Name _____ Date _____

Water Use for Electricity Scenarios

Use the resources provided by your teacher to investigate your assigned problem scenario. Then follow the steps below.

- Use the MapMaker Interactive to locate the area described in your scenario.
- Use the Freshwater Availability map to assess the water stress in the region covered by your scenario.
- List trade-offs between the advantages of the energy resource and its impact on the freshwater supply in the area covered in the scenario.
- Write a recommendation about whether or not the energy resource is appropriate for the region, based on water availability/needs for the energy resource. Include reasons for your decision.
- As part of the recommendation, create a list of factors other than water that should be investigated before a final decision is reached.

Scenario 1: Hydrofracking in Texas
Hydraulic fracturing, or hydrofracking, is a process used to extract more natural gas from wells. In this process, fracking fluid, a mixture of up to 99 percent water and various chemicals, is injected into the ground to create fractures. These fractures make it easier for natural gas to be extracted. Estimates of how much water is used in hydrofracking vary from 50,000 gallons to 5 million gallons of water per well. This water is taken mainly from rivers and lakes in the area local to the well. Some drought-prone areas where hydrofracking takes place are expressing concerns over the water usage and possible water contamination from hydrofracking. One place where local water districts are trying to restrict water for hydrofracking is in Texas. Grand Prairie city became the first local government in Texas to restrict water for hydrofracking, and more towns are considering what they should do. Imagine you are a decision-maker in a North Texas town where hydrofracking takes place. Investigate hydrofracking and water availability in your region. Make a recommendation about whether or not the practice should be allowed access to local water.

Scenario 2: China and Coal
The demand for electricity is increasing greatly in China. The use of coal to produce electricity is growing rapidly as well. China is expected to build 16 new coal-fired power plants in its northern and western provinces by 2015. Coal is an abundant and inexpensive energy resource in China. However, mining coal and burning it to produce electricity requires more water per megawatt-hour of electricity produced than most other energy resources. There is concern that the added burden on water supplies in northern and western China from the new coal plants could send the area into a water crisis. Imagine you are a decision-maker in China. Investigate coal and water availability in northern and western China. Make a recommendation about whether or not these new coal-fired power plants should be built.

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Water Use for Electricity Scenarios, continued

Scenario 3: Kenya and Wind Power
A proposed new wind farm project in the Lake Turkana region of Kenya would be the largest wind farm in sub-Saharan Africa. The new wind farm would cover 40,000 acres and include 365 wind turbines. Currently, 60 percent of Kenya's electricity comes from hydroelectric plants. Once the wind farm is built, it is expected to provide the equivalent of 20 percent of Kenya's current electrical demand. Imagine you are a decision-maker in the Lake Turkana region of Kenya. Investigate wind power and the availability of water in the Lake Turkana area. Make a recommendation about whether or not the wind farm should be built.

Scenario 4: South Africa and Solar Energy
Currently, South Africa uses coal to generate about 85 percent of its electricity. However, South Africa has been identified as an area with great potential for generating electricity through solar power. As part of its plan to increase the diversity of its energy resources, South Africa has awarded three solar energy projects to a consortium of companies. These three projects are expected to generate up to 238 megawatts of electricity. Imagine you are a decision-maker in South Africa. Investigate solar energy and the availability of water in South Africa. Make a recommendation about whether or not these large-scale solar thermal projects should be built.

Scenario 5: Brazil and Hydroelectric Energy
Demand for energy is on the rise in Brazil. The country is responding to this demand by building more dams along its largest rivers, including the Amazon. Brazil, which already has over 2,000 dams in operation, expects to build 20 new dams by 2022. One of those proposed dams is the Belo Monte Dam, which would be located along the Xingu River in the state of Para. Once constructed, this dam would be the third largest in the world. However, environmentalists and activists have criticized the project. They believe that the impact on wildlife and indigenous populations will be too great. Imagine you are a decision-maker in Para, Brazil. Investigate hydroelectric energy and the availability of water in this region of Brazil. Make a recommendation about whether or not the dam should be built.

Scenario 6: Germany and Solar and Wind
In 2010, Germany announced its intention to reduce its use of fossil fuels in order to decrease its greenhouse emissions 80 percent by 2050. In 2011, the country announced that it would also shut down its nuclear power plants, which supply 20 percent of Germany's electricity, by 2022. Germany is investing heavily in new infrastructure and energy efficiency measures. The government is also offering strong incentives and subsidies for solar and wind technology. The push for renewable energy has been so effective that the technology is being integrated more quickly than planned. Since these technologies are initially more expensive, the price of electricity is also rising. Imagine you are a decision-maker in Germany. Investigate solar and wind technology and water availability in Germany. Make a recommendation about whether or not the addition of new solar and wind technology should be scaled back significantly.

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