

Introducing Wind Energy and Turbines



Overview

Find out about power generated by the wind, what a wind turbine is and how it works

NZ Curriculum Achievement Objectives:

LEARNING AREAS	ACHIEVEMENT OBJECTIVES	LEVELS	YEARS
Science: Physical World Physical inquiry and physics concepts	Explore everyday examples of physical phenomena, such as movement, forces, electricity and magnetism, light, sound, waves, and heat.	1-2	1-4
Technology: Technological modelling	Understand that functional models are used to represent reality and test design concepts and that prototypes are used to test technological outcomes.	1-2	1-4
English: Speaking, writing and presenting	Acquire and begin to use sources of information, processes and strategies to identify, form and express ideas	1-2	1-4

Teacher information:

Wind Energy and Turbines

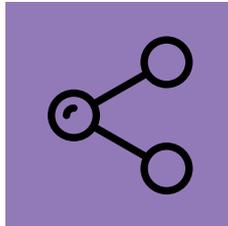
Learning sequence



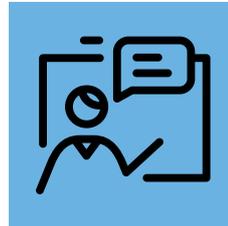
Introducing knowledge



Explore and investigate



Make and share



Reflect and extend



Make a difference

Learning intentions

Students are learning to:

- Begin to understand the concept of energy being conveyed by moving air.
- Identify parts of a wind turbine and describe how it produces energy.

Success criteria

Students can:

- Explain the concept of wind energy and observe and record the action of wind on a set of objects.
- Explain the parts of a wind turbine and how it works.

Resources needed

- Exploring energy and electricity slideshow: <https://docs.google.com/presentation/d/1clxcKx6LOZ13zGiHrMGrx0hwYP5Ku7WterVxSfVXVf8/edit?usp=sharing>
- Wind energy slideshow https://docs.google.com/presentation/d/1epwO8f0KZapSLoivQQl6qYS8ZPzp_XSuetXoB_Ot3QE/edit?usp=sharing
- Wind power, Connected 3 2010. Ministry of Education (2010)
- Paper, thumb tacks, and ice block sticks for pinwheel models.

Vocabulary:

- Energy, electricity, heat, heater, heat pump, space, cool, cold, hot, warm.

Background information and supporting resources

- Windmills and Waterwheels: Harnessing the Energy of Wind and Water. Building Science Concepts Book 54. Wellington: Learning Media, Ministry of Education (2004).
- Energywise website: www.energywise.org.nz
- EECA: www.eeca.govt.nz
- www.windenergy.org.nz
- www.kidwind.org/

Learning experience suggestions

Note: These are suggestions only and teachers are encouraged to adjust the activity to suit the needs and interests of their students.



1. Introducing knowledge

Introduction:

- Students can share their prior knowledge about wind power with a partner. Write on a KWL (What I Know, What I Want to Know, What I Learned) chart either as an individual, group or class (see example: <https://www.eduplace.com/graphicorganizer/pdf/kwl.pdf>)
- View the Google Slides presentation: Exploring energy and electricity: <https://docs.google.com/presentation/d/1clxcKx6L0Z13zGiHrMGrx0hwYP5Ku7WterVxSfVXVf8/edit?usp=sharing>. This slideshow introduces the vocabulary: energy, electricity, device, appliance and more. It introduces some basic concepts of electricity and how it is used.
- View the Google Slides presentation: Wind Energy: https://docs.google.com/presentation/d/1epwO8f0KZapSLoivQQl6qYS8ZPzp_XSuetXoB_Ot3QE/edit?usp=sharing This slideshow introduces vocabulary: energy, harnessing, turbines, blades etc. It introduces the concepts of how wind is formed and what a wind turbine is.

Students can record their prior knowledge and experience on the student recording sheet below:



Thinking about the wind

Fill in the blanks with your ideas.

Wind can blow a _____ .

Wind can fly a _____ .

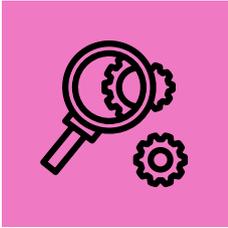
Wind can shake a _____ .

Wind can make a _____ go faster.

I can hear the wind when _____ .

I can feel the wind when _____ .

Google Docs version: <http://bit.ly/2HAoFt8>



2. Explore and investigate

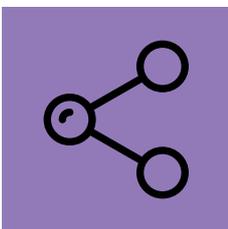
Thinking like a scientist

Ask questions: Where does wind come from?
What does wind feel like? How can wind turn
and move objects?



- Discuss what can move in the wind. Why does it move? Is it heavy or light?
- Go outside and play in the wind, see which natural objects are blown in the wind and which are not. Discuss reasons why.
- Complete an experiment 'Will the wind blow it?' (see example below)
- Google Docs version: https://docs.google.com/document/d/1pm67qGcB63HWSe3FCen0pOi-Gai9ml_EOzkRmPzcEX1c/edit?usp=sharing

Will the wind blow it?		
Object	Prediction	Results
paper		
shell		

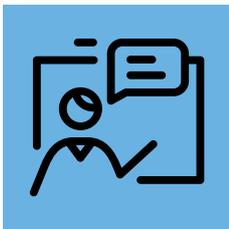


3. Make and share

- Make a simple paper pinwheel (see <http://stem-works.com/external/activity/562>) and use the wind outside, or a hairdryer, fan, or balloon to make it go. Cut a piece of paper and fold in one side of each triangle. Anchor with a pin or thumb tack to a piece of wood or an iceblock stick.



- Discuss what makes your pinwheel go faster/slower.
- A wind turbine works in a similar way to a pinwheel. The wind blows the turbine around. Look at and discuss a photo of a wind turbine and describe the shapes. Why is it tall? What spins around? How does the spinning of the blades make power?
- Look at and discuss a diagram of the inner workings of a wind turbine. What new vocabulary can you learn about? (tower, gearbox, generator, rotor, blades, shaft) see: <https://www.energy.gov/eere/wind/how-do-wind-turbines-work>
- You can make a wind turbine using a 3D printer and the step by step guide on the School-gen website, see: <http://www.schoolgen.co.nz/make-and-play/maker-projects/make-a-wind-turbine/>. Design experiments to try with your wind turbine. Some ideas for an experiment are: predict and record what happens with your wind turbine when it is outside, in front of a fan or hairdryer, or predict and record which objects the wind turbine can move.
- Discuss and draw on a map where in your school would be the best place to put a wind turbine for ultimate results.
- Make a simple kite or manu tukutuku and fly it outside on a windy day. Discuss how the kite stays up.



4. Reflect and extend

- Reflect on experiences and knowledge around wind energy. In pairs, share definitions of what wind energy is.
- Look at photos or videos of wind farms. Why is New Zealand an ideal place for harnessing wind? What happens if the wind is not blowing or if the wind is too fierce?
- Read 'Wind Power: The Debate' (see resources on page 2) and discuss:
 - » What do you think about wind farms?
 - » What are the ecological and visual impacts?
 - » Are there any pollution problems?
 - » Do the benefits outweigh the negatives?
 - » Design and implement a class/school survey asking others of their opinions.



5. Make a difference

- Students can use their findings to make a poster or slideshow on the benefits of using the wind as a natural, renewable power source.
- Enquire to where your nearest wind farm is and see if you can pay a visit.
- Design and label how you could use a wind turbine at your house, school or local reserve.

Would you like to learn more about electricity and power generation? Try these other School-gen activities

Electricity	<ul style="list-style-type: none"> • Introducing electrical energy learning experience 	http://www.schoolgen.co.nz/wp-content/uploads/2019/01/Introducing-electrical-energy.pdf
	<ul style="list-style-type: none"> • Introducing electrical energy slideshow 	https://docs.google.com/presentation/d/1clxcKx6L0Z13zGiHrMGrx0hwYP5Ku7WterVxSfVXVf8/edit?usp=sharing
Wind energy	<ul style="list-style-type: none"> • Make a wind turbine 	http://www.schoolgen.co.nz/wp-content/uploads/2018/01/Educ%20Resource_WindTurbine_.pdf
Hydroelectricity	<ul style="list-style-type: none"> • Hydro turbine challenge STEM activity 	http://www.schoolgen.co.nz/wp-content/uploads/2019/05/Hydro-turbine-Challenge-L3-and-4.pdf
	<ul style="list-style-type: none"> • Introducing hydro power 	http://www.schoolgen.co.nz/wp-content/uploads/2019/05/School-gen-Introducing_Hydro_Power.pdf
	<ul style="list-style-type: none"> • Hydroelectricity and turbines slideshow 	https://docs.google.com/presentation/d/1H26vmCw2SdIX5uHm4ppwKx7xSuDhf4zriiTykE6QuLQ/edit#slide=id.g5483348dc0_0_0
	<ul style="list-style-type: none"> • Make a hydro turbine: maker project 	http://www.schoolgen.co.nz/make-and-play/maker-projects/make-a-hydro-turbine/