**Generating Energy**

Gheorghe Tecuci

Learning Agent Center and Computer Science Department, George Mason University

[tecuci@gmu.edu](mailto:tecuci@gmu.edu), <http://lac.gmu.edu>

**1. Introduction**

This exercise was adapted from:

Jonathan Osbome, Sibel Erduran, Shirley Simon, *Ideas, Evidence & Argument in Science* (IDEAS), King's College London, 2004, pp. 10-18, <https://www.stem.org.uk/elibrary/collection/3308>

<https://www.stem.org.uk/resources/elibrary/resource/28125/ideas-resources>

The aim of this exercise is to explore the feasibility of using different energy sources such as wind, hydroelectric, nuclear, and solar for producing electricity by developing several evidence-based argumentations. Section 2 presents the inquiry and Section 3 presents the corresponding argumentations developed with the sInvestigator system.

sInvestigator may be downloaded from <http://lac.gmu.edu/sInvestigator/>

The knowledge base containing the argumentation may be downloaded from

<http://lac.gmu.edu/sInvestigator/CaseStudies/GeneratingEnergy.zkb>

**2. Inquiry: What type of energy to produce?**

Imagine the following scenario. A lethal airborne virus has wiped out the vast majority of people on the earth. Although it has killed off a lot of the people, it has not damaged any other wildlife or the environment in any way. The whole of society has broken down and the technological age has come to a complete halt. After a while, the few people left alive who were immune to the virus have come together in communities to help each other to survive. The main priority now is to provide some way of producing electricity.

You are one of the few people left and have been elected as representatives on a committee to decide the way forward to produce energy for the community. The place where you have settled is near a waterfall on a river which is tidal. There are cliffs around the flat open ground on top, ideal for trapping solar or wind energy. Nearby are deposits of plutonium. Luckily there is a disused power station in the locality which can quite easily be converted to produce electricity from whichever energy source you decide to use.

One of the main priorities of these communities is to provide some way of producing electricity. On the island there are the following:

* a large waterfall which could be used as the site for a hydroelectric power station;
* cliffs with flat open ground on the top where wind turbines or large numbers of solar cells could be placed;
* sources of uranium;
* a disused power station which could be easily converted to produce energy from uranium (nuclear energy).

A survey has been carried out amongst the survivors about the different energy sources and the results have been used to produce statements about the four possible energy sources (Wind, Hydroelectric, Nuclear, Solar, Wind). You are some of the few people left alive and have been elected as representatives onto four person Committees. Each member of the Committee has chosen a different energy source which they think will be the best. The role of the Committee is to discuss the advantages and disadvantages of all four energy sources and then to decide on the best way to generate electricity.

Wind Energy: Statements

* Relatively easy to set up.
* Does not work when there is no wind or when the wind is too strong.
* Each wind turbine does not generate very much electricity.
* Does not produce any gases which pollute the atmosphere.
* Low production costs – wind is free.
* Some people think wind turbines look ugly.
* A renewable source of energy

Hydroelectric Energy: Statements

* Does not produce gases which pollute the atmosphere
* Generates electricity continuously provided that there is enough water flowing
* A renewable source of energy
* Very expensive to build a dam and hydroelectric power station
* Low production cost - water is free
* Usually involves flooding farm land or forests

Nuclear Energy: Statements

* Very expensive to set up
* Can be very harmful if it goes wrong
* A very small amount of nuclear fuel (uranium) provides a very large amount of electricity
* Does not produce any gases which pollute the atmosphere
* Very high maintenance costs
* Very reliable and can provide energy for a long time

Solar Energy: Statements

* Solar cells are difficult to make
* Only produces electricity when the sun is shining
* Does not produce any gases which pollute the atmosphere
* Low production costs - sunshine is free
* A renewable source of energy
* Not very efficient - each solar cell does not produce much electricity

Assess each of these sentences based on evidence and develop argumentations that show the advantages and disadvantages of each energy source.

**3. Analysis**







