Name: _____Date:_____Class:_____

The Bright Idea Worksheet

Objective: To use data from Renewable Energy Living Lab website to evaluate energy options and provide recommendations of energy sources suitable for various U.S. locations.

Materials: Work in groups of two or three students, with a computer to access the internet.

Engage: You have recently been hired by "The Green Company" as an engineering consultant to examine its energy use and source options. The chief executive officer (CEO), Mr. Envy, recently read an article describing how one of his competitors installed a photovoltaic system (solar panels) at its headquarters to generate 100% of their electricity needs. Mr. Envy wants to outdo his rival, so he assigned you the task of designing solar energy systems for each of his four facilities to generate 100% of the electricity needed for each facility. **Your task** as an engineer is to examine the science and technology behind the choice to use renewable energy and present the pros and cons of various options for each facility, including but not limited to feasibility (space, availability, etc.), cost and environmental impact. To solve this problem, you'll use real-world data from the Renewable Energy Living Lab website.

Explore:

1. Determine how much solar energy is available at each location, using information from the Renewable Energy Living Lab.
   - Begin by navigating to http://www.teachengineering.org/livinglabs/index.php > and clicking to enter the Renewable Energy Living Lab > then select the grades K-12 portal.
   - Explore the living lab data to become familiar with the interface.
   - Refer to the FAQs (bottom right of the map) if you have trouble finding the data you need.
2. Determine the minimum size of the photovoltaic system required to meet the energy needs at the following four locations. The four facilities are identical three-story office buildings, each with 1,500 m^2 of available roof space on 10-acre lots, using an average of 2,800,000 kWh/year of energy.

   Facility 1 in Longmont, CO = _____

   Facility 2 in Utica, NY = _____

   Facility 3 in Cedar Rapids, IA = _____

   Facility 4 in Yuma, AZ = _____

Explain: Compare the minimum size of the required photovoltaic system to the available space at each location. Is it reasonable to install the systems at these locations? Explain using data and your calculations.

Evaluate other energy sources for those same locations using the Renewable Energy Living Lab. How does the potential to use solar power compare to other renewable sources of energy in those locations? Use quantitative and qualitative data in your comparison.

Elaborate: As necessary, develop alternatives for Mr. Envy to consider in addition to his 100% solar power idea. Consider multiple sources (for example, 20% geothermal, 30% wind and 50% solar) or eliminating solar completely to be replaced by a different power source(s).

Evaluate:
Summarize your research and analysis in the form of a feasibility plan that compares renewable energy options for four different facility locations. Prepare a final presentation for Mr. Envy. Have your presentation style (written or oral, individual or small group) approved by your teacher. Report **requirements**:

- A summary of the preliminary data tasks.
- An analysis of Mr. Envy's original plan of 100% solar power at each location and your assessment of how successful this plan might be.
- Your evaluation of other power sources for each location.
- Your proposed alternative(s) for Mr. Envy.

Remember: Mr. Envy is a stubborn CEO who thinks this is the simplest thing he could do—just slap some solar panels on the roof and be done with it. If you want him to do something else, you must present a convincing argument. The **best presentations include**:

- An explanation of the problem (This is your chance to educate Mr. Envy; he is not a scientist or engineer so explain the science and technology to him with direct and accurate statements.)
- Quantitative and qualitative data to support your analysis of the problem
- An explanation of your recommendation(s)
- Data to support your recommendation (s)
- Use of graphics to clearly present data and concepts