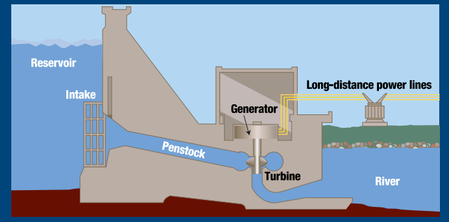
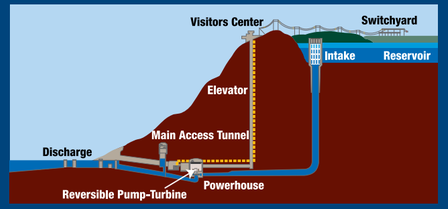
How is hydroelectric power generated?

A hydropower plant consists of a dam and powerhouse. The dam holds back the water in the reservoir, and the powerhouse encloses the turbines and generators that produce electricity. When power is needed, water is released from the reservoir through a large pipe, called a penstock, into a turbine. The force of the water spins the blades of the turbine, which is connected to a generator that spins, producing electricity. After passing through the turbine, the water reenters the river on the downstream side of the dam.



A unique element of the TVA hydropower system is the Raccoon Mountain Pumped Storage Plant, near Chattanooga. The plant consists of two reservoirs, one above the plant at the top of Raccoon Mountain, and the other below it. In periods of low power demand, water is pumped from the lower reservoir to the upper one. Then, when demand is higher, water is released through a tunnel to the powerhouse to generate electricity.



TVA's hydro plants

	Dam Height (feet)	Dam Length (feet)	Reservoir Length (miles)	Capacity* (megawatts)	Construction Span
Tennessee River					
Fort Loudoun	125	4,190	61	123	1940-43
Watts Bar	122	2,960	96	175	1939-42
Chickamauga	129	5,800	59	129	1936-40
Nickajack	86	3,767	46	100	1964-67
Guntersville	97	3,979	76	114	1935-39
Wheeler	72	6,342	74	355	1933-36
Wilson	137	4,541	16	611	1918-24
Pickwick Landing	113	7,715	53	193	1934-38
Kentucky	206	8,422	184	199	1938-44
Raccoon Mountain Pumped Storage	230	8,500	1.2	1532	1970-78
Clinch River					
Norris	265	1,860	129	111	1933-36
Melton Hill	103	1,020	44	72	1960-63
French Broad River					
Douglas	215	1,705	43	90	1942-43
Holston River					
South Holston	285	1,600	24	46	1942-50
Boone	168	1,697	33	83	1950-52
Fort Patrick Henry	95	737	10	32	1951-53
Cherokee	183	6,760	59	126	1940-41
Watauga River					
Watauga	331	925	16	68	1942-48
Wilbur	77	375	2	12	1912
Little Tennessee River					
Fontana	480	2,365	29	241	1942-44
Hiwassee River					
Chatuge	150	3,336	13	10	1941-42
Nottely	199	3,915	20	16	1941-42
Hiwassee	307	1,376	22	121	1936-40
Apalachia	150	1,308	10	74	1941-43
Ocoee River					
Blue Ridge	174	1,553	11	13	1925-30
Ocoee 1	135	840	8	25	1910-11
Ocoee 2	30	450	0.8	19	1912-13
Ocoee 3	110	612	7	28	1941-42
Elk River					
Tims Ford	175	1,580	34	37	1966-70
Caney Fork River					
Great Falls	92	800	22	37	1915-16

**Net winter dependable capacity: the amount of power a plant can produce on an average winter day, minus the electricity used by the plant itself.*

To find information on dam releases, reservoir levels, and other river system data, go to **http://lakeinfo.tva.com.**

TVA's hydro plants are being automated and modernized for even greater levels of efficiency and reliability.

Fish have increased in number and diversity downstream from TVA dams thanks to the tailwater improvements program, which was recognized by the Wildlife Habitat Council.

Looking ahead

If power production were the only function of TVA dams, managing the Tennessee River system would be relatively easy. The reason TVA has become a model for regional resource planning the world over is the delicate balance it continually seeks between its multiple river-system responsibilities: power generation, flood control, navigation, environmental steward-ship, shoreline use, and water supply for power plant operations, consumer use, recreation, and industry. The ongoing refinement of this integrated approach will help TVA continue to meet the challenges of the future.

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Tennessee Valley Authority

Dams and Hydro Plants

Providing multiple benefits for the people of the Tennessee Valley

TVA is the nation's largest public power provider, supplying electricity to large industries and 158 power distributors that serve 8.3 million consumers in seven southeastern states. TVA also offers economic development services and manages the Tennessee River and its tributaries to provide multiple benefits, including flood control, navigation, water quality, and recreation. Although TVA is owned by the federal government, all of its programs and business operations are self-financed.

Hydropower plays a vital role in the TVA power system because it's clean, economical, and reliable, and it can be brought online quickly when the demand for electricity is high. On the Tennessee River system, which is the nation's fifth-largest, TVA maintains 29 conventional hydroelectric dams and one pumped-storage plant for the production of electricity. This hydro system generates between 7 and 10 percent of TVA's electricity supply each year, playing a crucial role in helping TVA fulfill its mission of providing affordable, reliable power.

Nine of these hydroelectric dams are on the main channel of the Tennessee River, and 20 are on tributary rivers. TVA also has 20 nonpower dams.

An integrated approach

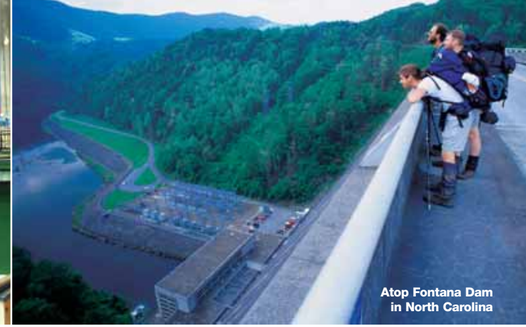
The Tennessee River system provides multiple benefits for the people of the Tennessee Valley. When TVA was founded in 1933, the most critical need was to control flooding and open up the Tennessee River to navigation. But the dams brought the added benefit of inexpensive power production, and they were TVA's sole source of power generation until the first TVA coal-fired plant was finished in 1942.

Kentucky Dam

Besides producing electricity, the TVA system of dams and reservoirs prevents an average of about $208 million in flood damage each year, enables navigation by boats and barges that carry 50 million tons of goods to market annually, ensures a clean and adequate water supply, and supports a recreation industry that makes an important contribution to the regional economy. In addition, the river provides the cooling water that's necessary for the operation of coal-fired and nuclear power plants.

TVA uses an integrated approach to managing the river system, balancing all of these benefits in a way that creates the greatest value for the people of the Valley.

Raccoon Mountain Pumped Storage Plant Generators



Atop Fontana Dam in North Carolina

Dam safety

As is the case throughout TVA's power system, safety is a top priority at TVA dams. Each dam is carefully evaluated in a formal inspection about every five years. That includes an analysis by engineers who rappel down the face of the dam for a close-up view. Other inspections are carried out yearly and monthly, helping to ensure that potential concerns are spotted before they become major problems.

Reliability and efficiency

TVA's hydro plants operate with a high degree of reliability and efficiency. Two ongoing projects will improve plant operations even more. The hydro modernization project, scheduled for completion around 2015, will significantly increase the hydro system's power output. The automation project, which enables the plants to be controlled and monitored from a command center in Chattanooga, will reduce operating costs and increase efficiency.

Protecting aquatic life

Hydropower operations can have important effects on aquatic life below dams. Drying out of the riverbed downstream from a dam (this area is called the tailwater) as well as low oxygen levels in water released from dams stresses fish and other creatures that live in the water and reduces their natural habitat. To address these problems TVA began a five-year, $44 million tailwater improvements program in 1991. Several approaches are used to keep a constant flow of water in the riverbed and to add oxygen to the water. Studies show that such efforts are making a positive difference in water quality and the health of the aquatic environment downstream of hydropower dams.

Visit www.tva.com/environment/water for more information.

Inside the turbine housing at a hydro plant