MOBILE SCIENCE EDUCATION

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Industry Tour: Pelican Point Power Station

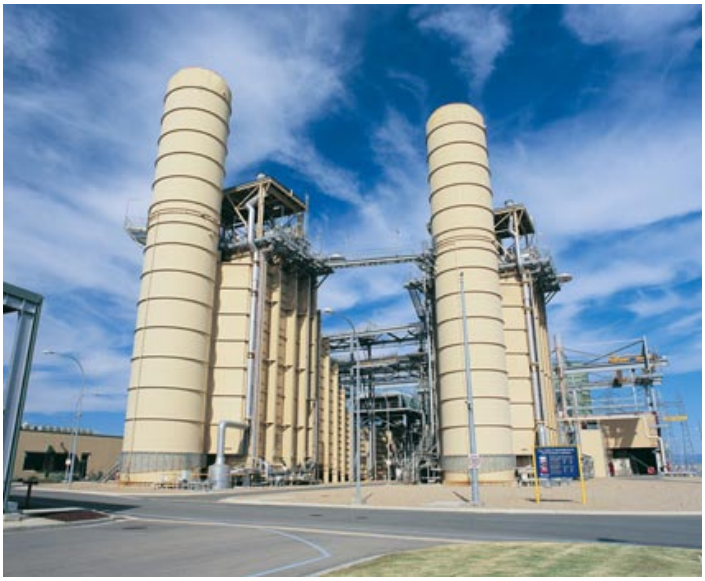
Notes and Suggestions for Primary Teachers

Background Info

International Power

Pelican Point is owned and operated by International Power, which has interests in over 33,000 megawatts of power generating capacity in 21 countries. They own 5 power stations and 4 peaking units[1] in Australia, including a wind farm at Canunda in the south east of South Australia. Their total net capacity in Australia is 3221 MW[2].

Pelican Point



Pelican Point is one of the youngest, most environmentally friendly and most efficient power stations in Australia. The station opened in October 2001, cost approximately $400 million to build and was commissioned and constructed within just two years.

There are two gas turbine generators on site, capable of generating 160 MW of electricity each. The hot exhaust gases from each turbine is used to produce steam through a heat recovery system, and the steam produced is used to power a steam turbine generator, producing an extra 165 MW. In most other power stations, these exhaust gases are simply let out into the atmosphere without being used. This heat recovery system allows Pelican Point to operate at 53% efficiency[3], significantly better than the 35% efficiency achieved by conventional gas power stations, and more than twice as efficient as a conventional coal fired power station. The station as a whole produces 485 MW of electricity, but 5 MW is used in running the station. The remaining 480MW is enough to power approximately 320,000 average homes.

The Generators and the Grid

The 3 generators produce electricity at just 15,700 volts. The voltage from the generators is increased to 275,000 volts by step up transformers in order to overcome the resistance of the wires that make up the national grid. At the local substations the electricity is stepped down to a much lower voltage for distribution to a local area, and is stepped down again to just 240 volts at a box on the wall of each home.

[1] small automated stations that switch on when the demand for electricity is high
[2] http://www.ipplc.com.au/Page.php?iPageID=28
[3] This means that 53% of the energy available in the burning fuel is becoming electricity.

Preparing for the Tour

Below are some suggestions for class activities before the tour.

- Find out how much students already know about electricity and power generation by drawing a concept map in groups or having a class brainstorm on the board

- Find out how much students already know about electricity and power generation by holding a class discussion using guided, open questions about the different forms of energy, power stations, electricity and other related topics.

- Students confirm their understanding of the particle theory: neutrons, protons and electrons. Use models to create atoms of differing sizes, discussing the electromagnetic properties of each particle.

- Come up with a class list of questions to be answered on the tour. Some examples would include:
    - What does Pelican Point do to protect the environment?
    - What is the energy source for Pelican Point?
    - Are work experience opportunities available?
    - What was the career path of the station operator?
    - How much of South Australia does Pelican Point provide power for?
    - Have there ever been any serious accidents?

After The Tour

Below are some suggestions for follow-up work back at school to maximise the value of the tour:

- Students investigate the relationship between magnets and electricity - create an electromagnet / measure the direction and strength of the magnetic field around a wire carrying a current / build a simple motor or generator.

- Students research alternative renewable power sources, including cost-benefit analyses and the social and environmental values associated with the necessity for these.

- Students measure the energy use of different household appliances and conduct household energy audits, making recommendations for more efficient energy use.

- Students draw a flow chart of the energy transformations from the sun to electricity via fossil fuels. Alternately, you could print out the cards available on the website (see links below).

- Students research alternative renewable power sources and create a flow chart, as above, for this power source.

- Using the energy cards as a model (see links below), students create their own 'energy histories' for everyday activities.

- Ask students to write a list of all the forms of energy they can think of - try to find an example of a machine or natural process that converts from energy from one form on the list to another (e.g. the sun converts nuclear energy to light energy and heat energy; an electric motor converts electrical energy to movement, heat and sound).

- Brainstorm a concept map of power generation in a power station.

- Students construct some series and parallel circuits with batteries, small light globes, wires and multimeters and draw their circuits using the correct symbols.

- Students construct a chemical battery, using vinegar, zinc, copper and two wires. (Activities similar to this and the previous one were a part of the tour in previous years. The decision was made to remove them since they can be done very easily in the classroom and do not add to the energy futures/energy histories approach taken during the tour program itself.)

Useful Links

Overview	http://science.howstuffworks.com/electricity-info.htm An overview of what electricity is and how it works, with many links for further study.
	http://www.infoplease.com/ce6/sci/!0820460.html An explanation of generators and their parts.
	http://resources.schoolscience.co.uk/CDA/16plus/index.html More detailed lesson resources, including information and activities relating to transformers, generators, current and efficiency.
Renewables	http://www.energyquest.ca.gov/ This website is full of fun experiments and quizzes for teachers and students of all ages - plenty of excellent resources.
Resources	http://www.mobilescienceeducation.com.au/pdf/PPenergycards.pdf Print these cards to aid your students in constructing 'energy histories' flow charts.

Curriculum Connections

A visit to the Pelican Point Power Station will contribute towards:

Learning Area	Strand	Key Ideas and Outcomes
Science	Energy systems	Students apply quantitative relationships between forces, energy and energy transfer in order to explore the properties of the physical world. 5.4
		Students critique key methods of energy conversion and energy use, and compare the extent of currently known sources with projected future needs. They identify changes necessary for sustainable energy transformation and use. 5.3
Design and technology	Critiquing	Students deconstruct technologies in order to expose the values which lie behind the intentions, design and manufacture of products, processes and systems. They critically examine the consequences of past technologies, and speculate on and explain the consequences of present and future technologies and their capacities to shape human existence. 5.1
	Making	Students make discriminating and responsible use of materials and equipment to create sustainable products. They use the knowledge gained to conceptualise, communicate and act for more ethical resource use in the wider community. 5.5
Society and environment	Place, space and environment	Students critically analyse the relationships between interactions and flows of people, ideas, energy and resources. They experience the resultant patterns, on a variety of scales and contexts, within an equity framework. 5.4

F, T, In
KC4, KC5, KC6, KC7