**GEOGRAPHY FACTFILES**

Energy resources case study

Renewable energy:

Hydro-power: Three Gorges Dam

Three Gorges Dam is located at the center of China, surrounded by large area of lands. It’s built on the ChangJiang river. Three Gorges Dam uses hydro-power to generate electricity. And it’s the world largest hydro-electric power station, has the largest generating capacity. Because the Three Gorges Dam is a hydro-electric station, it shares the advantages and disadvantages that a hydro-electricity station has.

Let’s first look at the advantages, the first advantage is that once a dam is constructed, electricity can be produced at a constant rate, so it’s stable and nearly never stops working. The second one is that there are no fuel used, so it produces much less pollution and cost less money to work. At last, it can also use for irrigation and other purposes.

But the hydro-power stations also have its disadvantages as well. The most important one is the impacts to people used to live in the dam area. When a hydro power station is built, the flood will destroy the environment and the houses. The damage will appear on natural habitats and historical feature. With the destroy of villages and towns, people also has to move away from the place that their family has been lived for hundreds of years. In the case of the Three Gorges Project, 1.2 million people need to move away. And the government needs to pay for these people, it’s a large amount of money, also includes the cost of the buildings.

So that’s all about the Three Gorges dam, the planners need to consider the disadvantages and the advantages when they want to build a dam, or it may cause a lot of problems.

Solar energy: Solar power in United States

Solar power in the United States includes utility-scale solar power plants as well as local distributed generation, mostly from rooftop photovoltaics. As of the end of 2015, the U.S. has 25 gigawatts (GW) of installed photovoltaic capacity with an additional 1.8 GW of concentrated solar power. In the twelve months through August 2016, utility scale solar power generated 32.8 terawatt-hours (TWh), 0.81% of total U.S. electricity. During the same time period total solar generation, including estimated distributed solar photovoltaic generation, was 50.8 TWh, 1.25 % of total U.S. electricity. In 2015, 30% of all new electricity generation capacity in the country came from solar. By 2015, solar employment had overtaken oil and gas as well as coal employment in the U.S.

The United States conducted much early research in photovoltaics and concentrated solar power. The U.S. is among the top countries in the world in electricity generated by the Sun and several of the world's largest utility-scale installations are located in the desert Southwest. The oldest solar power plant in the world is the 354-megawatt (MW) SEGS thermal power plant, in California. The Ivanpah Solar Electric Generating System is a solar thermal power project in the California Mojave Desert, 40 miles (64 km) southwest of Las Vegas, with a gross capacity of 392 MW. The 280 MW Solana Generating Station is a solar power plant near Gila Bend, Arizona, about 70 miles (110 km) southwest of Phoenix, completed in 2013. When commissioned it was the largest parabolic trough plant in the world and the first U.S. solar plant with molten salt thermal energy storage.

Wind energy: Gansu Wind Farm Project

The Gansu Wind Farm Project (also called Jiuquan Wind Power Base) is a group of large wind farms under the construction in western Gansu province in China (40.2°N 96.9°E 40.6°N 96.9°E, 40.23°N 97.13°E). The Gansu Wind Farm Project is located in desert areas near the city of Jiuquan in two localities of Guazhou County and also near Yumen City, in the northwest province of Gansu, which has an abundance of wind resources.

The 8 GW of initial planned capacity of this wind farm is similar to that of the Kashiwazaki-Kariwa Nuclear Power Plant in Japan, which was the largest nuclear power plant in the world until its closure in 2012.

The project is one of six national wind power megaprojects approved by the Chinese government. It is expected to grow to 20,000 megawatts by 2020, at an estimated cost of 120 billion Chinese yuan ($17.5 billion). The project is being built by more than 20 developers in two localities in Guazhou County and also near Yumen City.

The project is divided to multiple phases. The first 3,800 MW phase consisted of eighteen 200 MW wind farms and two 100 MW wind farms. The second 8,000 MW phase consists of forty 200 MW wind farms. The planned capacity is 5,160 MW by 2010, 12,710 MW by 2015 and 20,000 MW in 2020.

In 2008, construction began on a 750 kV AC power line to carry electricity from the wind farm, and construction of the wind farms themselves started in August 2009. Power is being purchased for 0.54 yuan per kWh, even though electricity from coal fired power plants would be about half that price. Since operations began, some 6.26 billion kWh has been generated as of October 31, 2011 with 5.96 billion kWh of that produced in 2011.

In November 2010 officials announced the completion of the project's first phase, involving the installation of over 3,500 wind turbines with an installed capacity of approximately 5,160 MW according to Wang Jianxin, director of the Jiuquan Development and Reform Commission. Total installed capacity rose to approximately 6,000 MW in March 2012—roughly equivalent to the United Kingdom's entire wind power capacity at that time—with new wind turbines being erected at the rate of 36 per day.

Unrenewable energy

Nuclear power: Daya Bay nuclear plant

Daya Bay Nuclear Power Plant is a nuclear power plant located in Daya Bay in Longgang District, Shenzhen, Guangdong, China; and to the north east of Hong Kong. Daya Bay has two 944 MWe PWR nuclear reactors based on the Framatone ANP French 900 MWe three cooling loop design, which started commercial operation in 1993 and 1994 respectively.

The economics of new nuclear power stations is a controversial subject, and multibillion-dollar investments ride on the choice of an energy source. Nuclear power stations typically have high capital costs, but low direct fuel costs, with the costs of fuel extraction, processing, use and spent fuel storage internalized costs. Therefore, comparison with other power generation methods is strongly dependent on assumptions about construction timescales and capital financing for nuclear stations. Cost estimates take into account station decommissioning and nuclear waste storage or recycling costs in the United States due to the Price Anderson Act. With the prospect that all spent nuclear fuel/"nuclear waste" could potentially be recycled by using future reactors,

Modern nuclear reactor designs have had numerous safety improvements since the first generation nuclear reactors. Nuclear power plants cannot explode like a nuclear bomb because the fuel for uranium reactors is not enriched enough, and nuclear weapons require precision explosives to force fuel into a small enough volume to go supercritical. Most reactors require continuous temperature control to prevent a core meltdown, which has occurred on a few occasions through accident or natural disaster, releasing radiation and making the surrounding area uninhabitable.

Fossil fuels: Electricity in Germany – a European MEDC

Germany is the largest consumer of electricity in Europe. The main fuels for German power stations are coal, nuclear and gas. Germany has reserves of two types of coal – ignite and bituminous coal: Lignite(brown coal) which contains less carbon, gives out less heat when burnt, produces more ash, and causes more air pollution. It is extracted in Nordrhein-Westfalen and Sachsen (in western Germany) and Brandenburg (in eastern Germany); Bituminous coal is more carbon-rich and generally of better quality. It is mined in Nordrhein-Westfalen (the Ruhr Coalfield) also and Saarland.

The bituminous coal power stations are partly located on the coalfields, to save transport costs(e.g. the Scholven power station), but they are also more widely located throughout the country. The power stations on the coast and on navigable rivers(e.g. the Rostock power station) use imported coal. Germany is committed to a reduction in its greenhouse gas emissions. One example of how this might be done is shown by the Schwarze Pumpe power station. The lignite fuel is burned in the present of pure oxygen – releasing water vapor and carbon dioxide. By condensing the water in a pipe, captures and isolates nearly 95% of the CO2. That CO2 is then compressed into a liquid and sold