genesis school-gen | STEM PLD
presented by
nanogirl

Wind Power
Wind Turbines

Summary:

This resource supports your teaching around the topic of **wind energy.**
It contains an activity suitable for Years 3-8.

Your students will:

- **UNDERSTAND:** Renewable energy is important for sustainability. The Earth's resources, including wind, are part of what makes renewable energy possible.
- **KNOW:** Wind turbines generate electricity
- **DO:** Build a model wind turbine and use it to investigate the best location for a new local wind farm.

Curriculum Links:

Learning Areas	Achievement Objectives	Levels	Years
Science **Nature of Science:** Investigating in Science	Ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.		3-8
Physical World: Physical Inquiry and Physics concepts	Explore, describe, and represent patterns and trends for everyday examples of physical phenomena, such as movement, forces, electricity and magnetism, light, sound, waves, and heat.	3-4	3-8
Planet Earth and Beyond: Earth Systems	Explore and describe natural features and resources. Appreciate that water, air, rocks and soil, and life forms make up our planet and recognise that these are also Earth's resources.	1-2 3-4	3-8 3-8
Maths and Statistics **Statistics:** Statistical Investigation	Conduct investigations using the statistical inquiry cycle. Plan and conduct investigations using the statistical inquiry cycle.	1-3 4	3-8 3-8

Understand

Earth's resources, including wind (**hau**), can be harnessed to use as sources of renewable energy. Harnessing wind energy is an important part of New Zealand's transition to sustainable energy. Wind which might feel soft to us is actually capable of moving large objects like wind turbines. By learning about wind farms and wind turbines, students can connect something that they feel around them everyday—the wind—to the large-scale applications of science and technology. Learning about the wind is a great way to introduce topics such as climate and weather to your class.

Inā tere ngā kapua, he hau kei muri—When the clouds move, there is a wind behind them (Ngati Hine).

Know

Wind is moving air created by differences in temperature and pressure over the Earth's surface. There is not a 'place where wind starts from', as air is constantly moving all over the surface of the Earth.

Wind farms and wind turbines

Wind energy is very important in New Zealand. In 2022, wind power generated about 2,837 Gigawatt hours of electricity—that's about 6.5% of New Zealand's net annual electricity generation. Overall, New Zealand generates about 87% of its electricity from renewable sources.

The places where electricity is generated from the wind are called 'wind farms' and the structures which do this are called 'wind turbines.' Wind turbines look like large fans or windmills. Turbines have large blades which are shaped to catch the wind as it blows past them. As this happens, the wind turbine blades start to spin. The spinning blades rotate a turbine, which is connected to a generator that generates electricity.

Wind farm locations

Wind farms need to be built in places with strong prevailing winds. "A good example of this is the Genesis generation asset 'Hau Nui Wind Farm' in South Wairarapa". It is built in a location with the second highest potential energy output in New Zealand. Other places with wind farms include the Ruahine ranges in Manawatū, and Taranaki. Taranaki also has offshore wind farms, which are located out at sea. As well as being windy, good wind farm locations need to be in places where there is enough open space to build the large structures, so they are not built in the middle of towns or in areas used for agriculture.

Do

Your students will build their own **wind turbine** and use it to investigate the best location around the school for a potential new wind farm.

Materials:

(If your students are building their own wind turbines)

- 1 piece A4 paper per student
- Glue
- 1 small pin or thumb tack per student
- 1 pair scissors per student
- 1 paper straw OR lolly stick per student
- Coloured pencils for decorating the wind turbines (Optional)
- Printed copy of the instructions for building a wind turbine from the last page of this resource (Optional)

(If your students are not building their own wind turbines)

- Enough spinning wind toys for the class to have one each.

Instructions before the activity:

- Start with a class discussion which brings in their prior knowledge. Has anyone seen a wind farm before? Do you live in an area where there are wind farms? If not, has anyone ever stood by a spinning fan and felt that the spinning blades moved the air around them?
- If you have a fan in your classroom, take a look at the shape and size of the blades. The blades on a wind turbine are similar, but not exactly the same shape.
- If your class will be making their own turbines, give out the materials and instruction sheets and have them make their own turbine now.
- Ask the class to imagine that the school wanted to start creating their own electricity from wind turbines. Where would they choose to build their wind turbines, and why? Have the class guess, and share their guesses with others.

- Your class can now investigate where around the school is the windiest place, and the best place to build the wind farm. The students can try holding their wind turbines in different places to test this. Remember that the best place might not be the place with the strongest gusts of wind—it's also about steady winds and being away from places where other people are working or walking.
- Older students might be interested in also investigating wind direction and wind speed.

Activity Instructions: Wind Turbine

1. Take your piece of A4 paper. Fold one corner over until it reaches the opposite edge, then make a sharp fold.
2. Cut the leftover rectangular strip off the bottom of the paper. When you open up the paper, it should now be a square.
3. Decorate or colour in your square if you like!
4. Refold the paper into a triangle. Fold that triangle in half again to make a smaller triangle.
5. When you open the paper square up, there should be folds that make an 'X' shape from each corner, meeting in the middle.
6. Starting at each corner, cut down the creases, but not all the way to the middle. Leave about 2cm space.
7. You have cut each corner in half. Bend one half of one corner into the centre and glue it there. Do the same for each of the corners, making sure to take the same side of each corner.
8. Once all four half-corners are in the middle and the glue is dry, stick the pin or thumb tack through the centre of all four corners and the centre of the square.
9. Place the pencil, lolly stick or twig underneath the pin, and press the sharp end of the pin into the paper straw or lolly stick near to one end. Make sure that there is a little space between the straw or stick and the paper square.
10. Gently blow into the blades and watch them spin.

Extension activities

- Have your students present their wind farm location ideas to the class. They could make a poster, or draw a map.
- Investigate your local wind conditions, by researching national weather services like Metservice and NIWA.

Extra resources

Help your students develop their understanding of wind energy further with this resource from Genesis School-gen:
https://www.schoolgen.co.nz/for-teachers/resources/wind-energy-and-turbines

We hope you have enjoyed this educational STEM resource.
School-gen is a Genesis community initiaive to get kaiako, tamariki and whānau enthused about STEM.
For more free resources please visit out Genesis School-gen website and follow us on Facebook and Instagram @schoolgennz