

NRG Island

The *New Republic of Gigawattia* is an island in the Pacific Ocean. It has recently gained independence from the *Kingdom of Jouleopia* and consequentially needs to build new power stations. Its population is growing so the power station must have capacity for future energy demands. As a developing country, the World Bank has agreed to loan money to NRG to build power station(s) as soon as possible.

You are an electrical engineering consultant and have been asked by the government of NRG to advise them as to which type of power station(s) they should build.

You must review the survey information provided to you by your apprentice and prepare a PowerPoint presentation to present to the NRG government.

Your presentation should include:

- ✓ A summary of your island scenario and an outline of possible energy resources.
- ✓ An explanation of the Physics behind how your chosen power station(s) works and why you have chosen it.
- ✓ An unbiased, honest and truthful description of some of the advantages and disadvantages of your chosen type of power station(s).

You may need to research the Internet to produce your PowerPoint presentation. Go to the **Physics department homepage** <http://fizix.info> and under **Year 10 Links** you will find a link to *Andy Darvill's Science Site*, which is a very good place to start. Under **Resources** on fizix.info you can download a copy of this sheet and the island map.



Scenario A

NRG has a population of 200,000 with about 100,000 living in the capital Port Gigawatt. Coal was a major export of Jouleopia before the civil war and a geological survey of the coal quarry east of Newton has revealed sufficient resources to sustain NRG's needs for up to 100 years. Port Gigawatt has capacity for ships to begin export again. Local inhabitants say Shell have prospected for oil in the area to the north of NRG and found significant oil and gas reserves. The climate of NRG is temperate and winds speeds are highly variable. The soil is fertile but unemployment is high amongst the agricultural workers in Farmborough as supply for many crops outstrips demand and the farmers are petitioning the government's agriculture minister to manage agriculture more centrally. The tidal range at the mouth of the River Hubble is very low and the tidal marsh and low-lying nature reserve is inhabited by many endangered species of birds. A hydroelectric scheme on the river would flood the reserve and the fertile land around Farmborough.



Scenario B

NRG has a population of 400,000 with about 250,000 living in the capital Port Gigawatt. The disused coal quarry east of Newton is virtually exhausted in reserves and is being used as a landfill for refuse. A leaked copy of an oil prospecting survey conducted by Shell shows that the oil fields to the north of NRG are unviable and of poor yield. A geological survey conducted by USGS in 1998 in the mountains north of Amazingstoke show large deposits of uranium ore and that the region was tectonically stable. The climate of NRG is tropical with long periods of sustained sunny weather, very light winds and variable precipitation levels. The tidal range at the mouth of the River Hubble is very low and the tidal marsh and low-lying nature reserve is inhabited by many endangered species of birds. A hydroelectric scheme on the river would flood the reserve and the fertile land around Farmborough.



Scenario C

NRG has a population of 20,000 with about 9,000 living in the capital Port Gigawatt. NRG is situated in the Arctic Circle near Alaska and consequentially has very few hours of daylight in winter. The island chain to the south of NRG are actively volcanic and the southern mountains of NRG has geysers and bubbling mud-pools in which the local inhabitants say are rich in nutrients for bathing. The flat plains around Farmborough are fertile and ideal for growing tomatoes in plastic greenhouses but heating and running artificial lights in winter is currently expensive for the farmers. The disused coal quarry east of Newton has long been exhausted of reserves and is now used as a landfill site. The civil war has left much of the low-lying nature reserve to the north east of NRG polluted and barren of wildlife and many local environmental groups claim that the special status could be removed for a new environmental project such as a reservoir. The climate is cool and the mountain glaciers in the centre of the island keep the River Hubble fast flowing all year.



Scenario D

NRG has a population of 5,000 with about 3,000 living in the capital Port Gigawatt. NRG is situated in the south Pacific, south east of New Zealand close to the International Date Line. On Juleopia Independence Day in 2004, NRG secured the rights to the vast oil fields to the north-east of the island on the condition that these were not burnt on the island as the strong prevailing winds caused by the Antarctic Circumpolar Current would carry the pollution to the Kingdom of Juleopia. Consequentially, the government of NRG is popular for its green issues and the country of NRG has one of the lowest carbon emissions in the world today. It has also signed the treaty to ban nuclear weapons and technology. The town of Newton is constantly battered by winds and holds the Guinness Record as the world's windiest town with an average wind speed of 42 km/h. The morphology of the western coast of NRG produces regular and safe waves and is popular with surfers. In contrast, the tidal marsh at the mouth of the River Hubble is sheltered and macrotidal.