

Haas Underground Powerhouse (1958)

Designated as a California Historic Civil Engineering Landmark by the San Francisco Section, ASCE



The High Sierras of Central and Northern California, with their many rivers having small volumes of water but great drops in distance, have been the scene of many of the most important developments in hydraulic engineering. The famous Pelton Wheel, invented in the Sierra foothills, was designed for the particular water supply problems of California to get the maximum power from the minimum water. Most of the region's water utilities, including Pacific Gas and Electric, date their ancestry to the small water companies built by the hardy Forty-niners to provide water to the placer mines of the Mother Lode. By far the greatest impetus to hydraulic technology came with the growing electrification of California, when the Sierran rivers were utilized as a source of plentiful, inexpensive electric power.

The post-World War II Kings River Project of the Pacific Gas and Electric Company introduced a new innovation into the traditional technology of Sierra hydro plants. Haas Powerhouse, a 144-megawatt facility, was located in a vast cavern deep in the granite heart of the mountains. The first large underground power plant built in the United States, Haas' unique location resulted in a large savings in penstock steel, resulting in a lower overall project cost.

The plant is the second highest head (fall of water) plant in the nation, with a vertical drop of 2,444 feet between the forebay reservoir and the turbines. Water from the forebay, Lake Wishon, flows through seven miles of tunnel and penstock to spin the turbo-generators in the powerhouse, which is located nearly 500 feet underground.



Located 500 feet below ground, the vast cavern of Haas Powerhouse contains machines capable of producing 144 megawatts of electricity.

In addition to being the prototype for subsequent underground power plants throughout the world, Haas Powerhouse and the Kings River Project are key elements in the power and water supply systems of Central California.

TECHNICAL DATA

Cost	\$80 million for the entire Kings River Project
Engineers	J.B. Cooke, Supv. Civil Engr. Walter Dreyer, Chief Engr. C.W. Appleford, Chief Civil Engr. W.R. Johnson, Chief Elec. Engr. J.E. Schumann, Civil Engr. H.V. Lutge, Chief, Proj. Planning G.B. Thatcher, Project Cons. Engr.



Haas Underground Powerhouse

lat:37.0031, lon:-118.9667

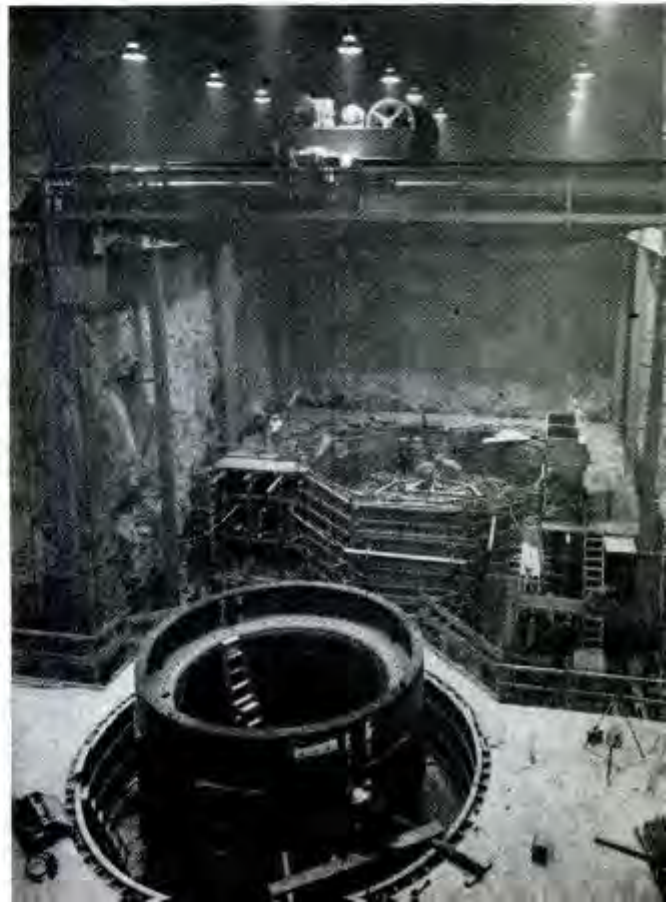
Powerhouse Inside Mountain Has Six-Mile "Waterfall"



Profile sketch illustrates the flow of water to underground Haas powerhouse from High Sierra reservoir

BURIED 427 FEET in the solid granite of the Sierra Nevada Mountains of California is a hydroelectric installation as big as a 10-story building. The huge underground Haas powerhouse contains two generators with a capacity of 128,000 kilowatts. The installation is part of the Kings River hydroelectric system of the Pacific Gas and Electric Company. Water to operate the turbines comes from the Wishon Reservoir, which is over a mile high in the Sierras. The water flows six miles through a 13-foot horseshoe tunnel cut in the rock. The end of the tunnel connects with a steel penstock that carries the water 4560 feet above ground to another granite tunnel through which the water plunges 850 feet, almost straight down, to the turbines. After falling 14 times the height of Niagara Falls, the water rifles into the turbines with a pressure measuring 72 tons per square foot. The nozzle speed of the water jets hitting the turbine cups is 261 miles per hour. Then the water flows through a tailrace to produce more power in other generators downstream. Granite that was cut from where the tunnels and the powerhouse are now located was used in construction of the Wishon Reservoir Dam.

Interior view of underground powerhouse during installation of generators. Walls are solid granite



CALIFORNIA HISTORIC
CIVIL ENGINEERING LANDMARK



HAAS UNDERGROUND POWERHOUSE
1958

SAN FRANCISCO SECTION ASCE 1976

WATER FROM LAKE WISHON FLOWS SOUTHWESTERLY
THROUGH SEVEN MILES OF TUNNEL AND PENSTOCK TO
SPIN THE TURBINES IN HAAS POWERHOUSE NEARLY 500
FEET BELOW GROUND LEVEL.