Hydropower: A Clean Power Source That Must Consider Local Geology

 Hydropower has been used for several centuries in the United States, from the simple water wheels used to power old mills in New England to the massive hydroelectric dams such as Hoover Dam out in Colorado. These structures can be used to provide power for small scale or large scale uses. How is this done though? In the case of a water wheel, flowing or falling water turns the wheel, which then can turn gears, operating machinery. This would be used for milling flower or preparing fiber to be used for cloth. The dependency on running water limited the locations these could be used though, which is why many of the old mills in New England were placed along rivers. At times when they needed to generate additional power and/or a steadier supply of power, people would dam a river to create a mill pond that would serve as a reservoir.

 On a much larger scale, we can look at Hoover Dam, located on the border between Arizona and Nevada. The construction of such a massive dam led to the development of Lake Mead, which, when at full capacity, is the largest reservoir in the US. Reservoirs such as Lake Mead can supply a much more consistent flow of water to these dams, yet they do have their consequences. Due to their size, the construction of such a reservoir may force the evacuation of nearby communities and change local ecosystems. The formation of the reservoir will, in part, depend on the local geology. Local sediment and outcrop characteristics could play a part in the shape a reservoir takes, while the size of a dam will impact the amount of space a reservoir will require.

 How does a hydroelectric dam work though? Water from the reservoir will enter controlled channels within the dam, spinning a turbine, or turbines, along its path to the other side of the dam. This is seen in Figure 1, while the turbine is connected to a generator. Blue arrows are used to map direction of flow, while yellow arrows are used to map the direction of current and the transfer of mechanical energy. A generator functions through spinning electromagnets around a conductor, converting mechanical energy to electric energy.

Through a project on the scale of Hoover Dam, large regions of the country can be supplied with clean power. In the case of Hoover Dam, it can supply electricity to parts of Arizona, Nevada, and California, according to the US Bureau of Reclamation. Additionally, aside from flooding related to the dam, it can pay for itself over long periods of time. With careful planning, minimal impacts can occur, reducing the potential costs after construction and maintenance of the dam.



Figure : Diagram of a Hydroelectric Dam - United States Geological Survey

Sources:

<https://water.usgs.gov/edu/hyhowworks.html>

<https://www.usbr.gov/lc/hooverdam/faqs/powerfaq.html>