19. Statistics and Rates of Change

In preparation for an upcoming debate on renewable energy, you find a recent UK government report containing information about different sources of renewable energy. You decide to dive into the data to pull out some key statistics and trends to support your arguments in the debate.

The table below shows electricity generated from renewable sources in terawatt-hours (TWh) over a 10-year period.

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Onshore wind	12.2	16.9	18.6	22.9	20.8	28.7	30.4	31.9	34.9	29.2
Offshore wind	7.6	11.5	13.4	17.4	16.4	20.9	26.5	32.0	40.7	35.5
Solar PV	1.4	2.0	4.1	7.5	10.4	11.5	12.7	12.4	12.9	12.1
Total hydro	5.3	4.7	5.9	6.3	5.4	5.9	5.5	5.9	6.9	5.5
Landfill gas	5.2	5.2	5.0	4.9	4.7	4.3	3.9	3.6	3.5	3.3
Other bioenergy	9.5	12.9	17.6	24.4	25.4	27.6	31.1	33.8	35.9	36.6
Total	41.2	53.2	64.5	83.4	83.0	98.9	110.0	119.6	134.7	122.2

1. What was the largest source of renewable electricity generation in 2021?

Other bioenergy (36.6 TWh)

2. What percentage of total renewable electricity was generated by that source?

36.6/122.2 = 29.93%

3. Noting your answer to question 1 above, how has the largest source of renewable electricity changed since 2012?

In 2012, onshore wind was the largest source of renewable electricity and generated 12.2 TWh of electricity.

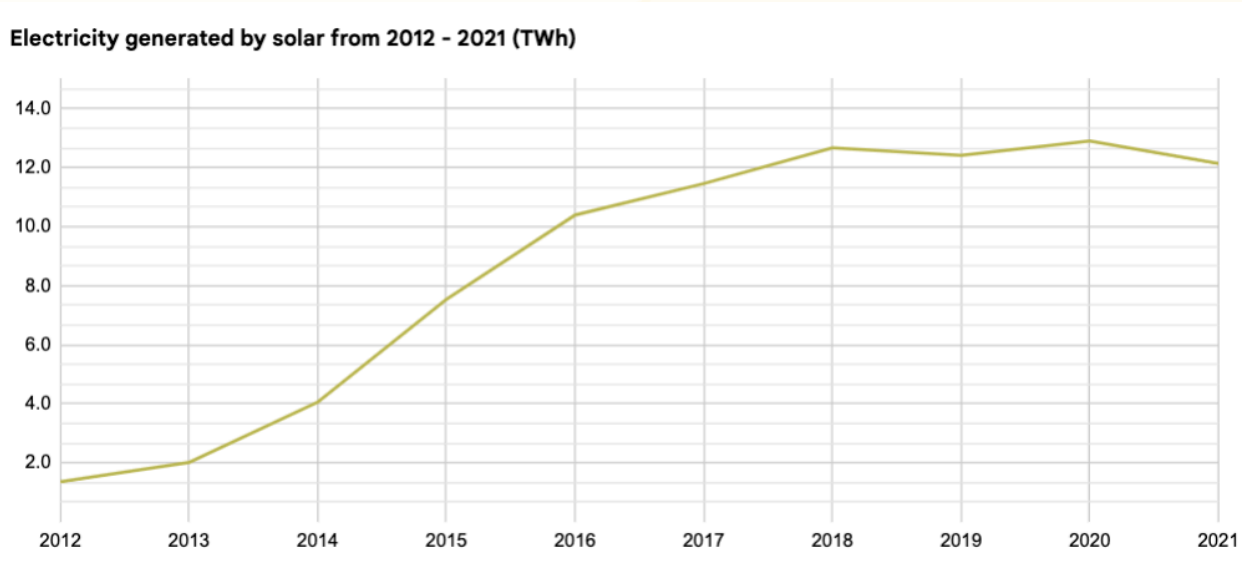
4. If, in 2022, weather conditions caused offshore wind electricity generation to fall by 12% year-on-year, how much electricity was generated by offshore wind in 2022?

35.5 x (1-0.12) = 31.25 TWh

5. Assume that in 2022 electricity generation from offshore wind fell by 12% from the previous year but total electricity generated from renewables remained the same as in 2021. For the shortfall to be made up entirely by solar energy, how much would solar electricity generation need to increase since 2021 to meet this gap?

Offshore wind = 31.25TWh
Gap created by weather conditions 35.5 - 31.25 = 4.3TWh
Increased solar production = 12.1+4.3 = 16.4 TWh
(16.4-12.9)/12.9 = 27.1%

6. Draw a line graph showing the electricity generated by solar PV from 2012 to 2021.



a. Calculate the gradient of the line between 2014 and 2016 for solar PV.

(10 - 4 - 4.1) / 2 = 3.17

b. If this growth rate had remained constant since 2016, how much electricity would have been generated by solar PV in 2021?

10.4 + (3.17 x 5) = 26.2 TWh

7. The school debate on renewable energy is entitled "Which renewable energy sources should the UK invest in?". Based on the information provided in this resource, what are some points that you might wish to make? Use examples from the data and previous questions to support your views.

Any reasonable observations are valid. Example commentary:
Bioenergy and offshore wind are currently the largest producers of renewable energy with onshore wind a close third. There is clearly a track record of these producing electricity reliably. This may suggest that the UK should invest further in these options.
Solar grew by nearly 800% between 2012 an 2021, which may suggest that solar technology is rapidly improving and is now contributing nearly 10% of total renewable electricity production. Therefore, solar may also be an area for further investment by the UK.