Energy Vision

2020

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Volume 2, Technical Document

Existing Power System

Volume 2, Technical Document 3

Existing Power System

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Existing Power System

Capabilities and Characteristics

TVA's existing power system of 25,600 megawatts is projected to provide 27,995 megawatts of summer net dependable capacity by 2005. Summer net dependable capacity is the amount of generating capacity available to the system after accounting for internal uses. Summer capacity is used because TVA anticipates summer as the most limited season in the future. This is due to a seasonal loss in generating capacity and the continued higher growth rate of summer demand as compared to other seasons.

TVA's generating capacity comes from a mix of generating resources including hydro, coal-fired, combustion turbines, and nuclear plants. *Figure T3-1* shows the projected generating mix for TVA.

This projected capacity takes into consideration generation sources that will be added or modified through 2005. Specifically, TVA will begin generating power from Watts Bar Nuclear Plant Unit 1 and will restart Browns Ferry Nuclear Unit 3 during 1996, adding 1,170 and 1,065 megawatts, respectively. Ongoing hydro modernization projects will result in an additional 360 megawatts available from existing hydro units. The installation of pollution control equipment at some steam plants may reduce generation capacity by approximately 35 megawatts as TVA implements Phase II compliance with the Clean Air Act Amendments. TVA will also see a loss of 72 megawatts due to the sale of steam from the Johnsonville Fossil Plant to a nearby industry.

For the purposes of Energy Vision 2020, the additions and reductions in generation output described in the paragraph above are considered as part of the existing power system, since they are planned for the immediate future.

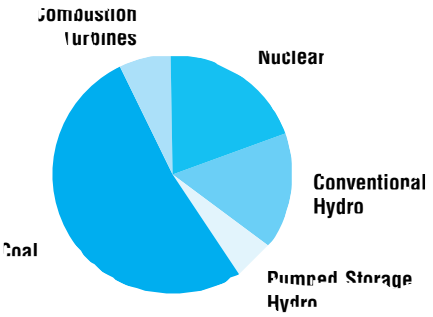
Description of TVA's Generating Resources

TVA'S HYDRO SYSTEM

The TVA hydro system includes 109 conventional hydroelectric generating units and 4 pumped-storage units at Raccoon Mountain. These units are located at 9 main river and 20 tributary plants.

Included with TVA's hydro power capacity is 405 megawatts available from the U.S. Corps of Engineers' facilities through

FIGURE T3-1. **Projected System Capacity in 2005**



	MW	%
Pumped-Storage Hydro	1,532	5
Combustion Turbines	1,952	7
Conventional Hydro	4,404	17
Nuclear	5,517	20
Coal	14,590	51
Total	**27,995**	**100**

This figure shows TVA's generating mix and the percentage supplied by each type of generating resource.

contracts with the Southeastern Power Administration and 321 megawatts available from hydro units owned by Aluminum Company of America and operated by TVA as part of the TVA power system. *Figure T3-2* lists TVA's hydro generating units, including information on location, capacity, years in service, etc.

As noted earlier, TVA's hydro generation capacity will be increased based on ongoing modernization projects. Initial projects will add approximately 360 megawatts of generating capacity and improve efficiency by 3 percent by 2005. Subsequent modernization projects could add 163 megawatts of capacity by 2005

FIGURE T3-2. **Hydro Generating Units**

Hydro Generating Unit	Location	Units	1995 Plant Summer Net Capacity (MW) [1]	Commercial Operation Date	Comments
Appalachia	Polk County, TN	2	76	1943	Tributary
Blue Ridge	Fannin County, GA	1	10	1931	Tributary
Boone	Sullivan & Washington Counties, TN	3	99	1953	Tributary
Chatuge	Clay County, NC	1	10	1954	Tributary
Cherokee	Jefferson County, TN	4	135	1942	Tributary
Chickamauga	Chattanooga, TN	4	130	1940	Main River
Douglas	Sevier County, TN	4	136	1943	Tributary
Fontana	Swain & Graham Counties, NC	3	235	1945	Tributary
Fort Loudoun	Lenoir City, TN	4	140	1943	Main River
Fort Patrick Henry	Sullivan County, TN	2	36	1953	Tributary
Great Falls	Rock Island, TN	2	32	1916	Tributary
Guntersville	Near Guntersville, AL	4	117	1939	Main River
Hiwassee	Cherokee County, NC	2	135	1940	Tributary
Kentucky	Near Paducah, KY	5	183	1944	Main River
Melton Hill	Loudon County, TN	2	75	1964	Tributary
Nickajack	Near Chattanooga, TN	4	96	1967	Main River
Norris	Near Norris, TN	2	100	1936	Tributary
Nottely	Union County, GA	1	17	1956	Tributary
Ocoee #1	Polk County, TN	5	22	1912	Tributary
Ocoee #2	Polk County, TN	2	18	1913	Tributary
Ocoee #3	Polk County, TN	1	27	1943	Tributary
Pickwick	Hardin County, TN	6	240	1938	Main River
South Holston	Near Bristol, TN	1	40	1951	Tributary
Tims Ford	50 miles south of Nashville, TN	1	40	1972	Tributary
Watauga	Near Elizabethton, TN	2	60	1949	Tributary
Watts Bar	Near Spring City, TN	5	179	1942	Main River
Wheeler	Near Town Creek, AL	11	380	1936	Main River
Wilbur	Near Elizabethton, TN	4	11	1912	Tributary
Wilson	Near Muscle Shoals, AL	21	629	1925	Main River
	Total TVA Hydro	**109**	**3,408**		
SEPA	Various		405		
Tapoco			321		
	TOTAL DISPATCHABLE HYDRO		**4,134**		
Raccoon Mountain Pumped-Storage	Near Chattanooga, TN	4	1,532	1978	Pumped-Storage

[1] Based on 1995 SERC IE 411 report.

TVA has 109 conventional hydro generating units located along the Tennessee River and its tributaries.

and have been included as supply-side options for consideration in TVA's integrated resource planning process.

TVA's conventional hydro plants fall into two broad types: main river and tributary. Main river plants are located on the Tennessee River and are generally operated to maintain seasonal lake levels, taking into account recent and predicted rainfall. Tributary plants are located on streams that feed into the Tennessee River and are generally the higher head (vertical change in water elevation) plants located in mountain valleys with deep drawdown possible to provide flood storage capability.

FIGURE T3-3. **TVA's Hydro System**

Hydro System in Fiscal Year	Capacity (MW)	EAF (%)	Total O&M ($/kW)	Total A&I ($/kW)
1994 (Actual)	4,044	97	7.7	13.3 [1]
2005	4,404	97	7.6	6.1

[1] Includes hydro modernization capital expenditures.

Hydro capacity is expected to remain a reliable generating source for TVA, providing 4,404 megawatts with an availability factor of 97 percent.

TVA's hydro facilities are generally operated on five basic considerations:

1. **Flood Control** – In accordance with the TVA Act, the primary responsibility at the dams is flood control.
2. **Environment** – Minimum flow, lake level, and water quality considerations factor into hydro generation.
3. **Power Generation** – In fiscal year 1994, TVA generated or purchased 20.2 billion kilowatt-hours of hydro energy, which represented approximately 15.4 percent of all TVA power generation. In addition to significant power generation, the hydro system is operated to maintain system voltage and provide ready reserve and peaking capability.
4. **Recreation** – System operations are sometimes under constraints to be compatible with white water rafting, fishing, and other recreational activities.
5. **Navigation** – TVA has constructed an extensive system of locks to support river traffic from Paducah, Kentucky to Knoxville, Tennessee. In low rainfall periods, TVA must maintain minimum river levels to support transportation.

Operating reliability is measured by "equivalent availability factor." Equivalent availability factor (EAF) is the ratio of the energy a unit could have generated, if called on, and if sufficient water was available, to the energy the unit would have produced if it had run at full load over the entire period, expressed as a percentage. The hydro system equivalent availability factor for fiscal year 1994 was 97 percent. TVA projects the availability factor for the plants to be 95 percent through 2005 and 97 percent for 2005 through 2020. The drop in availability factor through 2005 is due to the hydro modernization program, which will require that some units be removed from service for refurbishing.

Hydro generation is TVA's lowest cost generation source. Operating and cost features of TVA's hydro generation system, including capacity, equivalent availability factor (EAF), operations and maintenance (O&M) cost, and additions and improvements (A&I) costs, are listed in *Figure T3-3*.

FIGURE T3-4. **Coal-Fired Generating Plants**

Coal-Fired Generating Plants	Location	Units	1995 Plant Summer Net Capacity (MW) [1]	Commercial Operation Date (First Unit) (Last Unit)	Comments
Allen	Memphis, TN	3	744	May 1959 October 1959	Cyclone Furnace
Bull Run	Oak Ridge, TN	1	879	June 1967	Supercritical Pulverized Coal
Colbert	Near Muscle Shoals, AL	5	1,179	January 1955 November 1965	Pulverized Coal
Cumberland	Cumberland City, TN	2	2,448	March 1973 November 1973	Supercritical Pulverized Coal with Scrubbers
Gallatin	Gallatin, TN	4	976	November 1956 August 1959	Pulverized Coal
John Sevier	Rogersville, TN	4	704	July 1955 October 1957	Pulverized Coal
Johnsonville	New Johnsonville, TN	10	1,206	October 1951 August 1959	Pulverized Coal
Kingston	Kingston, TN	9	1,434	February 1954 December 1955	Pulverized Coal
Paradise	Drakesboro, KY	3	2,159	May 1953 February 1970	Supercritical Pulverized Coal Units 1 & 2 Have Scrubbers
Shawnee 1-9	Paducah, KY	9	1,206	April 1953 June 1957	Pulverized Coal
Shawnee 10	Paducah, KY	1	140	December 1989 (AFBC conversion)	Atmospheric Fluidized Bed Combustion
Widows Creek	Bridgeport, AL	8	1,610	July 1952 February 1965	Pulverized Coal; Units 7 & 8 Have Scrubbers
	TOTAL	**59**	**14,685**		
Watts Bar (Idle)	Near Spring City, TN	4	240		Pulverized Coal

[1] Based on 1995 SERC IE 411 Report.

TVA has 59 coal-fired units available for service with a generating capacity of 14,685 megawatts.

TVA'S COAL-FIRED SYSTEM

TVA has 59 active coal-fired units at 11 sites. Four 60-megawatt coal-fired units are now out of service at a twelfth site on the Watts Bar Reservation. The coal-fired units range in size from 107 megawatts each for units 1-4 at the Johnsonville Fossil Plant to 1,224 megawatts for each unit at Cumberland. TVA's oldest active coal-fired unit was placed in service in 1951. The newest unit was placed in service in 1973. One unit at Shawnee was converted to atmospheric fluidized bed combustion (AFBC) in 1989. The average age of TVA's coal-fired generating units is almost 40 years. However, a recent review identified no technical problems that would prevent the continued operation of these plants through the Energy Vision 2020 study period.

Figure T3-4 lists key characteristics and locations of TVA's coal-fired facilities.

TVA's coal-fired units have a 1995 combined net summer capacity of 14,685 megawatts. TVA anticipates reductions in coal system capacity for: (1) loss in Johnsonville capability due to supplying steam to a nearby industry and (2) a possible loss from various units if scrubbers (pollution control equipment) are added. The installation of scrubbers is planned as part of a clean air strategy that is included in the integrated resource plan.

TVA is meeting Phase 1 of the acid rain control program of the 1990 Clean Air Act Amendments (CAAA) by the addition of sulfur dioxide scrubbers at Cumberland Units 1 and 2 and by the purchase of lower sulfur coal. In addition, low nitrogen oxides

FIGURE T3-5. Coal-Fired Plant Emissions

	Sulfur Dioxide				Nitrogen Oxides				Carbon Dioxide			
	AVERAGE 1990-1994		ESTIMATED CY95		AVERAGE 1990-1994		ESTIMATED CY95		AVERAGE 1990-1994		ESTIMATED CY95	
Plant/ CAAA Phase	**Tons SO_2**	**LB SO_2/ MMBTU**	**Tons SO_2**	**LB SO_2/ MMBTU**	**Tons NO_X**	**LB NO_X/ MMBTU**	**Tons NO_X**	**LB NO_X/ MMBTU**	**Tons CO_2**	**LB CO_2/ MMBTU**	**Tons CO_2**	**LB CO_2/ MMBTU**
Allen Phase I	66,120	3.34	25,205	1.00	33,729	1.70	42,849	1.70	4,094,359	205	5,167,025	205
Bull Run Phase II	45,087	1.75	77,775	2.50	15,659	0.60	18,666	0.60	5,317,540	205	6,377,550	205
Colbert Phase I	74,605	2.30	97,892	2.89	28,442	0.84	16,918	0.50	6,775,078	205	6,936,175	205
Cumberland Phase I	325,956	4.48	28,334	0.29	97,119	1.36	127,017	1.30	15,257,644	205	20,518,050	210
Gallatin Phase I	129,241	4.24	82,335	3.30	18,345	0.60	11,228	0.45	6,307,466	205	5,114,750	205
Johnsonville Phase I	95,044	2.79	94,908	3.30	26,518	0.83	13,674	0.48	7,064,874	205	5,895,800	205
John Sevier Phase II	57,549	2.35	57,450	2.50	15,308	0.64	13,788	0.60	5,045,858	205	4,710,900	205
Kingston Phase II	87,630	1.86	90,252	2.60	33,013	0.70	90,252	0.70	9,651,209	205	90,252	205
Paradise 1&2 Ph II, 3 Ph I	138,684	2.45	177,349	2.50	120,247	1.74	127,638	1.80	14,543,214	205-210	14,729,700	208
Shawnee 1-9 Ph II, 10 Ph I	55,117	1.62	71,330	1.46	29,803	0.88	40,578	0.83	7,330,461	205-210	10,044,600	206
Widows Creek Phase II	32,685	0.77	54,777	0.95	31,955	0.79	43,316	0.75	8,893,920	205-210	11,938,700	208

This figure shows the historical average for calendar years 1990 - 1994 and 1995 estimate of sulfur dioxide, nitrogen oxides, and carbon dioxide in tons per year and annual average pounds per million Btu by plant. The average is for calendar years 1990 - 1994 with the tons per year being a simple average and the pounds per million Btu being a weighted average.

burners will be added to numerous small units by the end of 1995; also a combination of low nitrogen oxides burners and, possibly, coal reburn at other units will be implemented by 2000.

Phase II sulfur dioxide compliance with the Clean Air Act Amendments will be guided by Energy Vision 2020. Options being considered include sulfur dioxide scrubbers at Paradise Unit 3 and at the Allen Fossil Plant, fuel switching at a number of locations, and natural gas combined cycle repowering of various coal units.

Figure T3-5 lists the coal-fired plants and the average emissions for 1990-1994 and an estimate for 1995 of sulfur dioxide, nitrogen oxides, and carbon dioxide.

Major capital expenditures are anticipated through 2000 (and possibly longer) for compliance with the Clean Air Act Amendments and major overhauls of the large coal-fired units. Capital costs will average between $150-200 million annually for Clean Air Act Amendment compliance and more than $300 million for overhauls to coal-fired plants through 2000.

Figure T3-6 provides cost and performance characteristics for the coal-fired system, including capacity, equivalent availability factor (EAF), heat rate, fuel cost, operations and maintenance (O&M) cost, and additions and improvements (A&I) cost.

FIGURE T3-6. **TVA's Coal-Fired System**

Coal System in Fiscal Year	Summer Net Capacity (MW)	EAF (%)	Heat Rate (Btu/kWh)	Fuel Cost ($/MWh)	Total O&M ($/kW)	Total A&I ($/kW)
1994 (Actual)	14,743	78.9	10,021	13.3	21.9	22.1 [1]
2005	14,590 [2]	85.0	9,884	15.8	26.2	24.0

[1] Does not include clean air compliance capital cost.
[2] Assumes a reference clean air strategy.

TVA expects some decrease in generating capacity from its coal-fired plants by 2005 due to the installation of additional pollution control equipment and the diversion of steam that will be sold to a local industry. Availability factor is expected to increase by 2005 due to plant improvements that will increase plant efficiency and reliability.

TVA'S COMBUSTION TURBINES

TVA has 48 combustion turbines located at 4 coal-fired plant sites. Twenty-eight of these combustion turbines are capable of burning natural gas or oil; the other 20 combustion turbines have oil capability only. Combustion turbines have a low fixed cost but very high operating cost due to the relatively high cost of gas and oil. These units are normally reserved for use during peak periods only.

The combined summer net dependable capacity of these combustion turbines is 1,952 megawatts. The average age of TVA's combustion turbine units is approximately 23 years. All units are anticipated to be available through the Energy Vision 2020 study period.

Figure T3-7 lists the locations and capacities of the combustion turbines in the TVA system.

TVA recently upgraded the reliability of its combustion turbines. Forced outage factor (FOF) is a measure of combustion turbines' reliability. Forced outage factor is defined as the number of hours a unit is on forced outage divided by the total hours in a period and is expressed as a percentage. A forced outage is defined as those hours when the system needs generation from a unit, but the unit is not able to generate power. Hours when a unit's outage has been planned (for example, scheduled maintenance) do not count as a forced outage.

Figure T3-8 shows significant performance and cost characteristics of TVA's combustion turbines, including capacity, forced outage factor (FOF), heat rate, fuel cost, operations and maintenance (O&M) cost, and additions and improvement (A&I) cost.

FIGURE T3-7. **Combustion Turbine Generating Plants**

Combustion Turbine Generating Plants	Location	Units	1995 Plant Summer Net Capacity (MW)	Commercial Operation Date (First Unit) (Last Unit)	Comments
Allen	Memphis, TN	20	488	June 1971 September 1972	Natural Gas or #2 Fuel Oil
Colbert	Near Muscle Shoals, AL	8	384	September 1972	Natural Gas or #2 Fuel Oil
Johnsonville	New Johnsonville, TN	16	784	June 1972	#2 Fuel Oil
Gallatin	Gallatin,TN	4	296	July 1975	#2 Fuel Oil
TOTAL		**48**	**1,952**		

TVA has 48 combustion turbine plants located at four steam plant sites. Combustion turbines, used primarily for peaking power, have a generating capacity of 1,952 megawatts.

FIGURE T3-8. **TVA's Combustion Turbine System**

Combustion Turbines In Fiscal Year	Summer Net Capacity (MW)	FOF (%)	Heat Rate (Btu/kWh)	Fuel Cost ($/MWh)	Total O&M ($/kW)	Total A&I ($/kW)
1994 (Actual)	1,952	3.5	12,500 [1]	51.1	1.7	4.7
2005	1,952	2.0	12,500	46.9	2.5	0.4

[1] Allen 17-20 heat rate for oil fuel is given as representative of system average.

Combustion turbines are expected to remain a reliable source of power through 2005 with a reduction in forced outage factor due to plant upgrades.

TVA'S NUCLEAR PLANTS

Five nuclear units, located at three sites, are included in existing generating assets—Browns Ferry Nuclear Plant Units 2 and 3, Sequoyah Nuclear Plant Units 1 and 2, and Watts Bar Nuclear Plant Unit 1. *Figure T3-9* gives the locations and capacities of these units.

In 1985 TVA shut down its nuclear operation and construction program to correct significant weaknesses. Operating characteristics since restart from this regulatory outage are anticipated to be more representative of future operations because of the changes in personnel, procedures, and equipment as compared to the pre-1985 period. Since return to service from the regulatory outages, Sequoyah Units 1 and 2 and Browns Ferry Unit 2 have recorded, respectively, a 66 percent, 65.4 percent, and 80.6 percent equivalent availability (explained previously in the section covering TVA's hydro system).

Figure T3-10 gives the significant characteristics for TVA's nuclear system, including capacity, equivalent availability factor (EAF), heat rate, fuel cost, operations and maintenance (O&M) cost, and additions and improvement (A&I) cost.

Although TVA has scaled back its nuclear construction program, nuclear generation is expected to play a vital role in helping TVA meet energy supply demands through the Energy Vision 2020 study period. The nuclear units at Browns Ferry will reach the end of their operating licenses during the study period (2014 for Browns Ferry Unit 2 and 2016 for Browns Ferry Unit 3). It is anticipated that these two units will be excellent candidates for license extension for two reasons. First, boiling water

FIGURE T3-9. **Nuclear Generating Units**

Nuclear Generating Plants	Location	Units	1996 Plant Summer Net Capacity (MW)	Commercial Operation Date (First Unit) (Last Unit)	Comments
Browns Ferry	Near Athens, AL	2 [1]	2,130	1975 1977	General Electric Boiling Water Reactors
Sequoyah	Near Chattanooga, TN	2	2,217	1981 1982	Westinghouse Pressurized Water Reactors
Watts Bar	Near Spring City, TN	1 [2]	1,170	Projected COD in FY 1996	Westinghouse Pressurized Water Reactor
TOTAL		**5**	**5,517**		

[1] Browns Ferry Unit 1 has been idled since 1983. Major modifications are required to bring the plant to current standards. Recovery of this unit is included as a supply-side option within the IRP.
[2] Watts Bar Unit 2 is approximately 68 percent complete. Completion of this unit is included as a supply-side option within the IRP.

Five nuclear units are expected to provide 5,517 megawatts of TVA's generating capacity.

FIGURE T3-10. **TVA's Nuclear System**

Nuclear in Fiscal Year	Summer Net Capacity (MW)	EAF (%)	Heat Rate (Btu/kWh)	Fuel Cost ($/MWh)	Total O&M ($/kW)	Total A&I ($/kW)
1994 (Actual)	3,282	65.6	10,140 [1]	11.0 [2]	90.7	29.8 [3]
2005	5,517	67	10,475	5.4	113.6	19.1

[1] Sequoyah 2 heat rate given is typical of all nuclear units.
[2] In 1994 TVA took steps to write off sunk interest charges on excess fuel inventory. This will result in future fuel expenses that are significantly lower but are more in line with market costs.
[3] Capital expenditures for SQN 1, SQN 2, and BFN 2 plus central office TVAN only.

TVA expects an increase in availability factor for its nuclear system due to plant upgrades. Fuel costs are projected to drop significantly following the write-off of interest charges on excess fuel inventory in 1994.

reactors, such as those at Browns Ferry, are not as susceptible to vessel aging as pressurized water reactors; second, these units have been brought up to current standards. TVA will follow closely the proposed Nuclear Regulatory Commission rule making on license extensions, but TVA anticipates these facilities will be available over the Energy Vision 2020 study period.

TVA has established a nuclear decommissioning fund for all of its operating nuclear reactors. Investments of power funds have been made since 1982 to provide for the accumulation of funds for decommissioning nuclear plants. By September 1993, the lowest interest rate environment in 20 years resulted in a situation where the market value of the decommissioning investments was significantly higher than their book value of $210 million. TVA elected to exercise the flexibility of the internal fund, and sold the investments through a competitive bid for $373 million.

TVA elected to return the proceeds to the decommissioning fund over a three year period beginning in fiscal year 1994. At the end of fiscal year 1994 the fund had $150 million. Plans are to add an additional $100 million by the end of fiscal year 1995 and an additional $123 million by the end of fiscal year 1996.

TVA's policy is to collect funds for decommissioning through rates based on a constant dollar amount adjusted for inflation over the life of the operating license of a nuclear plant. This policy is based on the theory that all ratepayers that benefit from the electric production of a nuclear plant should share equally in the cost of decommissioning. If TVA front-loaded the collection of the nuclear plant decommissioning funds, this would put an undue burden on the ratepayers receiving power generated during the early years of operation of the nuclear plant. On the other hand, if not enough funds were collected throughout the life of the plant, the ratepayers receiving power at the end of the operating license would have an unfair decommissioning burden.

Decommissioning expense has been recovered from ratepayers annually based on the present value of amounts not provided through earnings on the fund. In fiscal year 1990, these

FIGURE T3-11. **Projected Availability of Power Through Interchanges**

	BLOCK 1		BLOCK 2		BLOCK 3	
YEAR	Quantity (MW)	Price $/MWh	Quantity (MW)	Price $/MWh	Quantity (MW)	Price $/MWh
1995	250	23	250	27	1800	40
2000	300	27	300	32	1500	56
2005	0	N/A	300	39	1500	75
2010	0	N/A	0	N/A	1100	106
2015	0	N/A	0	N/A	1000	135
2020	0	N/A	0	N/A	1000	165

This figure shows the amount of power expected to be available through the interchange system through 2000. For each year, power is shown to be available in blocks with varying cost.

collections amounted to $18 million. TVA temporarily suspended decommissioning collections from customers after operating license life extensions were obtained for Browns Ferry and Sequoyah. The temporary suspension was made in an effort not to front-load decommissioning collections. Cashing in the gain on the market value of the fund in 1993 has resulted in a reduction of the annual decommissioning expense collection through rates to $13 million currently based on a projected long-term return of 8 percent. If alternative investments with a higher rate of return could be achieved, the annual collection could be lowered further. Collections for the decommissioning fund will resume in fiscal year 1995.

Interchanges with Neighboring Utilities

TVA has various types of interchange arrangements with neighboring electric systems that allow TVA and these utilities to buy, sell, and exchange power at times when it is mutually beneficial to do so. TVA anticipates that there will be some quantities of non-firm spot market power available, even during peak periods, for the future. Spot market power is power that is available for purchase on the open market, usually surplus power that may be available at any given time from a generating utility. "Non-firm" implies that TVA will not pay capacity charges for the power, and other utilities will not guarantee that it is available.

For planning purposes, TVA has assumed the quantities and price shown in *Figure T3-11*. These blocks are representative of purchase power from neighboring utilities. Depending on the economic loading of the power system, these blocks can be used to offset more expensive internal generating resources.

TVA also anticipates that it will be able to make off-system sales because of differences in timing of system peaks between TVA and neighboring utilities. Over the Energy Vision 2020 study period, these interchange purchases and sales are anticipated to be roughly in balance.

FIGURE T3-12. **Interchange with Neighboring Utilities**

Neighboring Utilities with Transmission Ties	Interconnections
Associated Electric Cooperative Incorporated	1
Appalachian Power Company	7
Big Rivers Electric Cooperative [1]	7
Carolina Power & Light	1
Central Illinois Public Service	1
East Kentucky Power Cooperative	6
Electric Energy, Inc. (DOE Paducah)	8
Energy Services (Arkansas Power & Light and Mississippi Power & Light Co.)	6
Kentucky Utilities Company	8
Louisville Gas & Electric Company	1
Nantahala Power & Light Company	1
Southern Company (Alabama Power and Georgia Power)	9
Union Electric	1
TOTAL	**57**

[1] Delivery points for power purchased by Big Rivers from the Southeastern Power Administration.

TVA has the capability to exchange power with 13 neighboring utilities which allows power to be bought, sold, or wheeled to meet utility needs.

Transmission System

TVA's transmission system serves an area of more than 80,000 square miles, serving a population of approximately 7.7 million. The system includes approximately 16,000 miles of transmission line, including 9,800 miles of 161,000 volt lines and 2,400 miles of 500,000 volt lines.

The system is used to transmit power to 160 distributors of TVA power. These distributors include 50 electric cooperatives, 107 municipal electric systems, and 3 county-operated systems. TVA also directly serves over 60 large industries and Federal installations. In addition, the transmission system is connected directly with 13 neighboring utilities. These interconnections allow TVA to buy power from and sell power to other utilities and to wheel electricity from one utility to another using TVA's power transmission system.

Figure T3-12 lists the electric utilities with which TVA has exchange agreements and the number of interconnections TVA has with each.

TVA is a member of the Southeastern Electric Reliability Council, a voluntary industry oversight organization dedicated to promoting electric system reliability by identifying and enforcing good engineering and operating practices. The Southeastern Electric Reliability Council is a subgroup of the North American Electric Reliability Council, which provides oversight for the entire North American grid. Through these arrangements, TVA has access to emergency backup power.