Describing Data: Lockdown electricity consumption

The Describing Data series of resources allows students to practise graph or data interpretation. Topics are predominantly related to electricity or climate, and each resource includes short answer and challenge questions.

Teacher notes

Most suited to	KS4
May be suitable for	KS3, KS5
Skills	Using a graph, data interpretation, data visualisation, scientific literacy
Subject	Science/physics/chemistry/maths/geography
Topic	Resource use, electricity
Suggested use	Lesson activity, homework, remote provision, home learning
Resources needed	Optional internet access, paper or electronic copies of data sheet and questions
Mark schemes guidance	Suggested or model answers are given. Numerical values are approximate. Suggested number of marks are given in brackets at the end of each answer

Feedback: https://forms.office.com/r/VkQ6FF4xxJ

Contact us: educational.resources@drax.com

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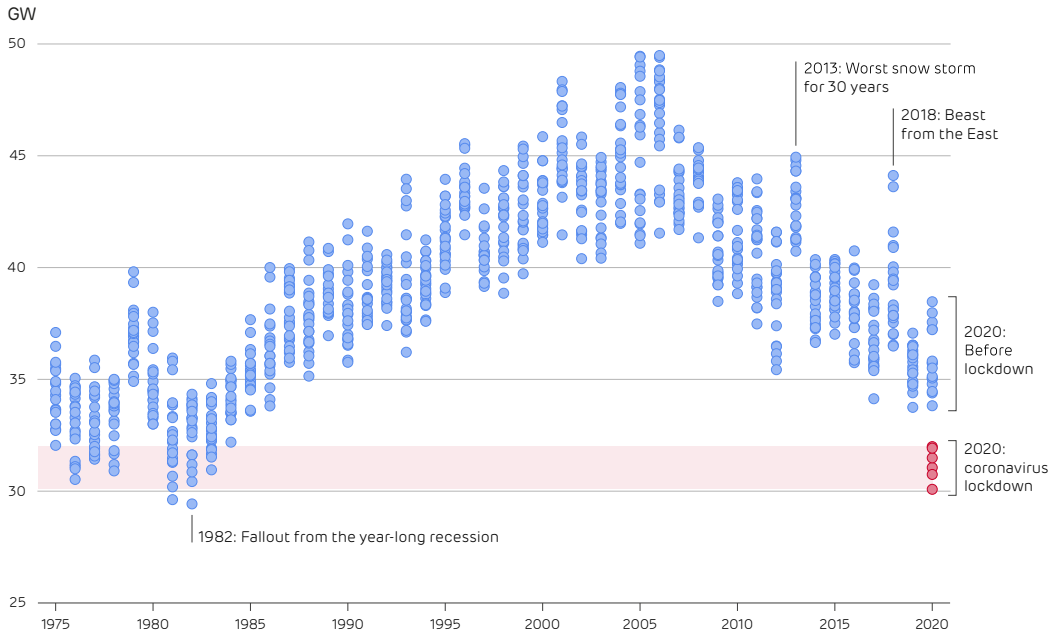
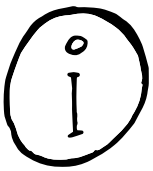


Daily average electricity demand in Britain across all working days in March 2020

Background information:

- Read the title of the graph carefully
- 'GW' means gigawatt. Giga means one billion, so 1 GW is 1,000,000,000 watts.
- On 23 March 2020, the UK took unprecedented steps to slow the spread of Covid-19 (coronavirus) and started a 'lockdown'. Everyone had to stay at home except for some essential reasons. Many businesses closed or moved online, people worked from home, and so did most school students.



If you'd like to read the full article on this topic:
https://reports.electricinsights.co.uk/wp-content/uploads/2020/10/200515_Drax_20Q1_A2.pdf

Describing Data: Lockdown electricity consumption

Answer the following questions on paper or in your book, as requested.

1. What's shown on the x axis of the graph?
2. What does each blue dot plotted on the graph represent? Read the graph title very carefully!
3. What does each red dot plotted on the graph represent?
4. What was the general trend in electricity demand between 1982 and 2006?
5. Describe the changes in electricity demand from 2005 and 2020. Include data from the graph.
6. Look at the data for 2013. How was 2013 different from 2012 and 2014? Use data from the graph.
7. Look at the data for 2018. What do you think the 'Beast from the East' was? Why?
8. In March 2018, what was the maximum electricity demand, the minimum, and the range?
9. What happened to electricity demand in the 2020 lockdown? Describe data for 2020 in your answer.
10. Does this graph tell you when the 2020 lockdown ended?

Challenge tasks

1. Explain why electricity demand was reduced during the lockdown. Predict or research what happened to electricity demand after lockdown ended.
2. Estimate daily average electricity demand for the whole of March 2019, including non-working days. Show your reasoning. (Hints: Think about how many working and non-working days there are. Use the graph and make some estimates and assumptions, then calculate a mean.)
3. Including your estimate for challenge 2, sketch a graph for average daily electricity demand for each month in 2019. As you don't have any data for other months of the year, you'll need to think about what increases and reduces electricity demand, and make some assumptions.

Describing Data: Lockdown electricity consumption answers

1. The year (from 1975 to 2020). (1)
2. The daily average electricity demand in Britain on a working day in March that year, measured in gigawatts. (This means the average electricity used by homes, businesses, transport etc, across each 24-hour period on each weekday) (2)
3. Each red dot is electricity demand on working days from 23 March 2020, when the UK was in a national lockdown. (1)
4. Between 1982 and 2006, electricity demand increased. (1)
5. Between 2005 and 2020, electricity demand generally decreased. However, demand in 2013 was higher than 2012 due to a bad snowstorm that month; 2018 was higher than 2017; and 2020 was going to be higher than 2019 before lockdown happened. Note: you may also have used demand data in your answer. (3)
6. Demand in 2013 was higher than in 2012 and in 2014 – nearly every working day had higher demand. The lowest average daily demand in 2013 was about 40.5Gw, and the highest was about 45Gw. This contrasts with 35.5GW to 41.5GW in 2012, and 36.5 to 40.5GW in 2014. (3)
7. The 'Beast from the East' was a cold weather event in March 2018 that brought cold winds and snow to large parts of the UK. You could have found this out either by looking it up, or looking at the graph and seen the increased electricity demand compared with the expected pattern. (1)
8. In March 2018, minimum average working day demand was about 36.5Gw, and the maximum was about 44.5GW. Based on these figures, the range (the difference between the minimum and maximum) was 8GW. (3)
9. Electricity demand in lockdown was much lower than for the working days for the same month before lockdown. The non-lockdown range was between about 34GW and 39GW each working day, whereas the lockdown working day demand was between 30GW and 32GW. (3)
10. No, it's not possible to use this graph to see when the 2020 lockdown ended, as it only contains data for March of each year. (1)

Challenge tasks – Suggested content

1. During the March 2020 lockdown, some factories that use a lot of electricity stopped production completely, and others reduced their use of electricity. Lots of offices were completely closed too, so no electricity was being used for lighting, heating, computer monitors and so on. All businesses deemed 'non-essential' were closed, so premises such as hairdressers, shops, restaurants and gyms weren't open or in use. Some essential services continued as normal, and electricity usage in some homes increased. Most schools only had a few pupils and members of staff attending. Overall, electricity demand across Great Britain reduced during the lockdown. Afterwards, electricity consumption began to increase again as more businesses reopened or increased their operating hours. However, some consumption patterns remained affected by the pandemic.
2. It doesn't matter if your answer is slightly different, but you should have considered some of the following points.

   Days in March = 31

   Working days are assumed to be Monday-Friday (except bank holidays).

   March 2019 working days = 21

   March 2019 non-working days = 10 (there were no Bank Holidays in March that year)

   Electricity demand on working days as shown on the graph is around 34GW to 37.5GW and so the mean is approximately 35.75GW on each day.

   Electricity demand on non-working days should be less. Although we don't know how much less from the graph, we could assume that demand may be similar to the level on lockdown days, when lots of businesses were closed.

   So estimated demand on non-working days is approximately 31GW per day.

   So the estimate for electricity demand for the whole of March is (35.75 x 21 days) + (31 x 10 days) GW

   This is 750 + 310GW = 1060GW for the whole of March 2019.

   So, to answer the question, estimated daily average demand is 1060 ÷ 31 days = 34 GW

   (Note: this is a rough estimate, so it wouldn't be appropriate to include lots of decimal places)

3. Your graph may look a little different. Sketch graphs do not include accurately plotted points but do include key features such as the shape of the graph.

   Some of the things to include are: title and axes labels; your estimated electricity demand calculated for March (in the example this was 34GW); estimates for the other months of the year.

   This graph shows approximated values for electricity demand in 2019.

   You should have considered typical temperatures and daylight hours when estimating the shape of your graph. Electricity demand is higher when the weather is colder, and the nights are longer.