



China Newsletter - April 2014

China Leads the World in Hydropower Projects

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Hydroelectric energy is made by moving water, and has been around for thousands of years. Ancient Romans built wheels, which acted as turbines, to grind grain for flour and bread. During the Industrial Revolution water wheels, located on the banks of flowing rivers, provided energy for grinding grain and cutting lumber. In the US, according to *National Geographic*, the first hydroelectric plant was constructed in Appleton, Wisconsin to power two paper mills and one home. But in order to harness the energy from flowing water, and create hydroelectricity, the water must first be controlled. In this effort a reservoir is constructed, usually by damming a river. The water is then channeled through tunnels in the dam. The energy of the water flowing through these tunnels causes the dam's turbines to turn. These turbines enable generators to move. Generators are machines that produce electricity. Controlling the amount of water through the dam's tunnels will control the amount of electricity that's produced. In addition, the faster the flow of the river, the more hydroelectricity that's produced. If however, because of heavy rains or another occurrence, too much water accumulates in the reservoir, dams have a system to bypass all tunnels, turbines, and generators and direct the water into a spillway, a structure that allows water to flow directly into the body of water below the dam.⁵





In its quest for renewable electric power, China has been building mega-dams at a rate unmatched in human history. Seeking a source of clean renewable energy, China's premier has given the country a stated goal of eventually weaning itself off fossil fuels, and raising hydrogeneration capacity by half before 2020.³ That's no small task. China is already the largest hydroelectric producer in the world, increasing their hydropower capacity by 15 gigawatts (GW) each year, according to Yves Rannou, the head of the China division at French engineering firm Alstrom. That's ten times the capacity being built elsewhere in the world, and enough energy to provide power to 12 million homes. In contrast to China, North America is only expanding at a rate of 1.9 GW annually, South America at 1.8 GW, Europe by 0.5 GW, and Africa by 0.3 GW.

Globally, China has 241 GW out of a total world capacity of 1,127 GW.⁴ The biggest hydroelectric project, of course, was the Three Gorges Dam, which stretches over a mile-and-a-half across the Yangtze, and can generate 22.5 gigawatts of power, more than ten times the hydropower of the Hoover Dam.

Building a hydroelectric project is no small feat. The Xiangjiaba project, on the border between Sichuan and Yunnan provinces, for example, will have eight giant 800 MW turbines producing 6.4 GW of energy. A facility of this size took 494 billion cubic feet of poured concrete to construct. Other dams scheduled for completion are the Baihetan, providing 13.1 GW, the Jinsha, providing 8.7 GW, and the Xiluodu, providing 14 GW.⁴

Since the 1950s, the Chinese have built over 22,000 dams more than 15 meters tall. This is more than half the world's current total. On the Yangtze River and its tributaries, for example, a series of 100 dams are planned, under construction, or completed, one 280 meters high, and one 314 meters high.^{1,2}

In addition to satisfying the nation's increasing energy needs required to fuel its growing economy, the Chinese government has turned to hydroelectric power because it's a non-polluting source of energy. Most of China's energy currently comes from coal-fueled power plants, which has correspondingly resulted in heavy smog over many of China's cities, as well as a continual increase in related health issues. However,



since coal-fueled power plants can be constructed very quickly, and are relatively cheap compared to a hydroelectric project, many areas have relied on this form of polluting fuel for its energy need in the absence of renewable energy alternatives. In response, the Chinese government is trying to create more hydroelectric projects to replace many local coal-fueled power plants. These projects tend to emphasize the construction of mega-dams, which can generate enormous amounts of electricity.

Even though dams generate a great deal of electricity, they also may have a negative impact. It's thought that some of China's major dams may be responsible for earthquakes, as the dam's reservoirs place extra stress on nearby rock formations. As an example, in 2001 the 50-story high Zipingpu Dam on the Min River was constructed less than a mile from a known major fault line. In 2007 and 2008 the reservoir filled and a major quake, 7.9 in magnitude, occurred in May of 2008, only 3 ½ miles downstream. That quake killed 80,000 people. Later studies showed that the reservoir triggered small quakes through the fault system, eventually culminating in the large quake. Other dam related quakes,

such as the April 2013 quake in Ya'an City, resulted in 200 fatalities and over 5,000 injuries.¹

Environmentalists note that other negative impacts imposed by dam construction are: interference with migratory fish patterns; the capture of chemicals, fertilizer runoff, and human waste in their reservoirs; rivers that become clogged and are unable to flush contaminants downstream; the build-up of silt which can no longer carry its nutrients downriver; and the relocation of large numbers of people away from their ancestral homes. In this regard nearly 16 million people in china have been relocated to make way for hydroelectric projects, with 10 million of these now living in poverty.¹

Even though the construction of dams does have negative environmental impacts, the government feels it has little choice. If it's to continue to grow, it will need an extensive supply of energy. Hydroelectric electric plants offer a clean and renewable energy alternative that, in the decades ahead, the government hopes will break the air pollution that chokes many of China's cities.



Endnotes:

1. http://e360.yale.edu/feature/chinas_great_dam_boom_an_assault_on_its_river_systems/2706/#.Un4qK-hFnlo.twitter
2. <http://judithcurry.com/2013/11/09/impacts-of-chinas-hydropower-boom/>
3. <http://www.reuters.com/article/2014/03/10/china-parliament-hydropower-idUSL3N0M70VN20140310>
4. <http://www.ibtimes.com/china-renewable-energy-development-hydroelectric-projects-comes-environment-citizens-1438388>
5. http://education.nationalgeographic.com/education/encyclopedia/hydroelectric-energy/?ar_a=1

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