

Clean and Reliable Hydro Power

SMUD'S UARP SYSTEM

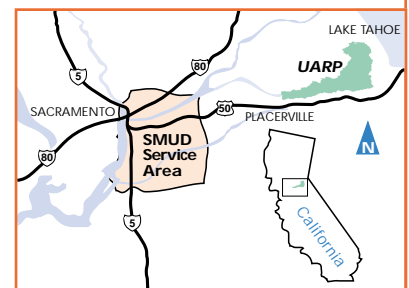
Overview

SMUD's Upper American River Project (UARP), consisting of 11 reservoirs and eight powerhouses, generates enough electricity to meet about 20 percent of SMUD's customer demand. In a normal water year, the UARP provides roughly 1.8 billion kilowatt-hours of electricity – enough energy to power about 180,000 homes. This abundant energy resource firmly establishes the UARP as an important component of the SMUD-owned generation that serves the needs of the 1.2 million residents of SMUD's service territory. Other sources of SMUD-owned generation power include natural gas-fired cogeneration, solar and wind energy. The primary value of the UARP to SMUD lies in the project's ability to provide operational flexibility, system reliability and economical power generation. The value of the UARP also extends beyond the boundaries of SMUD's service territory by helping to maintain the integrity of the Northern California electric transmission system.



Flexible Operation

SMUD's UARP is a flexible generation facility that, in combination with power purchases and other generation facilities, enables SMUD to deliver a steady and uninterrupted supply of electricity to SMUD's customer-owners. Because of the storage afforded by project reservoirs, SMUD is able to manage the water resources, within physical, regulatory, and safety constraints, to generate electricity when power is most valued.



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flexibility inherent in the UARP that is of significant value to SMUD.

In general, the operation of the UARP follows an annual cycle of reservoir filling and release that has been designed to coincide with the natural patterns of rain and snowmelt runoff characteristic of the Sierra Nevada. Typically, from

about mid-summer to mid-fall each year, the elevations of the three main storage reservoirs (Union Valley, Loon Lake, and Ice House) are gradually lowered to generate electricity and provide adequate storage space to capture winter/spring runoff and avoid spills. Reservoir elevations slowly rise during the spring and early summer as rain and snowmelt runoff fill the reservoirs.

The general operational regime of the UARP also provides secondary recreational benefits. By storing some of the spring runoff and releasing it in the summer and early fall, the UARP provides for more downstream summertime recreation than would otherwise be available if the system were unregulated. And in years with sufficient precipitation, near full reservoirs during the spring and summer provide an abundance of flat-water recreational opportunities.

Power is most valued when local demand is high and/or supplies are low, or constrained – periods generally associated with the highest power prices. Thus, for example, on a hot summer day, when customer demand for electricity is high, SMUD will often release water from storage to generate electricity at near capacity, particularly during peak hours of the day such as the late afternoon and early evening. SMUD may also generate electricity from the UARP when constraints on the western power supply occur due to such factors as unusually cold weather coupled with low precipitation in the Northwest, unexpected plant outages, or when natural gas supplies are constrained. Alternatively, when local demand for power is low or when the western power supply is abundant, water is held in the reservoirs, and the UARP generates at reduced capacity for shorter periods of time. It is this range of operational

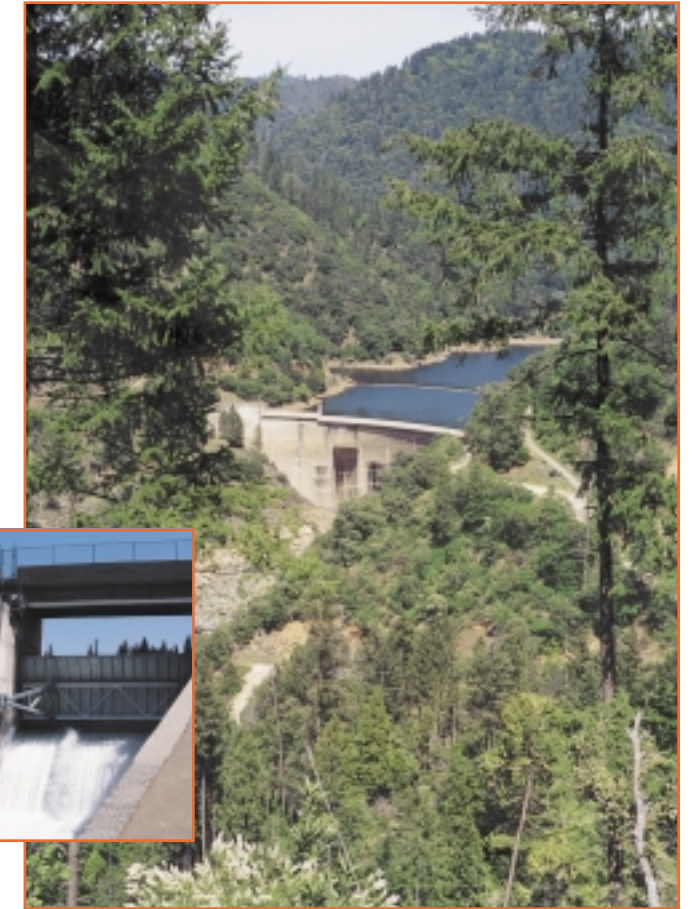
How Power is Generated

The UARP consists of 11 reservoirs and eight powerhouses with a generating capacity of 688 megawatts. The total storage capacity of the project reservoirs is over 400,000 acre-feet of water. The project also includes about 180 miles of transmission lines that transport electricity from the UARP powerhouses into Central California. Each of the eight powerhouses serves as an integral component of the project system as the water drops one full mile in elevation over a 53-mile river course.



Throughout the network of reservoirs and powerhouses water is conveyed through a series of tunnels, canals and penstocks. The tunnels and canals generally convey water horizontally while the penstocks convey the water down into powerhouse turbines. At each reservoir and diversion dam, SMUD releases a continuous minimum flow into the natural stream channel. These minimum flows can vary depending on the time of year and the type of water year.

A step-by-step description of how water flows through the UARP system, accompanied by a drawing of the project, is provided on the Hydro Relicensing web page of SMUD's web site www.smud.org



Secondary Benefits

Another benefit of the UARP is its effect on California's air quality. The state's sunny climate, pollution-trapping mountains and valleys, along with the activities of 34 million residents all contribute to air pollution in the state. Fossil fuel-fired generation (e.g., natural gas, oil and coal) also contributes to California's air pollution. By generating electricity without producing any undesirable air emissions as a byproduct, the UARP has a positive effect on California's air quality. In an average water year, the UARP – through clean, hydroelectric

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generation – displaces about 200,000 tons of carbon-based emissions annually from a combination of natural gas, oil and coal-fired power plants. Moreover, by focusing generation during times of high demand or short supply, the clean hydroelectric power from the UARP displaces the more inefficient and older power plants that are called into service to operate at those times.

In addition to clean and economical generation of electricity, the UARP also helps to ensure reliability of the electric transmission system within SMUD's service area and Northern California. The ability of the UARP to instantaneously generate electricity from 400,000 acre-feet of stored water provides substantial operating reserves for emergency situations and regulation to the California Independent System Operator. The UARP is at times obligated to be a source of available power to help in quickly putting base-load generation plants back on line in the event of a system-wide blackout. This helps to ensure integrated system reliability in California as well as other states west of the Rocky Mountains.



For additional information, please contact:

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