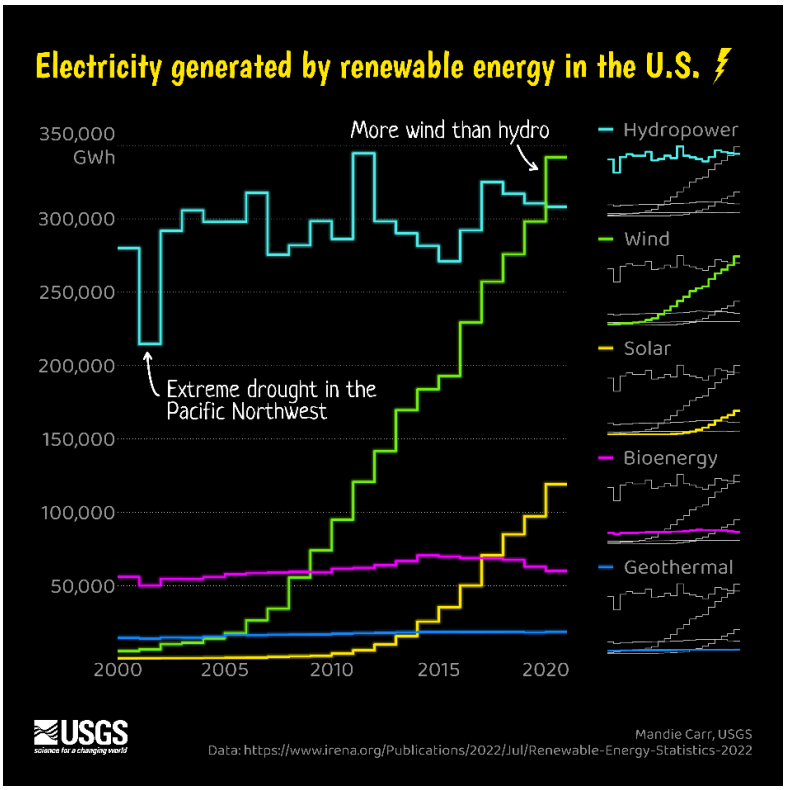
Electricity Generated by Renewable Energy in U.S.

Data Visualization Analysis Teacher Guide

Background

Renewable energy is energy that comes from sources that can be replenished on a human time scale. Fossil fuel sources are finite and cannot be replenished on a human time scale because they took millions of years to be created. Some common sources of renewable energy are solar, wind, hydropower, bioenergy, and geothermal. Solar energy is harnessing the radiant energy from the sun. Wind energy utilizes the kinetic energy from the wind. Hydropower harnesses the energy from moving water such as rivers, tides, and waves. Bioenergy utilizes the energy from burning organic matter from plants or animals. Geothermal energy is utilizing the Earth's internal heat.

The step chart illustrates the U.S. electricity generation in gigawatt hours (GWh) across five classes of renewable energy, from 2000 to 2020. As of 2020, these classes ranked (from high to low): wind, hydropower, solar, bioenergy, geothermal. From 2000 to 2020, wind power generation steadily grew from roughly 10,000 to 325,000 gigawatt hours. Hydropower generation in consistently high but can be impacted by drought.



Observe

1. What do you notice about this visualization? Record 3 observations. Consider axes, title, type of visualization (line graph, bar chart, map, bubble chart, or other), time, etc.

- ***Title: Electricity generated by renewable energy in the U.S.***
- ***Five types of renewable energy are shown: hydropower, wind, solar, bioenergy, geothermal.***
- ***Each type of renewable energy is shown in a different color***
- ***The x-axis: years from 2000 to 2020***
- ***The y-axis: amount of electricity generated in gigawatt hours (GWh) from 0 to 350,000***

- ***A drought in the Pacific Northwest is labeled on the graph***
- ***The point where wind exceeds hydropower is labeled***

Analyze

1. List the variables in the visualization.

   - ***The year is the independent variable***
   - ***The amount of electricity (gigawatt hours) is the dependent variable***

2. A relationship between variables exists when one influences the other. Do you notice a relationship between any of the variables in the visualization? If so, describe the relationship you observe.
   - ***Geothermal: As time increases, there is no change in the amount of electricity generated. Overall energy production stays below 50,000 gigawatt hours.***
   - ***Bioenergy: As time increases, there is very little change in the amount of electricity generated. Overall energy production is between 50,000 and 100,000 gigawatt hours.***
   - ***Solar: From 2000-2010, there is no change in the amount of electricity generated. From 2010-2020, there is a steady increase in the amount of electricity generated. Solar energy production is nominal in 2000 and increases to approximately 125,000 gigawatt hours in 2020.***
   - ***Wind: As time increases, there is a steady increase in the amount of electricity generated. Energy production from wind is nominal in 2000 and increases to over 330,000 gigawatt hours by 2020.***
   - ***Hydropower: There is no consistent amount of electricity generated over time. The amount is constantly increasing and decreasing. Energy production from hydropower ranges from approximately 210,000 gigawatt hours to 350,000 gigawatt hours. This form of energy generates the most electricity of all of the renewables shown for most of the time period.***

Interpret

1. What trends or patterns do you notice in the data? In 1 -2 sentences, summarize the main takeaway of this visualization.

   Over the time period shown (2000 – 2022), hydropower, although highly variable in energy production, is responsible for the most energy produced by renewable sources. However, it is surpassed by wind energy around 2018. Both wind and solar have increased over time, whereas bioenergy and geothermal have remained steady and below 100,000 gigawatt hours.

2. If you had to explain this to an adult, what would you tell them in 2 – 3 sentences?

   The majority of electricity generated by renewables comes from hydropower but changes a lot depending on drought. Wind and solar energy have been increasing since 2000. Both geothermal and bioenergy remain steady and below 100,000 gigawatt hours.

Connect

1. How does this visualization connect to your world?

   Answers will vary. Consider the following:

   - ***The source of electricity generation in your community.***

2. How does this connect to what we are learning about in class right now?

   Answers will vary