

Energy Experts Worksheet Example Answers

Learning Objective:

Use the Renewable Energy Living Lab to collect data on various energy forms and analyze the data to make recommendations for the best places in the U.S. to locate renewable energy projects.

Engage:

Renewable energy is a hot topic in engineering today. You will explore five forms of renewable energy resources and determine the best locations in America to convert these resources into electrical energy.

You have been hired by an energy engineering firm to help them identify potential sites to build renewable energy power projects. Your company has given you the following parameters:

- Sites must have a high potential for generating energy from a renewable source.
- Sites must be within a reasonable driving distance—200 miles—of an international airport.
- No more than 2 sites may be located within the same state.
- You must identify 3 sites for each type of renewable energy plant: solar energy, geothermal energy, wind energy, hydropower, and biomass energy.

Create a list of what types of information you think you will need to solve this challenge? For example, where are airports located? How much water is located nearby? Etc.

Example answer: What is considered high potential? Are international airports in each state? If not, which states have international airports? What conditions would make a state have good wind energy? Or solar energy? Or hydropower? Or biomass energy?

Share your answer with your partner/team.

Explore:

To complete your assignment, use the Renewable Energy Living Lab to determine the locations of potential sites. Follow the instructions below to get started!

1. Go to the online Renewable Energy Living Lab at <http://www.teachengineering.org/livinglabs/index.php>.
2. Choose age group K-12.
3. Explore the U.S. map.
4. Check the boxes under the Resources folder (located on the left under the Data Layers tab) to switch between the maps depicting the potential for the five different forms of renewable hydropower,

Name: _____ Date: _____ Class: _____

biomass, geothermal, wind and solar. Use the icons in the lower left corner to read more information about each form of energy.

Explain:

Complete the data table below as you explore each of the renewable energy forms.

Renewable Energy Type	Location of Potential Site #1	Location of Potential Site #2	Location of Potential Site #3
wind	Estes Park, CO	Laramie, WY (especially to the east of the city)	Livingston, MT
solar	Las Vegas, NV	Lancaster, CA	Phoenix, AZ
geothermal	Santa Rosa, CA	Sandy, UT	Spring Valley, NV
hydropower	Poplar Bluff, MO	Chattanooga, TN	Huntsville, AL
biomass	Bloomington, IL	Eugene, OR	Bangor, ME

Elaborate:

Explain how you determined each of the potential sites.

Example answer: I used Google Maps to search for all the international airports across the country and used each icon on the Renewable Energy Living Lab to search for areas with high potential for each type of renewable energy.

For wind power, from first glance it appeared that only “good” (7.0-7.5 m/s or 400-500 W/m²) and “excellent” (7.5-8.0 m/s or 500-600 W/m²) locations existed the U.S., so I looked at those locations. Zooming in showed that Colorado, Wyoming, and Montana have locations with “outstanding” (8.0-9.0 m/s or 600-800 W/m²) and “superb” (>10 m/s). Estes Park, CO, and Laramie, WY, are both within 200 miles of the Denver International Airport, while Livingston, MT is within 200 miles of the Great Falls International Airport.

For solar power, I searched for locations that had at least 6.0 kWh/m²/Day of solar power. Most locations with intense solar power are in the Southwest. Las Vegas, NV, is one and less than 200 miles

Name: _____ Date: _____ Class: _____

from the McCarran International Airport. Two other locations are Lancaster, CA, which is less than 200 miles from the Los Angeles International Airport, and Phoenix, AZ, which is less than 200 miles from the Phoenix Sky Harbor International Airport.

For hydropower, I searched for areas that had >500 MW of hydropower. One good location is Poplar Bluff, MO, which is less than 200 miles from the Lambert St. Louis International Airport. Chattanooga, TN also fit this requirement and was less than 200 miles from the Nashville International Airport, as well as Huntsville, AL.

For biomass energy, I searched for locations that had >500 thousand tons of biomass per year. The locations I found were Bloomington, IL (less than 200 miles from the Chicago O'Hare International Airport), Eugene OR, (less than 200 miles from the Portland International Airport) and Bangor, ME (less than 200 miles from the Bangor International Airport).

What was the biggest challenge you faced in determining potential sites?

Explain why this was a challenge.

Example answer: One of the biggest challenges was making sure my locations were within 200 miles from an international airport, especially because the Renewable Energy Living Lab map does not provide this information. Thus, I searched on Google Maps for "International Airports" and compared this map with the Renewable Energy Living Lab map. Also, for wind energy, some of the locations with the greatest wind energy are on difficult-to-access locations, such as the middle of a mountain range. This makes the chance of finding a nearby international airport more difficult.

Evaluate:

Compare your recommended sites to those of another group.

How are they similar? How are they different?

Example answer: The other group I compared sites with had some similar sites near the ones that my group found and had some of the exact same answers for solar power. We also had many different locations in different states.

After comparing your ideas with other groups, how could you improve your recommendations?

Example answer: I think that both our groups had good recommendations, but I think I could improve our recommendations by only including sites that had the absolute highest potential for a particular renewable energy source. In addition, including more sites might be helpful.