85,932	81,919
Accumulated net expense at beginning of period	949,294	867,375
Accumulated net expense at end of period	$1,035,226	$949,294

Notes 1 through 9 following the exhibits are an integral part of the financial statements.

**Deduct*

Changes in Financial Position

For the years ended September 30, 1980 and 1979

	Power program		All programs	
	1980	1979	1980	1979
	(Thousands)			
Source of Funds				
Program sources				
Net power income	$ 201,005	$ 136,737	$ 201,005	$ 136,737
Items not requiring funds; note a	22,807	67,707	22,807	67,707
Funds from power operations	223,812	204,444	223,812	204,444
Sale of power assets, principally nuclear fuel in 1980	702,114	2,669	702,114	2,669
Funds from power program; note b	925,926	207,113	925,926	207,113
Net expense of nonpower programs			85,932*	81,919*
Add items not requiring funds; note a			9,595	9,106
Funds used in nonpower operations			76,337*	72,813*
Sale of nonpower facilities			459	362
Funds used in nonpower programs			75,878*	72,451*
Debt sources				
Long-term bonds				
Issues	2,400,000	1,500,000	2,400,000	1,500,000
Redemptions	300,000*	100,000*	300,000*	100,000*
Short-term notes				
Issues	7,312,000	7,795,000	7,312,000	7,795,000
Redemptions	7,602,000*	7,390,000*	7,602,000*	7,390,000*
Total debt sources	1,810,000	1,805,000	1,810,000	1,805,000
Other sources				
Congressional appropriations	928	500	222,673	154,531
Property transfers	163	174	432	765
Total other sources	1,091	674	223,105	155,296
Total source of funds	$2,737,017	$2,012,787	$2,883,153	$2,094,958
Disposition of funds				
Expended for plant and equipment, excluding allowance for borrowed funds used	$2,212,560	$1,797,320	$2,299,425	$1,860,624
Less:				
Depreciation and depletion allowances charged to construction clearing accounts and other asset categories	6,128	4,456	8,663	6,874
Cost of removing retired facilities and salvage from retained materials	2,875*	2,487	3,529*	2,321
	2,209,307	1,790,377	2,294,291	1,851,429
Payments to U.S. Treasury; note 5				
Return on appropriation investment	78,413	68,868	78,413	68,868
Repayments of appropriation investment	20,000	20,000	20,005	20,000
	98,413	88,868	98,418	88,868
Deferred charges				
Mine and mill development cost	67,289	119,627	67,289	119,627
Energy conservation cost	20,982	—	20,982	—
Debt issue expense	48	30	48	30
	$ 88,319	$ 119,657	$ 88,319	$ 119,657

**Deduct*

Changes in Financial Position Continued

For the years ended September 30, 1980 and 1979

Disposition of Funds Continued	Power program		All programs	
	1980	1979	1980	1979
	(Thousands)			
Changes in working capital (increase or decrease*)				
Cash	$ 1,158	$ 36,347*	$ 65,023	$ 13,502*
Accounts and loans receivable	109,733	93,538	111,487	97,750
Inventories	134,048	251,489	138,024	254,550
	244,939	308,680	314,534	338,798
Less other current liabilities (excluding short-term debt)	96,039*	294,795	87,591*	303,794
	340,978	13,885	402,125	35,004
Total disposition of funds	$2,737,017	$2,012,787	$2,883,153	$2,094,958

Notes:

a. Items not requiring funds:

	Power		Nonpower	
	1980	1979	1980	1979
	(Thousands)			
Provision for depreciation	$169,032	$160,573	$9,464	$8,760
Provision for depletion	—	603	—	—
Provision for depreciation of mining equipment	—	3,618	—	—
Amortization of nuclear fuel	—	47,708	—	—
Net loss on retirements and disposals of property, plant, and equipment	4,499	7,959	131	346
Amortization of energy conservation cost	2,098	—	—	—
Allowance for disposal of spent fuel	886	—	—	—
Amortization of long-term debt discount and expense	958	995	—	—
Allowance for borrowed funds used during construction	154,666*	153,749*	—	—
	$ 22,807	$ 67,707	$9,595	$9,106

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

	Year ended September 30	
	1980	1979
	(Thousands)	
Funds from power program	$ 925,926	$207,113
Add back interest charges	880,859	658,139
Net power proceeds	$1,806,785	$865,252

Notes 1 through 9 following the exhibits are an integral part of the financial statements.

**Deduct*

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 $1,253,201,000 in completed multipurpose dams at September 30, 1980, is classified as follows:

	Investment		
	Direct	Multiple-use	Total
		(Thousands)	
Power	$320,374	$183,506	$ 503,880
Navigation	160,610	143,558	304,168
Flood control	65,364	165,525	230,889
Recreation	2,204	97,821	100,025
Local economic development	142	114,097	114,239
Total	$548,694	$704,507	$1,253,201

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

Plant additions and retirements—Additions to plant are recorded at cost, which includes material, labor, overhead, and allowance for funds used which is applicable to major generating facilities. The costs of generation during preliminary operations prior to commercial acceptance including amortization of nuclear fuel less credit for the fair value of energy generated are also included in the recorded costs 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 a composite basis. Rates of depreciation, including decommissioning costs of nuclear units, are derived from engineering studies of useful life and are reviewed each year. Depletion of coal land and landrights 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 is followed in the power program. In accordance with the TVA Board of Directors criteria for establishing wholesale power rates, the allowance is applicable only to the construction of major generating facilities and limited to the amount of the sum of depreciation and other current period noncash charges less the amount of the repayment of the appropriation investment as prescribed in section 15d of the TVA Act. The method used provides for the calculation each month of the interest on the most recent debt issues that are equivalent to the average balance of construction work in progress for major generating facilities subject to the limitation described. The equivalent average capitalization rate for fiscal years 1980 and 1979 was 2.98 percent and 3.95 percent, respectively.

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—Nuclear fuel is obtained directly from vendors and through contractual arrangements for mining, milling, and fabrication of raw materials obtained from land leased by TVA. During fiscal year 1980, TVA entered into an agreement whereby it will sell and lease back nuclear fuel on hand except prior to the milling stage or in a spent condition. The lease meets the criteria of a capital lease as defined by statement of Financial Accounting Standards No. 13 but is not accounted for as such in accordance with the ratemaking process. Certain nuclear fuel included in the balance sheet at September 30, 1980, represents acquisition transactions that will be included in the sale-lease agreement during ensuing months. The nuclear fuel costs are charged to operations on a unit of production basis in amounts equal to lease payments (the cost of fuel burned plus finance charges) and an allowance for spent nuclear fuel disposal.

Energy conservation cost—Beginning in fiscal year 1980, certain energy conservation program costs are deferred and charged to operations over a 5-year period.

Mine and mill development costs—Deferred mine and mill development costs are assigned to coal inventory and nuclear fuel on a unit of production basis determined in relation to estimated ore reserves.

Operating revenues—Revenues from the sale of electric energy are recorded only when billed. Revenue credits due customers are recorded in accordance with authorization of the Board of Directors.

Borrowing expenses—Issue and reacquisition expenses and discounts 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 the Federal Financing Bank are amortized over a 5-year period except that amounts under $6,000 are expensed as incurred.

Research and development—Research and development costs are expensed as incurred (approximately $61,800,000 in 1980 and $40,735,000 in 1979) 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 1981 are $2,475,063,000 for power projects and $60,697,000 for multipurpose and nonpower projects. Substantial commitments have been incurred for these projects.

At September 30, 1980, TVA had sold and leased back approximately $689 million of nuclear fuel. Estimated lease payments (exclusive of finance charges) are estimated to be: 1981, $65 million; 1982, $131 million; 1983, $206 million; 1984, $278 million; and 1985, $406 million. These estimates include additional sale-lease transactions. Lease payments charged to operations during fiscal year 1980 for leased nuclear fuel aggregated $45 million.

At September 30, 1980, the aggregate minimum gross rental commitments of TVA under all noncancelable operating leases are as follows:

1981	$18,580,000
1982	16,034,000
1983	15,046,000
1984	14,439,000
1985	8,517,000
and thereafter	64,813,000

The total rentals charged to power operating expenses and other operating clearing accounts for the years ending September 30, 1980, and 1979, amounted to approximately $23,159,000 and $20,128,000, respectively.

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, 1980, and 1979, were as follows:

	Power program		All programs	
	1980	1979	1980	1979
	(Thousands)			
Congressional appropriations, net	$ 6,632	$ 322	$ 222,672	$ 154,531
Transfers of property from other Federal agencies	164	174	432	765
	6,796	496	223,104	155,296
Less repayments to General Fund of the U.S. Treasury	20,000	20,000	20,005	20,000
Increase or decrease* for the period	13,204*	19,504*	203,099	135,296
Balance, beginning of period	912,628	932,132	2,831,029	2,695,733
Balance, end of period	$899,424	$912,628	$3,034,128	$2,831,029

*Deduct

Appropriations totaling $287,563,000 were made by Public Law No. 96-367, approved October 1, 1980, for the fiscal year beginning October 1, 1980.

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	Total
		(Thousands)	
Total to September 30, 1979	$1,033,771	$310,000	$1,343,771
Year ended September 30, 1980	78,413	20,000	98,413
	$1,112,184	$330,000	$1,442,184

For fiscal year 1981 the required payments will be $86,417,000 as a return on the appropriation investment at the computed average interest rate of 9.608 percent and $20,000,000 as a repayment, a total of $106,417,000.

In addition to the payments from net power proceeds, $5,000 of nonpower proceeds was paid to the U.S. Treasury in fiscal year 1980 under the provisions of Section 26 of the TVA Act. This brought the total payments from nonpower proceeds to $41,715,000.

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 $30 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, 1980, consist 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
8.05%	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
8%	1977 Series C, due October 31, 2002 (FFB)	400,000
8.375%	1978 Series A, due January 31, 2003 (FFB)	400,000
9.296%	1979 Series A, due February 28, 1989 (FFB)	500,000
9.155%	1979 Series B, due May 31, 1987 (FFB)	500,000
9.195%	1979 Series C, due August 31, 2004 (FFB)	500,000
10.545%	1979 Series D, due October 31, 2004 (FFB)	400,000
11.225%	1980 Series A, due January 31, 2005 (FFB)	500,000
12.955%	1980 Series B, due March 31, 2005 (FFB)	500,000
10.475%	1980 Series C, due June 30, 2005 (FFB)	500,000
10.890%	1980 Series D, due August 31, 2005 (FFB)	500,000
	Total long-term debt	9,025,000
Short-term debt		
	U.S. Treasury	150,000
	Federal Financing Bank (FFB)	1,635,000
	Total short-term debt	1,785,000
		$10,810,000

During fiscal years 1980 and 1979, the maximum amount of short-term borrowings outstanding was $2,122,000,000 and $2,166,000,000, respectively, and the average amount (and weighted average interest rates) of such borrowings was approximately $1,790,000,000 (11.6 percent) and $1,920,000,000 (9.3 percent), respectively.

A $500 million bond issue, 12.425 percent 1980 Series E, due November 30, 2005, was sold to the Federal Financing Bank in November 1980.

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 $59,978,000 in 1980 and $48,823,000 in 1979, including amortization of unfunded prior service costs over the average future careers of active members. The actuarially computed value of vested benefits of the plan as of September 30, 1979, the latest actuarial valuation date, exceeded the actuarially computed pension fund assets by $13,000,000, but was $20,612,000 less than the market value of pension fund assets.

8. Revenue credit due customers—On September 29, 1980, the TVA Board of Directors authorized that the amount received from power sales exceeding operating expenses and an interest coverage ratio of 1.05 would be returned to customers as determined to be appropriate. The revenue credit for fiscal year 1980 was $57,000,000. In fiscal year 1979, the Board set aside $163,000,000 for return to customers which provided for about 1.0 interest coverage ratio.

9. Litigation—Six citizens' suits were filed in June 1977 under the Clean Air Act alleging that sulfur dioxide emissions from ten of TVA's coal-fired steam plants and the particulate emissions from seven coal-fired plants violate State emission standards. Five of the cases were consolidated in the United States District Court for the Middle District of Tennessee; the other was filed in the United States District Court for the Northern District of Alabama. Plaintiffs asked that the courts order TVA to comply with the applicable emission standards as expeditiously as possible. In addition, the State of Alabama specifically asked the court to restrict operation of Widows Creek and Colbert Steam Plants until final compliance is achieved and assess a State penalty of $10,000 per day per violation. Proposed consent decrees were agreed to by the parties in December 1978 and presented to the courts for approval. The proposed decrees specify compliance schedules to control both sulfur dioxide and particulate emissions at TVA steam plants and provide for stipulated daily penalties if TVA does not meet these schedules. They waive any TVA liability for penalties and fines for past violations. The reference in the decrees as originally drafted to a Cumberland Steam Plant scrubber project and activities in lieu of penalties has been deleted, based on new air quality information. On October 15, 1979, the Alabama district court entered the decree covering the Widows Creek and Colbert plants. Approval of the Tennessee/Kentucky proposed decree is still pending before the court. Its entry is being opposed by a group of distributors of TVA power.

As originally drafted, the proposed Tennessee/Kentucky decree specified that TVA would install magnesium scrubbers at its Johnsonville Steam Plant as the compliance strategy to achieve a 3.4-pound-per-million Btu's sulfur dioxide emissions limitation. However, in August 1980 TVA proposed to the plaintiffs that the agreement be modified to delete the use of scrubbers at Johnsonville and that low-sulfur coal be utilized as the compliance strategy for the plant. The plantiffs are presently reviewing this proposal which would result in substantial capital cost savings and savings every year in lower operating expenses. While the settlement as submitted to the courts waives TVA's liability for penalties and fines for past violations, TVA is still potentially subject to the mandatory noncompliance penalties under Section 120 of the Clean Air Act Amendments of 1977 which will be levied separate and apart from this action. EPA has promulgated final regulations implementing section 120. These final regulations provide for calculation of penalties from the date of receipt of a notice of violation until compliance is achieved and do not consider preceding periods of noncompliance. Under EPA regulations, notices of violation will be issued to noncomplying sources in phases commencing no sooner than January 1, 1981. It is EPA's stated policy to issue notices first to those sources not in compliance with approved compliance schedules. When TVA would be issued such a notice is unknown, and it is therefore, impossible to calculate the amount of penalties TVA might be assessed. Petitions for review of EPA's section 120 regulations have been filed with the Circuit Court of Appeals for the District of Columbia by several parties, including TVA. It is TVA's position that under the Clean Air Act no penalties are due.

On November 18, 1977, TVA filed antitrust suits against 10 foreign uranium producers and 3 domestic firms, one of which was subsequently dropped as a party. The complaints were filed in United States District Courts in Chattanooga, Denver, and

New York City, and alleged unlawful agreements among the defendants to fix uranium prices and allocate world uranium markets which resulted in damages to TVA in an amount which has not yet been precisely determined. The cases were consolidated in Chicago for pretrial purposes by the Judicial Panel on Multidistrict Litigation. The consolidated proceeding is being coordinated with the *Westinghouse* v. *Rio Algom Ltd., et al.* antitrust litigation currently pending in Chicago. Discovery is now underway. Defaults have been entered by the clerk against certain of the foreign defendants who did not appear, including Rio Algom Ltd. (Rio). Rio has sued TVA in Canada for $2.2 billion for alleged breach of the same contract which is involved in TVA's suit against Rio and which TVA has asked the court to find void. In TVA's opinion there is little likelihood of a recovery by Rio.

In a suit brought by the Attorney General of Alabama, the United States District Court for the Northern District of Alabama ruled that Section 8(a) of the TVA Act requires TVA to maintain its "headquarters" in the immediate vicinity of Muscle Shoals, Alabama. TVA has appealed the decision, and the district court has stayed, pending the appeal, an injunction which requires TVA to relocate its "headquarters" from Knoxville, Tennessee, to Muscle Shoals. The case was argued before the United States Court of Appeals for the Fifth Circuit on June 11, 1980. The Court has not issued its decision.

A residential electric consumer of the Memphis Light, Gas, and Water Division (Memphis) filed a class action suit against it and its governing Board in the Chancery Court of Shelby County, Tennessee, on June 9, 1978. Plaintiff claimed that the operation of the fuel cost and purchased power automatic adjustment formula then contained in the TVA resale rate schedule applied to him and his class violates the Fourteenth Amendment's due process clause and the Tennessee statutes which require rate changes by Memphis to receive prior approval by the Memphis City Council. In addition to declaratory and injunctive relief, plantiff seeks a judgment for over $110 million allegedly collected by Memphis under the automatic adjustment formula since 1974. The case was removed to Federal court, TVA was joined as a party, and plantiff amended his complaint to charge TVA with a violation of the Fifth Amendment's due process clause on the same facts. The court granted judgment on the pleadings for TVA and Memphis, and the case is now pending an appeal before the United States Court of Appeals for the Sixth Circuit. In TVA's opinion the judgment should be affirmed.

A corporation which purchased electricity directly from TVA filed suit in the United States District Court for the Eastern District of Tennessee against TVA on September 17, 1980. The suit seeks a declaratory judgment that certain provisions of TVA's standard industrial power contract with the plantiff, including the minimum bill provision, are void. No monetary recovery is sought, and TVA has filed a counterclaim for the amount of minimum bills and other charges so far unpaid. TVA believes the court will uphold the provisions of the power contract at issue.

Operating Statistics

Power Earnings (*Millions*)

Operating Revenues	1980	1979	1978	1977[a]	1976	1975
Sales of electric energy						
Municipalities and cooperatives	$2,130.8	$ 1,810.9	$1,540.1	$1,238.3	$1,057.4	$ 737.2
Federal agencies	429.2	368.7	305.8	322.6	300.1	182.5
Industries	647.5	598.2	456.0	355.7	303.6	227.6
Electric utilities	20.7	4.7	3.9	2.9	1.9	1.6
Interdivisional	12.3	12.8	6.5	5.6	8.0	6.7
Revenue credit due customers note 8	57.0*	163.0*	—	—	—	—
Total sales of electric energy	3,183.5	2,632.3	2,312.3	1,925.1	1,671.0	1,155.6
Rents and other miscellaneous revenues	20.8	24.6	37.8	41.6	21.5	20.7
Total operating revenues	3,204.3	2,656.9	2,350.1	1,966.7	1,692.5	1,176.3
Operating Expenses						
Production	1,812.5	1,594.0	1,539.9	1,309.2	1,161.5	750.8
Transmission	34.4	31.9	27.5	27.6	24.6	22.2
Customer accounts	.8	.8	.7	.7	.6	.5
Demonstration of power use	14.2	12.1	4.3	2.1	1.4	1.3
Administrative and general	116.7	93.6	81.6	60.0	48.6	34.0
Payments in lieu of taxes	113.6	100.0	79.9	68.2	48.4	36.8
Social security taxes	17.2	14.6	11.7	8.7	6.7	5.2
Depreciation	169.0	160.6	150.4	138.4	122.0	110.3
Total operating expenses	2,278.4	2,007.6	1,896.0	1,614.9	1,413.8	961.1
Operating income	925.9	649.3	454.1	351.8	278.7	215.2
Other Income and Deductions	2.3	7.2*	.3	1.4*	.3*	.2*
Income before interest charges and extraordinary item	928.2	642.1	454.4	350.4	278.4	215.0
Interest Charges						
Interest on long-term debt, other interest expense, and amortization of long-term debt discount and expense	881.8	659.1	486.8	379.2	292.4	229.0
Allowance for borrowed funds	154.6*	153.7*	249.0*	178.6*	140.0*	117.4*
Net interest charges	727.2	505.4	237.8	200.6	152.4	111.6
Income before extraordinary item	201.0	136.7	216.6	149.8	126.0	103.4
Extraordinary Item	—	—	—	—	—	—
Net income	201.0	136.7	216.6	149.8	126.0	103.4
Return on appropriation investment	78.4	68.9	61.7	64.0	65.0	71.4
Increase in retained earnings	122.6	67.8	154.9	85.8	61.0	32.0
Retained earnings reinvested at beginning of period	1,295.6	1,227.8	1,072.9	987.1	898.4	866.4
Retained earnings reinvested at end of period	$1,418.2	$ 1,295.6	$1,227.8	$1,072.9	$ 959.4	$ 898.4

**Deduct*
[a]Does not include transition period July-September 1976.

Fiscal Years								
1974	1973	1972	1971	1970	1969	1968	1967	1966
$556.1	$476.3	$415.3	$379.2	$285.5	$222.2	$197.2	$172.0	$158.2
121.5	103.2	73.3	61.9	59.4	63.6	78.9	83.9	84.0
179.8	144.7	124.3	125.0	106.0	92.2	84.2	79.6	71.5
1.2	.8	6.3	10.1	7.6	7.3	8.6	10.1	7.9
5.0	4.0	3.4	3.1	3.0	2.8	2.7	3.1	3.0
—	—	—	—	—	—	—	—	—
863.6	729.0	622.6	579.3	461.5	388.1	371.6	348.7	324.6
20.0	20.3	19.2	18.7	18.1	15.2	12.1	2.4	2.2
883.6	749.3	641.8	598.0	479.6	403.3	383.7	351.1	326.8
494.2	408.7	325.6	306.1	246.1	210.3	191.1	187.8	170.4
20.8	18.9	17.8	16.9	15.1	14.3	13.9	12.9	12.4
.5	.5	.4	.4	.3	.3	.2	.2	.2
1.3	1.3	1.2	1.2	1.1	1.0	1.0	.9	.8
29.9	27.4	24.0	22.0	18.0	15.6	14.4	13.3	12.1
31.1	27.3	25.7	20.0	16.1	14.5	13.1	11.9	10.5
4.6	3.8	3.2	2.9	2.4	2.2	1.8	1.7	1.2
97.1	89.5	83.4	80.0	75.1	71.6	70.7	65.7	62.6
679.5	577.4	481.3	449.5	374.2	329.8	306.2	294.4	270.2
204.1	171.9	160.5	148.5	105.4	73.5	77.5	56.7	56.6
.4	.4	.1*	.1	—	—	—	—	—
204.5	172.3	160.4	148.6	105.4	73.5	77.5	56.7	56.6
184.4	139.3	100.3	77.7	62.4	38.8	26.5	19.7	13.9
86.0*	73.4*	52.0*	48.1*	31.6*	16.0*	8.1*	3.7*	5.2*
98.4	65.9	48.3	29.6	30.8	22.8	18.4	16.0	8.7
106.1	106.4	112.1	119.0	74.6	50.7	59.1	40.7	47.9
—	—	—	—	—	—	10.3*	—	—
106.1	106.4	112.1	119.0	74.6	50.7	48.8	40.7	47.9
63.4	53.7	55.8	65.2	57.6	53.1	46.8	47.1	43.9
42.7	52.7	56.3	53.8	17.0	2.4*	2.0	6.4*	4.0
823.7	771.0	714.7	660.9	643.9	646.3	644.3	650.7	646.7
$866.4	$823.7	$771.0	$714.7	$660.9	$643.9	$646.3	$644.3	$650.7

Net Power Assets

	At September 30				At June 30	
Net Assets	1980	1979	1978	1977	1976	1975
Completed plant	$ 6,641.0	$ 6,436.6	$5,865.2	$5,614.3	$5,017.0	$4,778.6
Less accumulated depreciation	2,041.6	1,897.5	1,746.1	1,609.3	1,458.9	1,344.4
Net completed plant	4,599.4	4,539.1	4,119.1	4,005.0	3,558.1	3,434.2
Construction in progress	7,702.8	5,832.3	4,586.6	3,280.2	2,470.9	1,714.2
Nuclear fuel	10.5	448.1	393.0	299.6	227.3	169.0
Inventories	745.0	611.0	359.5	373.0	377.4	273.2
Other current assets less other current liabilities	226.3*	433.2*	195.6*	131.5*	290.6*	47.6*
Deferred charges, net	296.2	210.9	92.3	53.9	17.3	11.2
Total	$13,127.6	$11,208.2	$9,354.9	$7,880.2	$6,360.4	$5,554.2
Derived From						
U.S. Treasury funds, gross	$ 1,479.6	$ 1,472.8	$1,472.3	$1,472.5	$1,471.1	$1,470.9
Less Treasury funds repaid	580.2	560.2	540.2	520.2	475.1	475.1
Net U.S. Treasury funds	899.4	912.6	932.1	952.3	996.0	995.8
Long-term debt	9,025.0	6,625.0	5,425.0	4,725.0	3,575.0	2,875.0
Short-term notes payable to U.S. Treasury	150.0	150.0	150.0	150.0	150.0	150.0
Short-term debt payable to others	1,635.0	2,225.0	1,620.0	980.0	680.0	635.0
Advances and contributions	—	—	—	—	—	—
Retained earnings	1,418.2	1,295.6	1,227.8	1,072.9	959.4	898.4
Total	$13,127.6	$11,208.2	$9,354.9	$7,880.2	$6,360.4	$5,554.2

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*

1974	1973	1972	1971	1970	1969	1968	1967	1966
$4,061.9	$3,820.5	$3,404.4	$3,317.9	$3,202.9	$2,977.3	$2,900.7	$2,792.5	$2,602.6
1,242.4	1,156.2	1,075.4	998.0	924.5	856.0	789.3	727.2	671.9
2,819.5	2,664.3	2,329.0	2,319.9	2,278.4	2,121.3	2,111.4	2,065.3	1,930.7
1,552.0	1,318.6	1,294.3	822.4	481.9	386.4	216.3	150.0	203.5
129.9	93.1	63.9	41.5	24.8	13.2	—	—	—
128.7	140.8	109.3	83.1	37.5	44.2	51.5	44.9	32.4
22.6	17.4*	26.3*	34.9*	16.6	2.2	3.6	23.8	7.3
23.9	15.0	11.5	10.0	6.8	6.9	5.1	3.3	2.5
$4,676.6	$4,214.4	$3,781.7	$3,242.0	$2,846.0	$2,574.2	$2,387.9	$2,287.3	$2,176.4
$1,470.3	$1,469.9	$1,470.0	$1,466.4	$1,463.5	$1,462.0	$1,461.0	$1,455.2	$1,455.1
455.1	435.1	415.2	395.2	375.2	360.1	345.1	330.1	315.1
1,015.2	1,034.8	1,054.8	1,071.2	1,088.3	1,101.9	1,115.9	1,125.1	1,140.0
2,125.0	1,775.0	1,225.0	675.0	675.0	375.0	275.0	215.0	145.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
570.0	480.0	630.0	680.3	321.0	352.7	250.0	202.2	140.0
—	.9	.9	.8	.8	.7	.7	.7	.7
866.4	823.7	771.0	714.7	660.9	643.9	646.3	644.3	650.7
$4,676.6	$4,214.4	$3,781.7	$3,242.0	$2,846.0	$2,574.2	$2,387.9	$2,287.3	$2,176.4

System Input, System Output

(Millions of Kilowatthours)

System Input	1980	1979	1978	1977	1976
System generation					
Hydro					
TVA plants	16,640	15,731	15,501	14,318	14,607
ALCOA plants	2,313	2,243	2,015	1,949	2,048
Cumberland plants	3,117	3,376	3,178	1,930	2,542
Total hydro	22,070	21,350	20,694	18,197	19,197
Pumped-storage[a]	(360)	(273)	(13)	—	—
TVA coal-fired plants	82,562	78,081	77,940	82,493	81,764
TVA nuclear plants	18,614	19,771	15,795	20,003	(100)
Combustion turbine plants	180	546	2,941	2,112	1,120
Total net generation	123,066	119,475	117,357	122,805	101,981
Purchased	278	87	901	602	4,952
Net Interchange	2,431	3,058	5,006	3,721	6,708
Total input	125,775	122,620	123,264	127,128	113,641
System Output					
Sales					
Municipalities and cooperatives	78,683	75,936	77,875	76,505	66,537
Federal agencies	16,922	16,170	16,722	22,268	21,610
Industries	23,862	24,913	22,878	22,739	19,941
Electric utilities	708	172	176	162	97
Interdivisional	395	497	295	313	533
Total Sales	120,570	117,688	117,946	121,987	108,718
Returned to ALCOA*	1,779	1,856	1,825	1,709	1,845
Losses	3,426	3,076	3,493	3,432	3,078
Total output	125,775	122,620	123,264	127,128	113,641
Generating capacity, fiscal year end—kilowatts	29,864,910	29,858,110	28,308,710	28,294,960	27,071,480
Area peak load—kilowatts	20,745,000	21,540,000	21,992,000	21,803,000	20,381,000

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

[a]Net losses in storing offpeak power from other sources for use in peak periods. Pumped-storage output was 1,298 million kWh in fiscal year 1980.

Fiscal Years

1975	1974	1973	1972	1971	1970	1969	1968	1967	1966
17,176	17,486	18,142	15,915	12,734	12,313	11,596	15,188	13,318	11,024
2,393	2,408	2,623	2,120	1,812	1,780	1,813	2,284	1,869	1,777
3,381	3,643	3,693	3,258	2,737	2,447	1,579	3,361	2,555	1,338
22,950	23,537	24,458	21,293	17,283	16,540	14,988	20,833	17,742	14,139
—	—	—	—	—	—	—	—	—	—
71,699	84,084	84,384	73,440	74,332	76,145	75,601	69,620	68,114	67,942
7,429	1,947	—	—	—	—	—	—	—	—
507	292	254	71	18	—	—	—	—	—
102,585	109,860	109,096	94,804	91,633	92,685	90,589	90,453	85,856	82,081
5,277	1,047	670	266	594	459	4	—	80	24
3,412	113	(915)	1,077	3,840	2,762	546	(1,049)	527	(754)
111,274	111,020	108,851	96,147	96,067	95,906	91,139	89,404	86,463	81,351
64,468	64,183	63,822	57,820	55,535	53,693	49,008	44,575	40,706	37,784
19,389	17,388	17,113	12,502	11,774	13,069	14,827	18,802	20,226	20,638
21,822	23,790	21,865	19,592	21,278	22,013	20,568	19,213	18,590	16,765
116	122	92	540	1,407	1,274	1,301	1,462	1,768	1,150
638	662	581	636	654	673	670	668	797	768
106,433	106,145	103,473	91,090	90,648	90,722	86,374	84,720	82,087	77,105
1,719	1,850	1,820	1,858	1,847	1,848	1,756	1,864	1,688	1,695
3,122	3,025	3,558	3,199	3,572	3,336	3,009	2,820	2,688	2,551
111,274	111,020	108,851	96,147	96,067	95,906	91,139	89,404	86,463	81,351
26,726,630	23,319,030	21,892,480	19,880,420	19,828,380	19,422,480	18,239,280	18,202,090	18,111,860	17,149,500
18,633,000	18,611,000	18,888,000	16,664,000	16,745,000	16,797,000	15,017,000	15,266,000	14,634,000	14,263,000

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

Fiscal Year	Total	Residential	Commercial and Industrial	Federal Agencies	Outdoor Lighting
1980	2,784,675	2,481,545	299,744	11	3,375
1979	2,722,984	2,425,623	294,041	11	3,309
1978	2,664,412	2,371,064	290,132	11	3,205
1977	2,601,415	2,316,414	281,906	11	3,084
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

Electricity Sales - *Millions of kilowatthours*

Fiscal Year	Total	Residential	Commercial and Industrial	Federal Agencies	Outdoor Lighting
1980	115,007	37,093	59,509	17,317	1,088
1979	113,438	35,212	60,511	16,667	1,048
1978	113,418	37,874	57,522	17,018	1,004
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

Customer Statistics Continued

Revenue from Electric Sales - *Thousands of dollars*

Fiscal Year	Total	Residential	Commercial and Industrial	Federal Agencies	Outdoor Lighting
1980	3,576,533	1,222,042	1,864,468	441,463	48,560
1979	3,235,762	1,090,813	1,718,399	381,555	44,995
1978	2,747,716	1,015,406	1,379,852	312,328	40,130
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

Residential Statistics

Fiscal Year	TVA Average Annual Use/kWh	TVA Average Annual Bill	TVA Average Annual Rate ¢/kWh	U.S. Average Annual Use¢/kWh	U.S. Average Annual Rate ¢/kWh
1980	15,130	$498.49	3.29¢	8,944	4.78
1979	14,680	454.81	3.10	8,834	4.24
1978	16,190	434.03	2.68	8,828	3.98
1977	16,400	380.34	2.32	8,730	3.70
1976	14,370	325.35	2.26	8,209	3.33
1975	14,540	255.92	1.76	8,068	3.05
1974	14,480	209.37	1.45	8,019	2.54
1973	15,080	196.07	1.30	7,882	2.32
1972	14,040	179.92	1.28	7,496	2.25
1971	14,400	175.53	1.22	7,243	2.14
1970	14,560	150.39	1.03	6,810	2.09
1969	13,600	128.71	.95	6,259	2.11
1968	12,668	117.74	.93	5,788	2.14
1967	11,680	103.68	.89	5,434	2.18
1966	11,294	101.81	.90	5,072	2.22

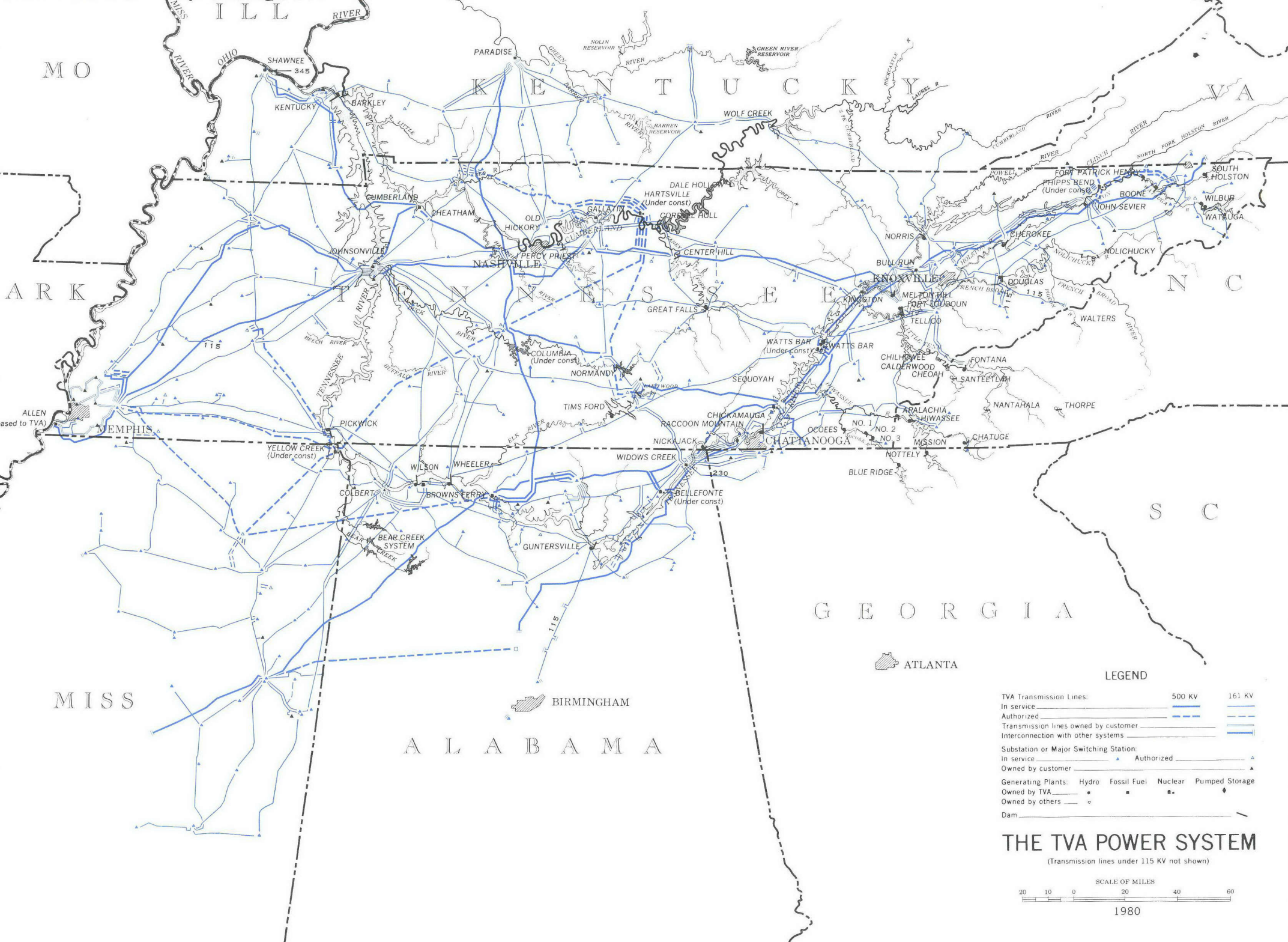
Federal agencies include only TVA's direct service and interdivisional sales.

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 features.

Fuel Statistics

Fuel Burned	1980	1979	1978	1977	1976
Coal-fired plants					
Coal - tons	35,825,904	34,734,280	36,061,379	37,946,797	37,158,293
Oil - gallons[a]	13,774,837	17,884,415	18,961,477	13,887,791	13,762,479
Total fuel expense	$1,236,906,202	$1,041,116,668	$897,590,341	$809,284,973	$699,978,978
Coal expense per ton	$34.134	$29.653	$24.672	$21.177	$18.715
Oil expense per gallon[a]	$1.018	$.624	$.416	$.408	$.333
Nuclear plants					
Total fuel expense	$55,797,057	$47,978,968	$38,355,587	$32,023,437	$118,052[b]
Combustion turbine plants					
Oil - gallons	9,884,880	51,261,900	270,004,262	193,032,102	102,083,371
Gas - MCF	1,234,082	—	—	—	—
Total fuel expense	$7,631,419	$19,578,115	$99,110,531	$67,883,653	$31,206,773
Oil expense per gallon	$.479	$.382	$.367	$.352	$.306
Gas expense per MCF	$2.350	—	—	—	—
Fuel Ratios					
Fuel expense per net kWh - mills					
Coal-fired plants	14.98	13.33	11.52	9.81	8.56
Combustion turbine	42.38	35.88	33.70	32.15	27.86
Nuclear plants	3.00	2.43	2.43	1.86	—
Cents per million Btu burned					
Coal-fired plants	140.60	132.16	113.57	96.96	85.91
Combustion turbines	286.74	272.68	263.28	251.80	220.39
Nuclear plants	28.22	23.00	22.46	17.32	—
Coal Received					
Tons	37,310,507	41,202,665	32,892,169	37,284,557	40,907,840
Mine cost plus transportation	$1,300,533,045	$1,217,524,119	$842,033,551	$781,474,331	$767,163,347
Cents per million Btu	150.60	130.40	115.94	95.75	85.68

[a]*Oil fired for light-off of coal-fired boilers and auxiliary uses.*
[b]*Cost of fuel oil fired for auxiliary steam and testing of emergency generators.*


ILL
MO
KENTUCKY
VA
NC
SC
ARK
TENNESSEE
MISS
ALABAMA
GEORGIA
MISS RIVER
OHIO RIVER
SHAWNEE
345
KENTUCKY
BARKLEY
PARADISE
NOLIN RESERVOIR
GREEN RIVER RESERVOIR
BARREN RIVER RESERVOIR
WOLF CREEK
CUMBERLAND
CHEATHAM
OLD HICKORY
GALLATIN
HARTSVILLE (Under const)
DALE HOLLOW
CORDELL HULL
CENTER HILL
PERCY PRIEST
NASHVILLE
JOHNSONVILLE
GREAT FALLS
COLUMBIA (Under const)
NORMANDY
TIMS FORD
WATTS BAR (Under const)
WATTS BAR
SEQUOYAH
CHICKAMAUGA
RACCOON MOUNTAIN
NICKAJACK
WIDOWS CREEK
BELLEFONTE (Under const)
CHATTANOOGA
OCOEES
NO. 1
NO. 2
NO. 3
NORRIS
BULL RUN
KNOXVILLE
KINGSTON
MELTON HILL
FORT LOUDOUN
TELLICO
CHILHOWEE
CALDERWOOD
CHEOAH
FONTANA
SANTEETLAH
ARALACHIA
HIWASSEE
MISSION
NOTTELY
BLUE RIDGE
NANTAHALA
THORPE
CHATUGE
CHEROKEE
DOUGLAS
NOLICHUCKY
WALTERS
FORT PATRICK HENRY
PHIPPS BEND (Under const)
BOONE
JOHN SEVIER
SOUTH HOLSTON
WILBUR
WATAUGA
ALLEN (Leased to TVA)
MEMPHIS
PICKWICK
YELLOW CREEK (Under const)
WILSON
WHEELER
COLBERT
BROWNS FERRY
BEAR CREEK SYSTEM
GUNTERSVILLE
ATLANTA
BIRMINGHAM
LEGEND
TVA Transmission Lines:
500 KV
161 KV
In service
Authorized
Transmission lines owned by customer
Interconnection with other systems
Substation or Major Switching Station:
In service
Authorized
Owned by customer
Generating Plants:
Hydro
Fossil Fuel
Nuclear
Pumped Storage
Owned by TVA
Owned by others
Dam
THE TVA POWER SYSTEM
(Transmission lines under 115 KV not shown)
SCALE OF MILES
20 10 0 20 40 60
1980