

Energy for All

**Background**

For close to 300 years, coal mining has been the lifeblood of many Cape Breton communities. Generation after generation of miners has gained their livelihoods from the Sydney field that is rich with high-grade low sulphur coal. Based on present demand and current recovery techniques, it has been estimated that the Sydney coal field has sufficient reserves to sustain continued mining activity for another 200 years.

However, the coal mining industry is facing severe economic difficulties. Governments are insisting that mining operations be economically viable and are not willing to provide subsidies. The use of coal as an energy source is associated with serious environmental concerns. As a result, the economic structure of small towns and villages is threatened as unemployment rates rise with the downsizing of mining operations. Once vibrant communities are now facing dereliction as an important source of income is drying up.

The Fermi Bay Development Project

A fictitious group of futuristic thinkers, The Fermi Bay Development Corporation, has conceived a plan for helping Cape Breton both socially and economically while at the same time seeking solutions for the global challenge

of generating environmentally friendly energy. Their vision is to build a state-of-the-art energy research station around Fermi Bay located on the northern coast of Cape Breton Island. They are confident that within the next decade, this research station will be able to develop fusion technology so that it is a viable energy alternative. The site is ideal for accessing the essentially unlimited supplies of Deuterium, Tritium and Lithium in the ocean. These are key elements for fueling fusion reactions.

Over the short term, the development group plans to construct a small CANDU reactor to provide for the immediate energy needs of the research station and the energy-efficient community that is planned at the site. A further component of the plan is to use the CANDU reactor to provide the energy for manufacturing coal by-products to ease the transition and provide jobs for unemployed local coal miners.

Challenge

Assume that the members of your class are citizens of Quiet Haven, a village in a cove near Fermi Bay. Much discussion is taking place. Many are excited by the possibility of new well-paying jobs. Some are concerned about the environmental damage that may follow the development. A group of coal miners are concerned that an outside workforce will be brought in. Already, a partnership has been proposed between a university and a local community college to build a new alternative energy institution that will provide career training in relevant technologies and provide local young people with opportunities to study at the frontiers of science and technology. However, the anti-nuclear lobby is concerned about radiation and the possibility of nuclear explosions.

The biggest concern of all is that the mayor of Quiet Haven is a key partner in the Fermi Bay Development Corporation. As a group of citizens,

you feel that this is a conflict of interest. Your local Member of Parliament has agreed to chair a townhall forum on the issues involved. If the issues raised can be resolved into a realistic plan for development, she will seek government funding to support the project.

Your challenge, as a class, has two phases. Phase 1 is to form small working groups to prepare for and conduct the forum. Phase 2 is to reorganize the groups to recommend development options for Fermi Bay.

The following interest groups have asked to make presentations at the forum.

A. The Fermi Bay Development Corporation

Points to be developed

- economic advantages
- source of employable workers
- social advantages
- environmental advantages
- scientific and technological advantages

B. Association of Physicists

Points to be developed

- overview of fission and fusion
- current problems with artificially inducing fusion
- theoretical solutions for overcoming present fusion problems
- recommended research projects that could be conducted at *Atlantic Academy*, the proposed new post-secondary institution

C. Society of Engineers

Points to be developed.

- proposed town layout for Fermi Bay that includes a CANDU reactor, experimental fusion facility, community housing and recreation facilities set in the topography of a typical cove on the Atlantic coast
- a plan to heat the town site using the thermal energy generated in the CANDU's coolant system

- an account of safety issues related to fission and fusion technologies
- safeguards built into buildings structures and town layout
- designs for energy efficient buildings

D. Green Concern Guild

Points to be developed.

- hazards related to nuclear reactors
- environmental damage related to development
- a proposal of realistic energy alternatives

E. Coal Miners Union

Points to be developed.

- Cape Breton coal as a viable energy source
- coal as the source of many necessary by-products
- proposal for a worker-owned cooperative using state-of-the-art technologies to manufacture coal by-products
- a plan for the retraining of coal workers for new employment opportunities to be created at Fermi Bay

Project Criteria

Phase 1 – The Forum

As a class, prior to beginning group work

- A.** Decide on a format for the forum. Consider inviting someone outside of your class to act as a moderator, such as your principal or a local politician.
- B.** Develop clear and specific criteria for the presentations. These criteria are to recognize the steps for establishing a reasoned point of view — an explicitly identified set of referenced data and a clearly laid out interpretation of the data.
- C.** Decide on acceptable methods of presentation, appropriate sources of information, time limits and time lines for the project.

- D. Develop an evaluation scheme for the presentations

Phase 2 – Recommended Options

Following the forum, the five interest groups are to be reformed into 5 Expert Panels. The expert panels will be comprised of one member of each of the interest groups. Each expert panel will then recommend a development plan for Fermi Bay that addresses the economic, social, environmental and technological concerns raised at the forum.

As a class, prior to panel work

- A. Decide on clear and specific criteria for formulating recommendations.
- B. Develop a scheme for evaluating the viability of recommended development plans.

Action Plan

Phase 1 – Interest Groups

1. Work in groups of 5 or 6, keeping in mind that each interest group must have sufficient numbers to form the Expert Panels in Phase 2.
2. Decide on a format for your presentation and subdivide research tasks.
3. Prepare presentation with particular attention paid to highlighting those aspects of your material that are actual facts, and those that are interpretations of facts, or a point of view.
4. Make presentation.
5. Prepare a summary of your interest groups' findings and points of view for each group member to take to his or her assigned Expert Panel.

Phase 2 – Expert Panels

1. Each expert panel is to include a member from each of the interest groups.

2. Review the points of view expressed by each interest group.
3. Brainstorm ways of formulating a development plan that would best address the concerns of all interest groups.
4. Develop a consensus and prepare written recommendations.
5. Submit recommendations for class discussion.

Evaluate

1. Reflect on your interest group's presentation. Did you present reasoned points of view or did you present an opinion that wasn't supported by actual data?
2. Were you able to uphold your group's point of view as their representative in an Expert Panel?
3. Recommend what improvements could be made to the development of your interest group's points of view and to your representation of them.
4. Identify elements of this case study that involve
 - scientific inquiry
 - the solution to technological problems
 - societal decision-making



Web Link

www.mcgrawhill.ca/links/atlphysics

To learn more about the issues involved, and as a starting point for your research, go to the above Internet site and click on **Web Links**.