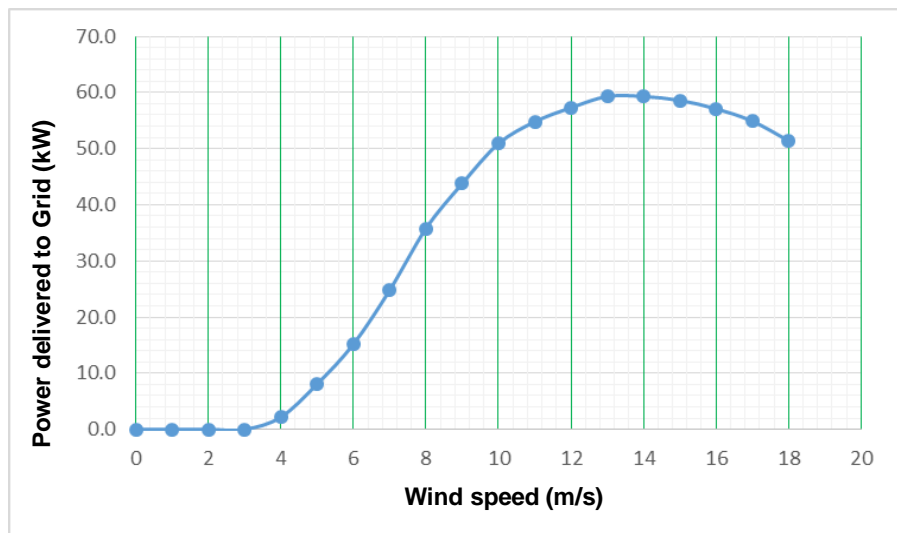




Llywodraeth Cymru  
Welsh Government

## Narrative – Wind power

<b>Year group and curriculum area</b>	Year 9 or 10. Science/mathematics/geography.
<b>Activity</b>	This activity is based on presenting data more clearly, and selecting a suitable method of displaying data for clarity and for drawing valid evidence-based conclusions.
<b>Topic</b>	Generation of electricity/renewable energy/power.
<b>Differentiation</b>	Learners can either be set this as an open task or guided in a very structured way through the activities.
<b>Possible strategy/solution</b>	<p>The purpose of this activity is to present the data in a more suitable way in order that more valid conclusions can be drawn.</p> <p><b>Requirements</b></p> <ul style="list-style-type: none"><li>• Wind farm fact sheet.</li></ul> <p><b>Task 1: Wind speed and power data</b></p> <p>This task involves learners in analysing and evaluating Cerys' thoughts, given in the task sheet, and relating it to the data and text supplied in the fact sheet</p> <p>This requires learners to draw a graph of the data presented e.g. a line graph – yields a relationship as shown in the graph.</p>



### Possible solution with explanations

Low wind speed produces little or no power output, therefore a 'cut in' wind speed might be employed so that the turbine does not rotate until a speed of say 6.5m/s (metres per second) is reached, giving the minimum useful power output of 20kW.

Power output peaks at 60kW at a wind speed of 13m/s. However the criteria would like to limit the power output to 50kW which is achieved at a speed of 10m/s therefore there is no further advantage of making the wind turbine spin faster. The turbine rotors should therefore be limited from turning any faster than 10m/s.

### Task 2 : Rotor speed and power data

This task involves learners in analysing and evaluating Sion's thinking, given in the task sheet, and relating it to the data and text supplied in the fact sheet

### Possible solution and explanations

A graph of rotor diameters (horizontal axis) and power output (vertical axis) is non-linear and can be drawn to locate the minimum diameter that will produce an output of at least 20kW. This is between 7 and 8m. Referring to graph this is 7.1m.

However rotors with diameter of over 11m are required to give the maximum output driven by winds of 10m/s.

While the smaller rotors would work and give the minimum power requirements the larger blades would produce higher energy outputs during strong winds.

	<p>While theoretical values are useful they are only an estimate and are dependent on the efficiency of the wind turbine, which the text state is at best 50%, so the actual output is half that of the theoretical value. In practice a far larger value diameter is required. By considering the theoretical values it has only been possible to established the relationship between rotor diameter and power output.</p>
<b>Links with the LNF</b>	<p><b>Skills</b></p> <ul style="list-style-type: none"> <li>• Generating and using a strategy to solve problems.</li> <li>• Working collaboratively to solve a problem.</li> </ul> <p><b>Numeracy component</b></p> <p><b>Strand: Developing numerical reasoning (Year 9/10)</b></p> <p><b>Element: Identify processes and connections (Year 9/10)</b> Learners are able to:</p> <ul style="list-style-type: none"> <li>• transfer mathematical skills across the curriculum in a variety of contexts and everyday situations</li> <li>• select, trial and evaluate a variety of possible approaches and break complex problems into a series of tasks</li> <li>• prioritise and organise the relevant steps needed to complete the task or reach a solution</li> <li>• choose an appropriate mental or written strategy and know when it is appropriate to use a calculator</li> <li>• identify what further information might be required and select what information is most appropriate</li> <li>• select appropriate mathematics and techniques to use.</li> </ul> <p><b>Element: Represent and communicate (Year 9/10)</b> Learners are able to:</p> <ul style="list-style-type: none"> <li>• explain results and procedures precisely using appropriate mathematical language</li> <li>• select and construct appropriate charts, diagrams and graphs with suitable scales</li> <li>• interpret graphs that describe real-life situations, including those used in the media, including discussion on limitations of data.</li> </ul> <p><b>Element: Review (Year 9/10)</b> Learners are able to:</p> <ul style="list-style-type: none"> <li>• interpret answers within the context of the problem and consider whether answers, including calculator, analogue and digital displays, are sensible</li> <li>• interpret mathematical information; draw inferences from graphs, diagrams and data, including discussion on limitations of data</li> </ul>

	<ul style="list-style-type: none"> <li>draw conclusions from data and recognise that some conclusions may be misleading or uncertain.</li> </ul> <p><b>Strand: Using number skills (Year 9)</b></p> <p><b>Element: Calculate using mental and written methods (Year 9)</b></p> <p>Learners are able to:</p> <ul style="list-style-type: none"> <li>use efficient written methods to add and subtract numbers and decimals of any size, including a mixture of large and small numbers with differing numbers of decimal places</li> <li>multiply and divide whole numbers and decimals.</li> </ul> <p><b>Strand: Using data skills (Year 9)</b></p> <p><b>Element: Collect and record data, Present and analyse data, Interpret results (Year 9)</b></p> <p>Learners are able to:</p> <ul style="list-style-type: none"> <li>construct and interpret graphs and diagrams (including pie charts) to represent discrete or continuous data, with the learner choosing an appropriate scale</li> <li>examine results critically, select and justify choice of statistics recognising the limitations of any assumptions and their effect on the conclusions drawn</li> <li>use appropriate mathematical instruments and methods to construct accurate drawings.</li> </ul> <p><b>Literacy component</b></p> <p><b>Strand: Writing across the curriculum (Year 10)</b></p> <p><b>Element: Organising ideas and information (Year 10)</b></p> <p><b>Aspect: Meaning, purposes, readers (Year 10)</b></p> <p>Learners are able to:</p> <ul style="list-style-type: none"> <li>write both extended pieces, which include detailed evidence and information, and shorter pieces which summarise concisely, showing clear awareness of the reader or intended audience</li> <li>construct responses that connect and develop ideas to fully cover the topic</li> <li>plan appropriately to develop writing for a range of different purposes and audiences</li> <li>use the tools and conventions of ICT creatively and appropriately to communicate effectively in a range of contexts.</li> </ul>
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**Aspect: Structure and organisation (Year 10)**

Learners are able to:

- improve the content, structure and accuracy of their writing through independent review and editing
- write independently in an appropriate form with increasing confidence, ensuring content is organised, detailed and relevant, *e.g. how best to present opinions, information and explanations*
- show clear awareness of different readers by selecting from a range of styles and structures, and adapting their use of language
- organise writing in an appropriate form, ensuring content is detailed within and between paragraphs or sections.

**Element: Writing accurately (Year 10)****Aspect: Grammar, Punctuation, Spelling, Handwriting (Year 10)**

Learners are able to:

- vary sentence structures to engage and sustain the reader's interest and write with grammatical accuracy
- use the full range of punctuation in order to vary pace, clarify meaning, avoid ambiguity and create deliberate effects
- use a variety of strategies and resources to accurately spell an increasing range of familiar, unfamiliar and subject-specific words
- present their handwritten or on-screen work effectively, choosing form, images and graphics to enhance meaning
- Welsh-medium statement: write grammatically accurate sentences ensuring that the verb tense and person is correct in context
- Welsh-medium statement: use a range of mutations correctly (soft, nasal and aspirate mutations) in context.