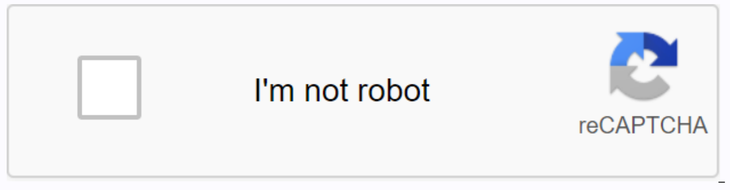

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Hydroelectric power station flow chart

Hydropower produces about 10% of the nation's energy. Credit: U.S. Army Corps of Engineers Flowing water generates energy that can be captured and converted into electricity. It's called hydropower or hydropower. The most common type of hydroelectric power plant uses a dam on the river to store water in a reservoir. Water released from the tank flows through the turbine and spins it, which in turn activates the generator to generate electricity. However, a hydroelectric power plant does not necessarily require a large dam. Some hydroelectric power plants just need to use a small channel to direct river water through the turbine. Another type of hydropower plant – called a pumped storage plant – can even store energy. Power is sent from the power grid to the electric generators. The generators then turn the turbines backwards, causing the turbines to pump water from the river or bottom tank into the upper tank where the power is stored. To use energy, water is released from the top tank back down into the river or lower reservoir. It spins turbines forward, activating generators to generate electricity. A small or microconductor energy system can produce enough electricity for a home, farm or ranch. Subscribe Read more Hydropower News Here For more resources on hydropower research, see the U.S. Department of Energy Hydropower Program. The hydropower content for this section is partly provided by the National Renewable Energy Laboratory and the Ministry of Energy. • School of Water Science HOME • Topics of water use • Falling water produces hydropower. Credit: Tennessee Valley Authority So how do we get electricity out of the water? In fact, hydropower and coal-fired power plants produce electricity in a similar way. In both cases, the power source is used to rotate a propeller-like piece called a turbine, which then turns the metal shaft into an electric generator, which is an engine that generates electricity. The coal-fired power plant uses steam turbine blades to turn around; whereas the hydroelectric power plant uses falling water to turn the turbine. The results are the same. Check out this diagram (courtesy of the Tennessee Valley Authority) of the hydroelectric plant to see the details: The theory is to build a dam on a large river that has a large drop in altitude (not many hydroelectric plants in Kansas or Florida). The dam behind it stores a lot of water in the tank. Near the bottom of the dam wall there is water intake. Gravity causes it to plummet through the pen inside the dam. At the end of the penstock there is a turbine propellor, which is rotated by moving water. The shaft from the turbine goes into the generator that produces energy. Power lines are connected to a generator that transmits electricity to your home and mine. The water continues around the propellor through the tail band into the river behind the dam. Way it is not a good idea to play in the water directly under the dam when the water is released! The turbine and generator produce an electricity scheme of a water turbine and a generator. Credit: U.S. Army Corps of Engineers In terms of how this generator works, the Corps of Engineers explains it this way: A hydraulic turbine converts the energy of running water into mechanical energy. The water generator converts this mechanical energy into electricity. The operation of the generator is based on the principles discovered by Faraday. He found that when the magnet moves around the wire, it causes electricity to flow. In a large generator, electromagnets are produced by circulating direct current through loops of wire wound around stacks of magnetic steel lamination. These are called field poles and are mounted on the circumference of the rotor. The rotor is connected to the turbine shaft and rotates at a fixed speed. When the rotor rotates, it causes the poles of the field (electromagnets) to move around the wires mounted in the stator. This, in turn, causes electricity to flow and voltage to develop at the generator's output terminals. Pump storage: Reconnecting water to peak electricity demand Electricity demand is not flat and constant. Demand goes up and down during the day, and overnight there is less need for electricity in homes, businesses and other facilities. For example, here in Atlanta, Georgia at 17:00 on a hot weekend day of August, you can bet that there is a huge demand for electricity to operate millions of air conditioners! But 12 hours later at 5:00 .... not so much. Hydropower plants are more efficient than fossil fuels and nuclear power plants in ensuring peak energy consumption in short periods, and one way to do this is to use pumped storage facilities that reuse the same water more than once. Pumped storage is a way to keep water in reserve for peak energy consumption times by pumping water that already flows through turbines to back up the reservoir above the power plant at a time when customer demand for energy is low, such as in the middle of the night. Water is then allowed to flow back through turbine-generators at a time when demand is high and heavy loads are placed on the system. Pumping equipment: Reuse of water for peak electricity demand The tank behaves similarly to batteries, stores energy in the form of water when demands are low, and produces maximum power during daily and seasonal peak periods. The advantage of pumped storage facilities is that hydroelectric power plants are able to start up quickly and make quick power adjustments. They work efficiently when used for an hour or several hours. Since pumped storage tanks are relatively small, construction costs are generally low compared to conventional hydropower plants. Page 2• School of Water Science HOME • Topics of water use • Falling water produces hydropower. Credit: Tennessee Valley Authority So Just How to Get from the water? In fact, hydropower and coal-fired power plants produce electricity in a similar way. In both cases, the power source is used to rotate a propeller-like piece called a turbine, which then turns the metal shaft into an electric generator, which is an engine that generates electricity. The coal-fired power plant uses steam turbine blades to turn around; whereas the hydroelectric power plant uses falling water to turn the turbine. The results are the same. Check out this diagram (courtesy of the Tennessee Valley Authority) of the hydroelectric plant to see the details: The theory is to build a dam on a large river that has a large drop in altitude (not many hydroelectric plants in Kansas or Florida). The dam behind it stores a lot of water in the tank. Near the bottom of the dam wall there is water intake. 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