MOBILE SCIENCE EDUCATION

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Industry Tour: Pelican Point Power Station

Notes and Suggestions for Primary Teachers

Background Info

GDF Suez Energy Australia

Pelican Point is owned and operated by GDF Suez Energy Australia, which owns 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 3540 MW[2]. The parent company, GDF Suez Energy International, has interests in over 76,800 megawatts of power generating capacity in 30 countries.

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.

Electricity

The 3 generators produce electricity at just 15,700 volts - for comparison, you can generate more voltage than this by scuffing your feet across a carpet. If you are wondering why carpets don't kill, voltage is not actually the dangerous part of electricity. Voltage can be thought of as the 'push' behind the electricity. What can make electricity dangerous is the *current*. Measured in amps, the current is a measure of how much electricity is flowing. The 10 amp current in your wall socket will

[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.

kill you at just 240 volts, but the 30,000 volts from the carpet doesn't bother you because the current is just a few milli-amps (*thousandths* of an amp).

The Grid

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.

Energy

Energy cannot be created, nor can it be destroyed - it can only be transformed from one form to another. There are several different forms of energy:

- Electrical
- Heat
- Light
- Kinetic (movement)
- Sound
- Potential
- Chemical
- Elastic
- Nuclear

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.
- Introduce the students to atoms, neutrons, protons and electrons using static charge experiments with balloons.
- 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?
    - How does a person become a power station operator?
    - How much of South Australia does Pelican Point provide power for?

After The Tour

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

- 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 basic circuits with batteries, small light globes and wire.
- Students create a simple electromagnet.
- Students construct a chemical battery, using vinegar, zinc, copper and two wires. (Activities similar to this and the previous two 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.energex.com.au/switched_on/index.asp A fantastic and comprehensive website with masses of information and ideas aimed at all year levels.
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 identify some energy sources, critically analyse current patterns of energy use and write scenarios to describe how they and others could better use energy in the future. 2.3
		Students analyse and chart sequences of energy transfer through items such as toys, home appliances and personal transport. 2.4
Design and technology	Critiquing	Students identify relationships between people, diversity and everyday products, processes and systems. They investigate design characteristics that shape, and are shaped by, these relationships and suggest why the particular design criteria may have been used. 2.1
	Making	Students identify, explain and value the characteristics and uses of a range of materials and equipment. They use this knowledge when critiquing their own and others' designs for products, processes and systems. 2.5
Society and environment	Place, space and environment	Students consider sustainability and care of resources and places as they explore how people's attitudes and values affect their interactions with natural features and cycles. 2.6

F, T, In

KC3, KC4, KC6, KC7