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Ponca City's Unit #4 combustion turbine generator is capable of generating 44 megawatts of power.

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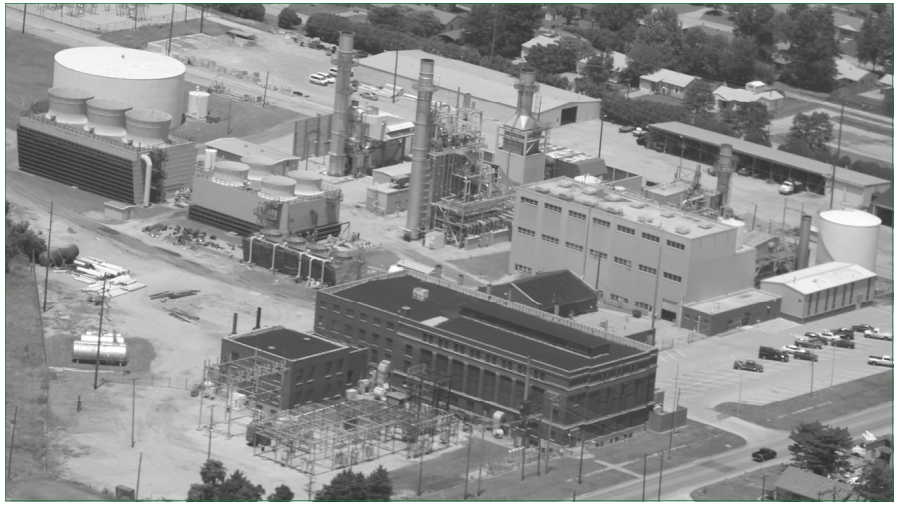
Ponca City Power Plant Complex and Kaw Hydroelectric Plant



Operated by the Oklahoma Municipal Power Authority
Ponca City, Oklahoma

Ponca City Municipal Power Plant Complex

On behalf of **Ponca City Energy** and the **Oklahoma Municipal Power Authority (OMPA),** their governing bodies and their employees, we welcome you to the Ponca City Municipal Power Plant Complex. This complex consists of a Steam Generation Plant and Combustion Turbine Generators. It is the largest municipally-owned generating complex in Oklahoma. The Kaw Hydroelectric Plant is located east of the complex on Kaw Lake.

In 1912, Ponca City voters decided to become a municipal electric utility by approving $30,000 in bonds for the construction of a municipal light and power plant. PCUA began serving the citizens of Ponca City in 1914. Now, almost 100 years later, Ponca City's electric utility continues to serve its citizens/owners with the growing need for electric energy. To assist Ponca City's Electric Department in promoting this same reliable product it has always provided to the community, the department developed a new name, logo and tag line in July 2001 - "Ponca City Energy - The Power of Ponca City."

PONCA CITY ENERGY THE POWER OF PONCA CITY

OMPA is a state governmental agency created in 1981 to allow cities and towns to work together on an economy of scale to provide an adequate, reliable and affordable supply of electricity. On July 1, 1985, OMPA became an operating utility and the newest power supplier in Oklahoma when it began to sell power to 26 Member municipalities under Power Sales Contracts. In 2010, OMPA celebrated a quarter of a century of service to its members. Ponca City was one of the original members and signed its contract with OMPA on December 1, 1984.

OMPA

The number of municipally-owned electric distribution systems served by OMPA has grown to 38. Total number of customers served in 2010 by the power supply program was 111,951.

Ponca City Municipal Power Plant Complex staff: (Left to Right) Allen Sheldon, Jody Derrick, Mark Floyd, Dusty Carlson, Robyn Burns, Ron Girdner, Pat Costello, Steve Burkett, Joel Benson, and David Bryan.

Kaw Hydroelectric Plant - Kaw Lake

Operation of the Kaw Hydroelectric Plant on Kaw Lake is monitored via the SCADA (Supervisory Control and Data Acquisition) system at the OMPA office in Edmond. The water flows from Kaw Lake and Dam are monitored by the U.S. Army Corps of Engineers, the nation's largest producer of hydroelectricity.

The lake's surface area is approximately 38,000 acres at the top of the flood control pool. The top of the flood control pool is 1,044.5 feet, while the normal operating level is 1,010 feet. Kaw Dam is 9,466 feet long and 121 feet above the streambed, 654 miles above the mouth of the Arkansas River.

Operating as a run of river facility with daily ponding, Kaw Hydroelectric operates approximately 104 gigawatt hours of energy for the OMPA power supply system on an annual basis. The generator is nominally rated at 29 megawatts at 76 feet of gross head with a maximum rating of 36.7 MVA.

The construction of Kaw Dam was authorized by the Flood Control Act of October 24, 1962. Ground breaking began on the project on May 21, 1966 and it was completed in May 1976. The total cost of Kaw Lake and Dam was $111 million. This included the construction of a foundation for the powerhouse, tailrace guard and penstock in the dam.

OMPA purchased the substructure from the U.S. Army Corps of Engineers for $3.8 million in July 1987. Construction began on August 29, 1987 and was completed in September 1989. The plant was constructed at a total cost of approximately $25 million. The hydroelectric plant was declared commercial on September 26, 1989.

Hydroelectric power production costs are less than those associated with other power sources. Hydropower is the harnessing of potential energy from a river's gravitational fall and storing water behind a dam. The continuous flow of water makes hydropower a renewable resource, whereas fossil fuels are non-renewable resources and are more expensive. Hydropower facilities also are simpler to operate and maintain than thermal plants.

Fast Facts
Kaw Hydroelectric Plant

Number & Type of Units	One - Vertical Kaplan Turbine
Plant Average Energy	104,000,000 Kilowatt-hours
Maximum Rating of Generator	36.7 MVA
Head Elevation	76 feet
Unit Speed	138.5 revolutions per minute
Generator Voltage	13,800 volts
Top of the Flood Control Pool	1,044.5 feet
Normal Operating Level	1,010 feet
Length of Kaw Dam	9,466 feet
Start of Construction	August 29, 1987
Project Completion	September 26, 1989
Total Cost of Plant Construction	Approximately $25 million
Total Cost of Kaw Lake/Dam	$111 million

If you are interested in knowing the daily operating schedule for the plant, call 580/765-9573 for a recorded message.

Steam Generation Plant

Due to continued growth, Ponca City voters approved a $2.5 million bond issue in August 1964 to provide funds for equipping, extending and improving the electrical system of the city. Included in this bond issue was $439,492 for the construction and installation of a steam turbine generating plant.

Construction of the masonry and aluminum steam generator plant by the general contractor, United Builders, Inc., started in September 1964. On July 1, 1966, the plant started commercial operation with the installation of the first of two General Electric steam generators. The unit was capable of producing 16,500 kW.

With the installation of the first steam unit in 1966, the capacity of generation for both the Steam and Diesel Generation Plants, with all 11 diesel engines operating, was increased to approximately 45,000 kW.

To expand the capacity of the plant, a second larger General Electric unit was installed in 1975 and the plant was enlarged to house this unit. The addition of Unit No. 2 increased the production capacity another 40,000 kW.

The building is 111 feet wide and 859 feet long and houses two steam generators (Units No. 1 and No. 2). The Steam Generation Plant Complex also contains two boilers, a control room, water treatment facility, administrative offices, and auxiliary equipment. The plant is equipped with automatic controls to shut the plant down if there is a malfunction.

The Repowering Project involves Unit No. 1. The 16,500 kW generator was modified to increase its capacity to 18, 750 kW when operated at 3,600 revolutions per minute.

Unit No. 2 consists of a generator with a rating of 41,500 kW and a unit speed of 3,600 revolutions per minute with a rated capacity of 44,000 kW, and a Foster Wheeler boiler manufactured in 1975 with a maximum continuous high-pressure steam output of 409,000 pounds per hour. The operating pressure for the boiler is 1,200 pounds per square inch.

In addition, a 200,000-gallon cooling tower was constructed with two pumps providing 16,000 gallons per minute to the main condenser to cool steam. Water treatment for the Steam Generation Plant is necessary to provide purified water used in the boilers, which is recirculated.

Combustion Turbine Generators

Upon signing an agreement in October 1990 with the Ponca City Utilities Authority, the Oklahoma Municipal Power Authority started planning for the repowering of the Ponca City Steam Generation Plant's Unit No. 1. The Repowering Project increases the capacity and generation efficiency of the existing Ponca City Steam Generation Plant through the repowering of Steam Unit No. 1. The efficiency of the repowered unit is increased by about 50 percent in the combined cycle mode.

This project enables OMPA to meet incremental load power supply requirements in a cost-effective way, which benefits all OMPA members. The combustion turbine was originally capable of producing approximately 40,000 kW. The combined cycle mode was fully operational in October 1995, six months ahead of schedule and under budget.

The $42 million project involves the conversion of an existing conventional steam plant, consisting of a gas fired steam boiler and a steam turbine, and replacing the boiler with a gas combustion turbine, General Electric's LM6000, and a heat recovery steam generator. The heat recovery steam generator in combination with the combustion turbine is capable of producing 90,000 pounds of steam when it is unfired and 159,000 pounds of steam when it is fired.

Waste exhaust heat from the combustion turbine is recycled to produce steam for the existing steam turbine Unit No. 1. The plant operates approximately 1,000 hours per year.

One of the major advantages to repowering an existing unit is that the combined cycle plant is generally more economical than the steam boiler. The plant uses state-of-the-art pollution control devices, which meet the current environmental standards.

While General Electric performed a maintenance outage in the fall of 2001, technicians discovered during a normal bore scope inspection that the LM6000 had an air-oil seal failure. After analyzing the costs of repair, the decision was made to upgrade the LM6000 with a Sprint package for more power output. This was installed in early 2002 and placed in operation on April 1, 2002.

The upgraded repowered unit is capable of producing a combined net output of approximately 44 MW in simple cycle operation with the Sprint package. In combined cycle operation, the combined net output with the Sprint package and duct burners is approximately 64 MW, depending upon conditions.

Combustion turbine generator