

# Teacher Lesson Guide

## Turbines and power generation

### The important stuff

This unit was designed for		Total content duration	
Target audience	Year 7-10	Total content duration	100 - 125 min
Curriculum links also for		This unit contains	Duration
Scientific understanding	Year 6 - 9	You need energy to make energy video	5 min
		Power station and turbine fact sheets	10-15 min
Science as a Human Endeavour	Year 5-10	Create a pinwheel	40-50 min
		Create a turbine	40-50 min
Science Inquiry	Year 5 - 10	Pumped Hydro video	5 min
Detailed curriculum code alignment for ACARA v9 is available in the <a href="#">Curriculum Alignment</a> section of this unit guide.		Check the timing and notes of these activities and find links to all of the individual resources in the <a href="#">Lesson Breakdown</a> section of this unit guide.	

### An overview of the lesson

This unit explores transformations of energy of moving water into electricity that Australians use every day. Use the videos on the unit page to introduce the concept of energy transformation in Snowy Hydro's power stations. Use the fact sheets to learn about Snowy Hydro's power stations and turbines that spin our generators. From here, have students make their own pinwheels from our templates to explore the relationship between form and function to make an efficient pinwheel. After the basics of a pinwheel, have students create their own turbine to demonstrate the transfer of energy from water. Take both of these activities as far as your students like with the opportunity to extend by encouraging the scientific process of posing investigatable questions around efficiency of the turbine. Watch the video about Pumped Hydro and consider with your students how this process would be useful for generating more electricity for Australians.

This unit compliments the [Dams and Reservoirs - Transforming the energy of water Unit](#) and leads well to the [Snowy 2.0 Unit](#)

[Suggested prior knowledge](#)

[Find detail on ideas discussed in this unit](#)

## Lesson breakdown

Activity timing and delivery guide			
Order	Duration	Activity description	Notes
1	5 min	<b>You need energy to make energy video</b>	Use the video to introduce the concept of energy transformation - energy can never be created or destroyed.
2	10-15 min	<b>Power station and turbine fact sheets</b>	Use the fact sheets to learn about the power stations in the Snowy Scheme. See if students can label the parts of a turbine that use energy to make energy.
3	40-50 min	<b>Create a pinwheel</b>	To explore the way energy of movement can be transformed, make a pin wheel. <i>Extension:</i> Test if one shape is more efficient than another from the templates. Go further by designing your own and measuring efficiency.
4	40-50 min	<b>Create a turbine</b>	Snowy turbines use water to spin them. Create a turbine and demonstrate how energy is transferred from water. <i>Extension:</i> Test if different designs are more efficient than another. Go further by designing your own and measuring efficiency. You might like to pause here to watch the <b>Pumped Hydro video</b> before continuing. Talk about what "efficiency" means in this context. Continue to discuss the learning from the video by "pumping" water back up to the top to try the turbines again and again.
5	5 min	<b>Pumped Hydro video</b>	Watch the Pumped Hydro video to explain how water can be used again and again to generate more electricity

For this lesson you will need	
Teaching resources	
<b>Video</b>	<a href="#">Science of the Snowy Scheme with Dr. Kirsten Banks: You need energy to make energy</a>
<b>Activity materials</b>	<p><i>For pinwheels:</i> printed pinwheel template sheets, craft paper, paper straws, berry pins, pen/pencil/textas</p> <p><i>For each turbine:</i> paper plates, cups, bamboo skewers, wide sticky tape rolls, marker-pens, buckets/vessels to catch water.</p>
<b>Video</b>	<a href="#">Science of the Snowy Scheme with Dr. Kirsten Banks: Pumped Hydro</a>

Student resources	
Fact sheets	<a href="#">Power stations fact sheet</a> <a href="#">Turbines fact sheet</a>
Activity sheets	<a href="#">Label the parts of a turbine activity sheet</a>
Hands on activities	<a href="#">Make a pinwheel hands on activity</a> <a href="#">Pinwheel shape templates</a> <a href="#">Create a turbine hands on activity</a>
Activity materials	<p><i>For pinwheels:</i> 3 different pinwheel templates, paper, 3 x paper straws, 3 x berry pins, pen/pencil/texta</p> <p><i>For each turbine:</i> 2 x paper plates, 4 x cups, 1 x bamboo skewer, wide sticky tape, marker-pen, 2 x buckets/vessels to catch water.</p>

## Key themes and ideas

### Suggested prior knowledge before this lesson

- Students would benefit from being introduced to [AC9S6U03](#): investigate the transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors
- Students may benefit from doing the [Dams and Reservoirs - Transforming the energy of water Unit](#) before this unit, however you can also flip the order and do this unit first.

### Within this unit, students will explore

- Transfer of energy:** From the transformation of energy from potential to kinetic with the use of a gravitational force to get water moving.
- Factors that affect energy transfer:** Students indirectly explore factors such as leverage, form and function and inertia from hands on activities
- Conservation of energy:** Explore where energy is absorbed in processes as well as passed on to another form of energy
- Engineering and scientific advances:** are often made as a result of the requirement from society. Students can learn about how engineering efficient turbines create more opportunity for electricity to generate
- Posing investigatable questions:** to explore how small changes in shapes can result in a change in energy transfer efficiency
- Examining environmental and economic considerations:** extension opportunity to discuss the re-use of energy of water to create electricity

# Curriculum alignment

## Years 5 & 6

Science understanding	
Year 5	
There are no direct year 5 science understanding curriculum links in this unit	
Year 6	
Physical sciences	<a href="#">AC9S6U03</a> investigate the transfer and transformation of energy in electrical circuits, including the role of circuit components, insulators and conductors
Science as a human endeavour	
Nature and development of science	<a href="#">AC9S5H01/AC9S6H01</a> examine why advances in science are often the result of collaboration or build on the work of others
Science inquiry	
Questioning and predicting	<a href="#">AC9S5I01/AC9S6I01</a> pose investigable questions to identify patterns and test relationships and make reasoned predictions
Evaluating	<a href="#">AC9S5I05/AC9S5I05</a> compare methods and findings with those of others, recognise possible sources of error, pose questions for further investigation and select evidence to draw reasoned conclusions

## Years 7 & 8

Science understanding	
Year 7	
Physical sciences	<a href="#">AC9S7U04</a> investigate and represent balanced and unbalanced forces, including gravitational force, acting on objects, and relate changes in an object's motion to its mass and the magnitude and direction of forces acting on it

Year 8	
Physical sciences	<a href="#">AC9S8U05</a> classify different types of energy as kinetic or potential and investigate energy transfer and transformations in simple systems
Science as a human endeavour	
Use and influence of science	<a href="#">AC9S7H03/AC9S8H03</a> examine how proposed scientific responses to contemporary issues may impact on society and explore ethical, environmental, social and economic considerations
Science inquiry	
Questioning and predicting	<a href="#">AC9S7I01/AC9S8I01</a> develop investigable questions, reasoned predictions and hypotheses to explore scientific models, identify patterns and test relationships
Processing, modelling and analysing	<a href="#">AC9S7I05/AC9S8I05</a> analyse data and information to describe patterns, trends and relationships and identify anomalies

## Years 9 & 10

Science understanding	
Year 9	
Physical sciences	<a href="#">AC9S9U05</a> apply the law of conservation of energy to analyse system efficiency in terms of energy inputs, outputs, transfers and transformations
Year 10	
There are no direct year 10 science understanding curriculum links in this unit	
Science as a human endeavour	
Nature and development of science	<a href="#">AC9S9H02/AC9S10H02</a> investigate how advances in technologies enable advances in science, and how science has contributed to developments in technologies and engineering
Use and influence of science	<a href="#">AC9S9H03/AC9S10H03</a> analyse the key factors that contribute to science knowledge and practices being adopted more broadly by society

<b>Use and influence of science</b>	<a href="#">AC9S9H04/AC9S10H03</a> examine how the values and needs of society influence the focus of scientific research
<b>Science inquiry</b>	
<b>Questioning and predicting</b>	<a href="#">AC9S9I01/AC9S10I01</a> develop investigable questions, reasoned predictions and hypotheses to test relationships and develop explanatory models

## All year level curriculum areas in focus

<a href="#">Science Learning Area</a>	<a href="#">Cross curriculum priorities</a>	<a href="#">General capabilities</a>
<a href="#">Key ideas</a>	<a href="#">Sustainability</a>	<a href="#">Critical and Creative Thinking</a>
<ul style="list-style-type: none"> <li>Form and function</li> <li>Stability and change</li> <li>Scale and measurement</li> <li>Matter and energy</li> <li>Systems</li> </ul>	<p><b>Systems:</b>  <a href="#">SS1</a>: All life forms, including human life, are connected through Earth's systems (geosphere, biosphere, hydrosphere and atmosphere) on which they depend for their wellbeing and survival.  <a href="#">SS2</a>: Sustainable patterns of living require the responsible use of resources, maintenance of clean air, water and soils, and preservation or restoration of healthy environments.</p> <p><b>Design:</b>  <a href="#">SD2</a>: Creative and innovative design is integral to the identification of new ways of sustainable living.</p> <p><a href="#">SD3</a>: Sustainable design requires an awareness of place, past practices, research and technological developments, and balanced judgements based on projected environmental, social and economic impacts.</p> <p><b>Futures</b>  <a href="#">SF2</a>: Sustainable futures require individuals to seek information, identify solutions, reflect on and evaluate past actions, and collaborate with and influence others as they work towards a desired change.</p>	<ul style="list-style-type: none"> <li><a href="#">Inquiring</a></li> <li><a href="#">Generating</a></li> </ul>
		<a href="#">Literacy</a>
		<ul style="list-style-type: none"> <li><a href="#">Reading and viewing</a></li> </ul>
		<a href="#">Numeracy</a>
		<ul style="list-style-type: none"> <li><a href="#">Measurement and geometry</a></li> </ul>
		<ul style="list-style-type: none"> <li><a href="#">Personal and social capability</a></li> </ul>
		<ul style="list-style-type: none"> <li><a href="#">Social awareness</a></li> </ul>

