Comp3402 Research-based approach

C.B.Price December 2021

Purpose	To understand the trends in energy production and to relate wind energy to these.
Files Required	nix
ILO Contribution	LO 4
Send to Me	nix
Homework	Independent Research

You should choose to address one of the following questions.

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1 What area of land is needed to provide power for Worcester City?

The answer depends on the technology used to produce the power. I suggest you compare **wind** and **nuclear**. The answers to the following questions need only to be approximate estimates.

- How much power do you consume? I told you I estimated that I use 1.5 kWatt. That was during the day. At night it would drop to 10% of this. So, what is the average power I use?
- How many people live in Worcester? So, what is the power need for Worcester?

- What power does a modern wind turbine produce?
- What area of land (in square meters) is required for a single wind turbine?
- Therefore, what is the total area of land required to power Worcester by wind?
- Can you find land of this area near Worcester?

- How much power does a nuclear power station produce?
- What area of land is required for this station?
- Therefore, what is the total area of land required to power Worcester by nuclear?
- Can you find land of this area near Worcester?

- Compare wind and nuclear power as a feasible source of power for Worcester. ***Imagine you are writing a report for the Local Authority advising them which future power option to adopt***. ***Write a paper to assert your position.***

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2 What is the Environmental Impact of Power Generation on Birds?

The answer depends on the technology used to produce the power. I suggest you compare **wind** power and a second **source of your choice.** The answers to the following questions need only to be approximate estimates. You may choose to include other living creatures (e.g. fish) in your research.

- How many birds are killed in a year by wind turbines in a country? Try UK or Denmark.
- How many birds are killed in a year by traffic?
- How many birds are killed in a year by cats?
- How many birds are killed in a year by your second source of power?
- What is the life-span of a bird compared to a human?

- Compare the impact of wind power and your chosen source on the environment. ***Imagine you are addressing a body who is concerned about environmental issues advising them on the environmental impact of the technologies. Write a paper to assert your position.***

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3 The 'End-Game' – The Cost of De-commissioning a Power Station

You may have seen those rather spectacular YouTube clips of defunct power station components being demolished like this recent one, https://www.youtube.com/watch?v=LkqFvn3RKB4 . The cost of de-commissioning power stations is often ignored in discussions about which type of power station we should be building in the future; the focus is often on 'commissioning' costs (build, bringing on-line etc.). The automotive industry has long recognised the importance of de-commissioning the cars they manufacture, they manufacture cars with 'Design for Recycling' in mind.

- How much does it cost to commission a nuclear power station? A single example is fine.
- What is this cost per Megawatt?
- How much does it cost to commission a wind farm? A single example is fine.
- What is this cost per Megawatt?

- How much does it cost to de-commission a nuclear power station? A single example is fine.
- What is this cost per Megawatt?
- How much does it cost to de-commission a wind farm? A single example is fine.
- What is this cost per Megawatt?
- Compare commissioning and de-commissioning costs per Megawatt for wind and nuclear. ***Imagine you are addressing a government committee. Write a paper to help them decide whether to invest in wind or nuclear power.***

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4 Electric Cars – How many can we power from a single wind turbine?

Wind turbines create power and electric cars use power. In this question we shall be working with **energy** which is the power used multiplied by the time it is used for. We typically use Kilowatts for power and Hours for time, so energy is measured in Kilowatt-Hours.

Let's assume you have purchased an electric car and you want to know how this can be powered solely by a single wind turbine.

- Choose an electric car.
- Find its power consumption in Kilowatts
- Estimate how many hours you drive in a year (start with a day and multiply by 365)
- Therefore, calculate the energy you will need in a year, in Kilowatt-Hours

- Now research a wind turbine, on land in the UK and find its power supply in Kilowatts
- Calculate the energy in Kilowatt-Hours it produces in a single year.

- Use your above calculations to find out how many electric cars can be powered by a single wind turbine in a year. ***Imagine you are discussing with your family whether to purchase an electric car and power this exclusively from 'green' energy. Write a paper to state your position.***
