SN EDUCATOR GUIDE

August 26, 2023

Geometric Hives and Renewable Energy Sources

Student Activity Worksheet: Syncing the Power Grid to Renewable Energy

Directions: Use the graphs and articles provided to answer the following questions as directed by your teacher.

Where does your electricity come from?

1. Visit the U.S. Energy Information Administration website and click on your state or territory to view its profile and energy estimates. Read the "quick facts" and discuss which one you find most interesting about your state.

2. Look at the graph below the quick facts and click on the tab labeled "Electricity." What are the top two largest net electricity generation sources in your state? Give the approximate amount of energy generated by each in April 2023. Provide units with your answer.

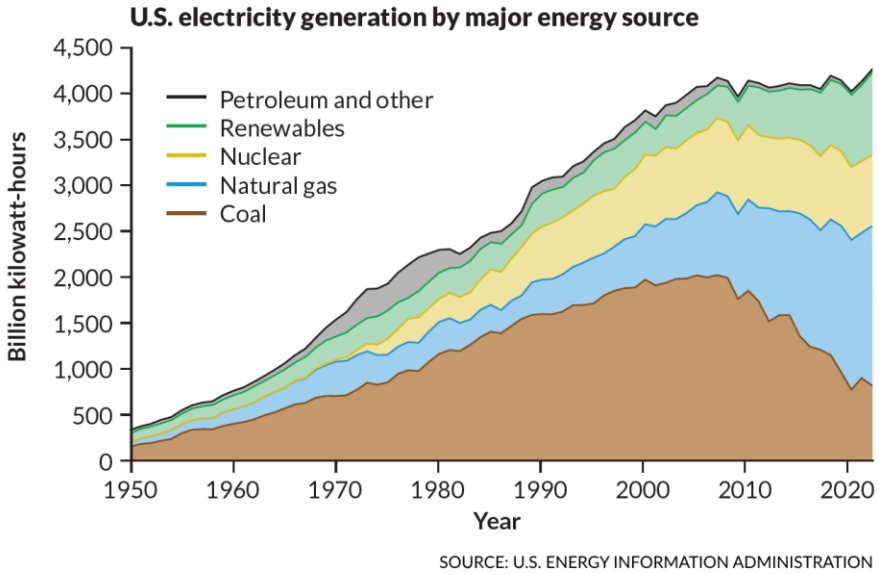
3. What does the unit abbreviation MWh stand for? What is its meaning?

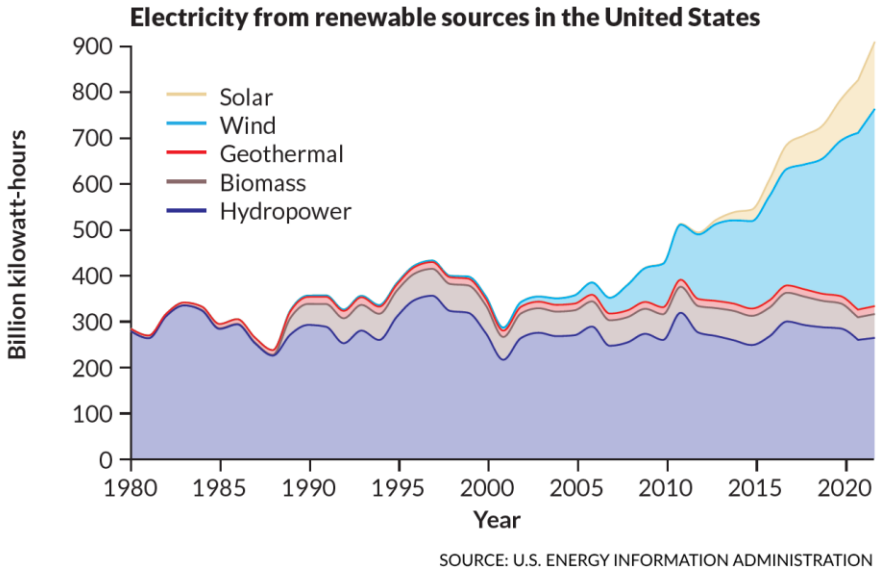
4. Open the All Energy Infrastructure and Resources map. Enter your school's address into the search bar at the top left corner of the map. Discuss the types of energy infrastructure and resources that are around the school (if needed, zoom out until you can see a couple of different types of infrastructure and resources on the map). Check the key in the box on the right side of the page to understand what the lines and symbols on the map mean (power plants, power lines, etc.).

Do the most common energy infrastructures and resources around your school support one of the two largest net electricity generation sources for your state that you found when answering the second question? Explain why or why not. For example, if you find many solar photovoltaic arrays close to your school, was one of the largest net electricity generation sources non-hydroelectric renewables?

Analyzing source data

Read the introduction to the *Science News* article "How one device could help transform our power grid" and check out the graphs titled "U.S. electricity generation by major energy source" and "Electricity from renewable sources in the United States." Answer the following questions in your small group.





1. Explain how the top graph relates to the bottom graph.

2. About how much total electricity was generated in the U.S. in 1990? What about in 2020?

3. What are some types of renewable energy sources? Based on the types of renewable energy sources you listed and your knowledge of energy sources that are not renewable, how would you define a renewable energy source?

4. Approximately how much electricity was produced by wind in 2020? What about solar in 2020? How did these values compare with 2015? Give your answer in billion kWh and as a percentage of the total U.S. electricity generation.

5. Looking at the first graph, what time period saw the largest growth in renewables as an energy source? Looking at the second graph, which renewable sources mainly contributed to this overall growth?

6. Does the first graph support the claim given in the first paragraph of the article, which states that the U.S. is on track to retire half of its coal-fired power plants by 2026? Explain using data from the graph.

Shifting challenges

Discuss the following questions within your small group. For more background on the electric grid, read the Science News Explores article "Explainer: What is the electric grid?."

1. Discuss some challenges of shifting from coal-fired power plants to renewable energy sources.

2. Revisit the website that gives your state's profile and energy estimates. On the graph below the quick facts, click on the first tab labeled "Energy Consumption Estimates." Does your state consume more energy from fossil fuels or from renewable resources? If time permits, explore other tabs that interest you.

3. What recommendations would you give for shifting your state to clean energy? Do you think your state has a need for grid-forming inverters? Why or why not?