LES 14

O B S E R V A T O R Y
SCIENCE AND TECHNOLOGY (ST)
Teacher's Guide A
Second Year of Secondary Cycle Two

ENERGY CLOSE TO HOME

STUDENT LOG

WORKING DOCUMENTS

EVALUATION DOCUMENTS

INFORMATION DOCUMENTS

PROCEDURE AND EVALUATION: SSC2 – SCIENCE

Observatory / Guide
11129-A

Name: _____ Group: _____ ST

The controversy

Notice of meeting

Québec, September 27, 2008

TO: Mayors of the Kewa region
FROM: Office of the Mayor of Sainte-Loiselle
SUBJECT: Special meeting to discuss the region's energy resources

Dear colleagues:

The campaign to encourage businesses to settle in our industrial park has been highly successful. However, the arrival of these new corporate neighbours will increase our power needs in the region. More than 90 percent of our energy needs are currently met by recently built hydroelectric dams. They have replaced the gas-based power plant at Fort Chassé, which has now been inactive for five years.

When the provincial government adopted its new energy strategy, the population expressed the desire for more diversified energy sources. To respect this preference, we will not build any more hydroelectric dams. Our region is rich in natural resources that could be used to generate electricity; we must decide which of these resources to develop.

I would therefore like to convene the mayors of our region to assess the economic, social and environmental impact of developing the region's energy resources. I am asking each mayor to put forward a proposal on the type of energy the region should develop in the coming years. After hearing all the proposals, we will attempt to reach a consensus. The meeting will be held:

Date: Tuesday, October 28, 2008
Time: 2 p.m.
Place: Laplaine conference room

Meeting agenda:

1. Welcome and introductions
2. Appointment of a chairperson for the meeting
3. Reading and adoption of the agenda
4. Roundtable: presentation of each mayor's proposal
5. Discussion of the proposals
6. Decision by consensus on the energy resource to develop
7. Adjournment

Enclosed are some documents to give you an overview of the energy potential of our region as well as the advantages and disadvantages of developing each of our local resources.

Yours truly,

Justin Lemieux
Justin Lemieux, Mayor of the Town of Sainte-Loiselle, for the Kewa region

In this context, you will play the role of a mayor who has been called to the meeting.

The controversy (*continued*)

Energy profile of the Kewa region

Uranium-bearing potential

Uranium deposits have been discovered in the sedimentary basin of Mont Tanabèche. The potential of this site is often compared to that of the Athabasca sedimentary basin, in Saskatchewan, which provides one third of global supplies. After 22 years of relative stagnation, the mining community is showing renewed interest in uranium, which is currently enjoying a boom in the country. This interest in uranium is due to its cost, which reached a market peak at the end of January 2007. The result has been an increase in spending on uranium exploration. The expenditure is spread over about 40 projects—including one in our area—and has led to the discovery of major deposits that could be used to supply the region with power from nuclear energy.

Wind potential

Wind potential in the Kewa region is among the greatest in the province and could be coupled with current hydroelectric facilities. During periods when the wind is strong enough, wind turbines could be relied on for power; the hydroelectric dams would take over when the wind drops. This combination would mean that water levels in reservoirs would never become too low. The two energy sources could also share the same distribution network, so the need for new transmission towers would be limited. The proposed building site for the wind turbines belongs to the provincial government. There are three farms in the vicinity.

Biogas potential

In 2005, the government adopted a regulation to minimize the impact of biogases from sanitary landfills. The *Règlement sur l'enfouissement et l'incinération de matières résiduelles* [Regulation concerning waste burial and incineration] requires landfills that bury more than 50 000 tonnes of waste annually to collect biogases, ideally to recover and reuse them and if not, at least to eliminate them. The Kewa region is home to a landfill that receives more than 65 000 tonnes of residual materials, at Valdaréo. Collecting the biogas from landfills reduces greenhouse gas emissions and also offers considerable energy potential.

Tidal energy potential

In the Bay of Farou, the average tides reach 15 m, making it an ideal site for the construction of tidal power plants. Strong stream currents occur in shallow zones near the coast, which makes distribution easier. These currents are entirely predictable. According to studies of the bay's tidal resources, the most efficient production method would be to generate power for approximately five hours, twice a day.

Geothermal energy potential

Because of the Toucounvou volcano, the Kewa region has the right geographic features for the construction of a geothermal facility. For geothermal energy to make a turbine work—and thus generate power—the temperature at the source must be more than 100ºC. On the appropriate site in the region, temperatures can reach 102ºC. Geothermal energy is widely used in the Philippines, Italy, Indonesia, Mexico, New Zealand, Japan and China. Iceland makes direct use of geothermal heat. In Canada, there is a test geothermal site in the Meager Mountain–Pebble Creek area of British Columbia.

Name: _____ Group: _____ ST

Creating the context

I ask myself questions

1. What is an energy resource?

2. What is energy potential?

3. What is a mayor?

4. What is an energy strategy?

5. What do you think are the social, environmental and economic issues associated with the development of energy resources?

6. Who are the main players in this situation?

Name: _____ Group: _____ ST

Creating the context (*continued*)

7. What questions should the mayors consider before they choose an energy resource to develop for electricity generation?

I must

8. Reformulate the goal of the controversy.

I think

9. Which form of energy do you think should be developed?

Creating the context (*continued*)

What I know and what I must find out

10. Write the information you already know and the information you need to find out.

What I know	What I must find out

Name: _____ Group: _____ ST

Creating the context (*continued*)

I prepare my work

11. Where will you find the information you need to settle this controversy?

12. Define the main steps of your work in chronological order.

Reflection

	Yes	No
Do I fully understand what I have to do?	☐	☐

Name: _____ Group: _____ ST

Gathering information

I do research

1. What is combustion?

2. Why do we use combustion to produce electricity?

3. Name the energy resources in the lithosphere that can be used to generate electricity.

4. How is electrical energy generated with fossil fuels?

5. How is electrical energy generated with geothermal applications?

Name: _____ Group: _____ ST

Gathering information (*continued*)

6. Give an example of a radioactive element used to produce electricity.

7. How is electrical energy generated with resources from the hydrosphere?

8. What causes tides?

9. How is electrical energy generated with resources from the atmosphere?

Gathering information (*continued*)

10. How can strong winds be predicted?

11. What kind of weather does an anticyclone bring? Explain your answer.

12. What kind of weather does a cold front bring? Explain your answer.

13. Highlight the information you consider relevant in your information documents. Copy this information in the tables in questions 14 and 15. Distinguish the advantages and disadvantages of developing each of the energy resources.

Gathering information (*continued*)

I apply my research results

14. What are the advantages of each of the energy sources? Write your information in the table below.

Energy source	Advantages

Name: _____ Group: _____ ST

Gathering information (*continued*)

Energy source	Advantages

Name: _____ Group: _____ ST

Gathering information (*continued*)

15. What are the disadvantages of each of the energy sources? Write your information in the table below.

Energy source	Disadvantages

Reflection

	Yes	No
Do I fully understand the scientific concepts covered in this situation?	☐	☐

Name: _____ Group: _____ ST

Resolving the controversy

I make suggestions

Name the energy resource you have chosen. Formulate your arguments for defending your position. Explain your reasons for eliminating the other energy resources.

Reflection

	Yes	No
Have I considered other approaches?	☐	☐

Name: _____ Group: _____ ST

Validating the solution

Form a team of five students to represent the mayors attending the meeting. Follow the meeting agenda and defend your position to the other members of your team. Your team must reach a consensus. Then, answer the following questions.

I justify my approach

1. What decision did your team members reach? Explain your answer.

2. Did your team reach a consensus? If so, describe the difficulties you had to overcome to reach an agreement. If not, explain why you could not reach an agreement.

3. Name at least one advantage of the energy resource your team chose.

4. Name at least one disadvantage of the energy resource your team chose.

Name: _____ Group: _____ ST

My evaluation

Use the evaluation grid on the following page to evaluate yourself. Write A, B, C, D or E in the "Me" column of the chart below.

SSC2—Makes the most of his/her knowledge of science and technology				
Criteria*	Observable indicators	Me	Teacher	Comments
1	**Creating the context** Definition of the goal and formulation of the questions for gathering information		☐ With help	
2	**Gathering information** Relevance of the advantages and disadvantages of developing the energy resources		☐ With help	
3	**Resolving the controversy** Formulation of the arguments in favour of the energy resource to develop		☐ With help	
4	**Validating the solution** Justification of the decision		☐ With help	

*** Evaluation criteria**

1 Formulation of appropriate questions
2 Appropriate use of scientific and technological concepts, laws, models and theories
3 Relevant explanations or solutions
4 Suitable justification of explanations, solutions, decisions or opinions

Evaluation grid

Name: _____ Group: _____

SSC2 Makes the most of his/her knowledge of science and technology

Criteria*	Observable indicators	A	B	C	D	E
1	**Creating the context** Definition of the goal and formulation of the questions for gathering information	The goal of the controversy is very clearly defined, and the questions for gathering information are relevant.	The goal of the controversy is clearly defined, and the questions for gathering information are relevant.	The goal of the controversy is not very clearly defined, OR the questions for gathering information are not very relevant.	The goal of the controversy is not very clearly defined, AND the questions for gathering information are not very relevant.	The work must be done again.
2	**Gathering information** Relevance of the advantages and disadvantages of developing the energy resources	All of the advantages and disadvantages of the energy resources are properly classified and relevant.	Most of the advantages and disadvantages of the energy resources are properly classified and relevant.	Some of the advantages and disadvantages of the energy resources are not properly classified, OR they are not very relevant.	Most of the advantages and disadvantages of the energy resources are not properly classified, AND they are irrelevant.	The work must be done again.
3	**Resolving the controversy** Formulation of the arguments in favour of the energy resource to develop	The arguments are very clearly formulated and defend the team's position very well.	The arguments are clearly formulated and defend the team's position well.	The arguments are not very clearly formulated, but they defend the team's position.	The arguments are not very clearly formulated, AND they do not defend the team's position.	The work must be done again.
4	**Validating the solution** Justification of the decision	The justification is very clearly formulated and based on relevant arguments. More than one advantage and disadvantage of the team's choice are relevant.	The justification is clearly formulated and based on relevant arguments. One advantage and one disadvantage of the team's choice are relevant.	The justification is based on arguments that are not very relevant, OR the advantage and disadvantage of the team's choice are not very relevant.	The justification is based on arguments that are not very relevant, AND the advantage and disadvantage are not very relevant.	The work must be done again.

*** Evaluation criteria**

1. Formulation of appropriate questions
2. Appropriate use of scientific and technological concepts, laws, models and theories
3. Relevant explanations or solutions
4. Suitable justification of explanations, solutions, decisions or opinions

Information documents

Biogas

The treatment of organic waste is of real concern to present-day industrial corporations. It is still almost systematically incinerated, buried or applied to farmland. A possible solution for recycling this type of waste, on both an individual and a collective level, is methanization. The methanization facilities already operating in France and elsewhere in Europe are proof of the effectiveness of this technique.

A RENEWABLE ENERGY

Biodegradable garbage (peelings, green waste, animal waste, paper, cardboard, etc.) can be considered a renewable source of energy belonging to the bioenergy sector. Biogas is the renewable energy that comes from the fermentation of organic waste.

OPERATING PRINCIPLE

Methanization is the process by which a combustible gas—called *biogas*—is formed. This process consists in the biological breakdown of organic matter in the absence of oxygen (called *anaerobic fermentation*). . . . Biogas forms naturally when certain conditions for decomposition are met. It is at the origin of will-o'-the-wisps in swamps and cemeteries, of spontaneous combustion in unregulated dumps and of firedamp in coal mines.

The composition of biogas is similar to that of raw natural gas. It is a mixture of methane, carbon dioxide, nitrogen and trace gases. Depending on the type of waste processed and climatic variations, the composition of biogas may vary in proportions.

Animal excrement, the organic part of household waste, fluid waste from agri-food facilities, and sewage sludge from wastewater treatment plants are concentrated and processed in digesters. Landfills for household waste can act as giant digesters if they are equipped with a biogas recovery system and waterproof membranes. . . .

ADVANTAGES

At the local level:
Methanization represents a complementary activity for farmers, who can benefit, in both economic and energy terms, from their agricultural waste (of plant or animal origin). For biogas producers, methanization is synonymous with economic self-sufficiency.

For the environment:
By providing an energy-producing and eco-friendly response to the problem of organic waste treatment, methanization is a form of decontamination. It is an alternative to burying or dumping waste and to fossil- or fissile-fuel consumption. On the other hand, all organic waste naturally produces . . . enormous amounts of methane and carbon dioxide. These gases rise to the upper layers of the atmosphere, intensifying the greenhouse effect. When burned, the biogas from methanization reduces the pollution from fermentation gases by a factor of 20. The methanization of sewage sludge and household and industrial waste eliminates the odours associated with their usual treatment processes.

Information documents (*continued*)

Biogas (*continued*)

DISADVANTAGES

The first obstacle to setting up biogas production facilities is the investment cost. Lack of awareness of methanization technology, in all sectors, is the second handicap. An awareness campaign targeting the groups and sectors concerned would attract attention to this new energy source that holds both economic and environmental promise.

GROUPS CONCERNED

The groups and sectors that may be affected by biogas production are mainly those that produce organic waste: farmers, landfill or wastewater treatment plant operators, agri-food, chemical and paper industries . . . .

Methanization also concerns individual citizens because of the organic household waste they generate: about 30 percent of all organic waste and 55 percent of household waste (kitchen garbage, paper, cardboard and garden waste such as grass clippings and dead leaves . . .). Through selective sorting, household waste could be used again thanks to methanization.

Source: Hespul, Association spécialisée dans le développement des énergies renouvelables et de l'efficacité énergétique, France, "Biogaz" [Web page], 2007 (accessed May 22, 2009). *[Translation]*

Information documents (*continued*)

Wind energy

THE FACTS

The energy said to be controlled by Aeolus, the god of the winds, has existed since the dawn of time. For millennia, sailboats have relied on this type of energy to propel themselves across water. In the seventh century, the Persians were already using the wind to operate their grain mills. However, the wind turbine as we know it is a more recent invention. It first appeared in Denmark and the United States at the end of the 19th century.

The amount of energy produced by a wind turbine depends not only on the wind speed but also on the size of the turbine. In favourable conditions, a 100-m land-based or a 120-m sea-based turbine can produce up to five megawatts (MW) of electricity. In Québec, 200 MW is a sufficient amount to supply between 70 000 and 100 000 homes with power.

Electricity is produced when the force of the wind turns the blades of the turbine. The propeller is connected to an alternator that transforms mechanical energy into electrical energy.

A PROMISING SECTOR

Wind turbine technology has made great progress in the past 10 years. Plans to build new offshore wind parks are under consideration in a number of places around the world. This approach is of interest to developing countries that have few resources and highly populated territories.

Wind energy has become a rapidly developing market all over the world. Since 1993, the demand for electric generators powered by wind energy has risen by 40 percent annually. According to analysts, the trend is still in its early stages because many developing countries have plans to use this form of energy.

Germany is the main producer of wind power, with installations for the production of more than 18 000 MW at the end of 2005. The country meets six percent of its electricity needs with wind power.

Other countries are investing considerable sums in research and development. Chinese researchers have developed a wind generator that works by magnetic levitation. Their turbine would increase the energy efficiency of the traditional wind turbine by 20 percent. The turbine is suspended on a magnetic cushion generated by an electromagnet, which reduces friction in the turbine. Only a light wind is needed to make it spin.

The pros and cons of wind energy

Pros
- Wind energy is one of the least expensive forms of renewable energy.
- Harnessing wind energy does not release any greenhouse gases.
- It does not leave any toxic waste in the environment.

Cons
- It depends on the wind, an unstable phenomenon.
- Some people believe that wind turbines spoil the landscape and make too much noise.
- Wind turbines are a hazard to some bird species.
- Wind energy cannot be stored.

Source: Radio-Canada, "Énergies renouvelables, énergies du futur: le vent" [Web page], 2007 (accessed May 25, 2009). *[Translation]*

Information documents (*continued*)

Geothermal energy

THE EARTH

Volcanic eruptions are a reminder of the sources of extreme heat hidden at the centre of the Earth. The shorter the distance from the Earth's core, the higher the temperature. Scientists estimate the temperature at the centre of the Earth to be more than 4000 degrees Celsius. The heat is mainly the result of radioactivity—the nuclear energy produced by decaying uranium, thorium and potassium.

Human beings do not feel this heat, however, and it varies from one part of the world to another. It is particularly intense in regions of high seismic activity.

Geothermal applications involve techniques for capturing the heat from the Earth's crust to use for heating or to generate electricity.

Water is commonly used to transport this heat. The water is heated underground and then used in the form of hot water or steam.

LOW-TEMPERATURE GEOTHERMAL RESOURCES

Heat from the Earth can be harnessed to provide heating or air conditioning in buildings, homes, apartments and greenhouses. This type of geothermal resource is characterized by temperatures between 30 and 150 degrees Celsius. It is usually found at an average depth of 1000 to 2500 m.

Many areas of the world meet these conditions: low-temperature geothermal energy is used in 70 countries. If the underground water is warm enough and of adequate quality, it can be piped directly into home radiators, as in Iceland, for example. Low-temperature geothermal energy meets 80 percent of heating needs in the country's capital, Reykjavik.

MEDIUM- AND HIGH-TEMPERATURE GEOTHERMAL RESOURCES

These types of geothermal energy are used to produce electricity. The resources are deposits of dry or wet steam, which are directed to power-generating turbines.

The energy sources of high-temperature geothermal installations may reach 350 degrees Celsius and are usually found at depths of at least 1500 to 3000 m in areas of high seismic activity.

The pros and cons of geothermal energy

Pros
- Harnessing geothermal energy does not release any greenhouse gases.
- Operating and maintenance costs are limited.
- It does not produce any waste.

Cons
- Installation costs are high.
- Energy use must be managed sustainably.
- It is not evenly distributed around the world.

Source: Radio-Canada, "Énergies renouvelables, énergies du futur: la terre" [Web page], 2007 (accessed May 25, 2009). *[Translation]*

Information documents (*continued*)

Nuclear power making a comeback?

Basking in the glow of the Nobel Peace Prize and rehabilitated by some environmentalists, nuclear power is no longer the taboo it once was. Hydro-Québec is even thinking of renovating its Gentilly-2 power plant. Is this good news or cause for concern?

Patrick Moore, one of the founders of Greenpeace, becomes irritated when the Chernobyl accident is used to attack nuclear energy. “We haven’t banned cars even though 40 000 Americans die in car accidents every year!” he argues. . . . What has happened to these green gurus who violently condemned nuclear energy for 30 years yet now leap to its defence?

They have simply decided to choose the lesser of two evils. At a time when climate change is at the forefront of environmental concerns, nuclear power seems preferable by far to gas, oil and coal. In fact, the Nuclear Energy Institute has calculated that if the 440 nuclear power plants currently active in 31 countries were replaced by coal- or oil-based thermal power plants, more than 500 million tonnes of carbon dioxide (CO_2) would be released into the atmosphere. For or against nuclear power, people cannot deny it this one advantage: it does not contribute in any way to atmospheric pollution.

“I believe nuclear power is a safe and environmentally friendly choice,” Patrick Moore says, before adding that this source of energy is experiencing a global revival thanks to a new generation of reactors. “China is planning to build about 40 plants,” says Michel Rhéaume, a physicist in charge of the nuclear division at Hydro-Québec. “In the United States, many projects are under review. Finland is building a new plant that uses an innovative technology incorporating a 16 000-MW reactor. And France, where 80 percent of the electricity is generated with nuclear energy, exports power to neighbouring countries.”

In Québec, only one power plant uses atomic energy: Gentilly-2. . . . One may wonder why Hydro-Québec insists on keeping a nuclear plant in operation, when it employs almost 600 people but supplies only three percent of the electricity in the distribution network. “Gentilly-2 is in excellent condition, it generates electricity eight days out of ten on average, so it is still useful,” maintains Michel Rhéaume. “At six cents per kilowatt-hour (kWh), it is one of our most profitable plants.” In comparison, wind power costs approximately 8.7 cents per kWh, and thermal energy, about seven cents. . . .

Since September 11, 2001, no visitors have been admitted to Gentilly-2, for reasons of national security. However, Louis Charest, the director of the Régie intermunicipale de gestion des déchets de Nicolet, Bécancour et Yamaska [the Nicolet, Bécancour and Yamaska regional agency for waste management], visited the power plant in November 2004, during an open house. . . .

“People don’t understand nuclear power,” deplores Louis Charest. “After all, it does not emit greenhouse gases, cause land to be flooded, or cease production when the wind drops. If we want to be in line with the Kyoto Protocol and fight global warming, we have to reduce our use of fossil fuels and open the door to nuclear power.” . . .

Obviously, not everyone shares his enthusiasm. No fewer than a hundred environmental organizations from Québec have joined a huge international coalition called “Sortir du nucléaire.” The president of Mouvement vert Mauricie, Michel Fugère, is among the most ardent opponents of this “needlessly expensive” source of energy, whose radioactive waste “puts ecosystems at risk for hundreds of thousands of years to come.”. . .

According to Torontonian Shawn-Patrick Stencil, who is in charge of energy for Greenpeace Canada, nuclear power is losing momentum in many countries. Germany, for example, put a stop to any new developments in the nuclear sector five years ago and is focusing its efforts on wind power instead. “Since 2000,” Stencil says, “not a single euro has been injected into the industry. But the Germans are adding 2000 MW of wind power to their network each year. In total, they produce 17 000 MW of wind power. In comparison, Ontario generates only 15 MW.”. . .

Information documents (*continued*)

Nuclear power making a comeback? (*continued*)

"Antinuclear activists have political rather than environmental agendas," maintains Patrick Moore, aware that he is considered a traitor by his successors at Greenpeace Canada. "If they really want to take a stand against power plants that emit greenhouse gases, then they have to admit that nuclear power is the best option."

Although he does not go so far as to say that nuclear energy is a green energy source, engineer Philippe Tanguy, who holds an industrial chair in energy at École polytechnique de Montréal, believes that nuclear power can satisfy the global energy appetite until the conversion to renewable energies is achieved. "Nuclear power is not the energy of the future, but it can be a transitional source," he says. "Oil stocks are running out. At the current rate, we have enough oil left for 50 years at most. By then, we must have learned to depend primarily on renewable energy sources, such as the wind, the sun and the biomass. However, these emerging technologies are not ready yet, while the nuclear industry is fully developed."

For Michel Rhéaume, there is no doubt that "logic and technology will one day override emotion." Nevertheless, nuclear power still suffers from a negative image in this country. According to Greenpeace, less than seven percent of the Canadian population would approve extended use of nuclear energy. Power plant safety remains a serious cause for concern. Besides the Chernobyl disaster in 1986, people also remember the accident at Three Miles Island in 1979. This unfortunate episode led to the permanent closure of the plant although there were no deaths nor any radioactive emissions in the atmosphere. "Isolated incidents," Philippe Tanguy claims; he goes on to point out that the most pro-nuclear of the G8 countries, France, has never suffered the slightest incident.

After 22 years of operation, there have never been any incidents at Gentilly-2 either. However, even if Hydro-Québec obtains government approval to renovate the reactor, a major problem persists: Where will the radioactive waste be stored?

After seven years of decontamination in a pool on the same site as the plant itself, the uranium bundles (fuel pellets inserted into tubes) are covered in concrete on-site. Containment like this is not a permanent solution, however, because concrete erodes over time. Last year, the Nuclear Waste Management Organization was mandated by the Canadian government to study this question and to propose a solution by December 31, 2005. In a preliminary report published last May [2005], the group recommended that all of the waste currently stocked on power plant sites be buried within the next 30 years. It did not specify where but mentioned a geological site deep in the Canadian Shield.

"Yes, nuclear power generates radioactive waste, but we have learned to dispose of it safely," declares Guy Arbour, engineer and president and cofounder of Securad, a Montréal company that plans to build underground facilities for the safe and sustainable disposal of irradiated fuel—an ambitious project with a two-billion-dollar price tag. After its useful life, the uranium will be sealed 300 m deep in the Precambrian rock of the Canadian Shield. Two possible sites are being studied: one on the Basse-Côte-Nord and the other in Labrador.

Philippe Tanguy sees an advantage to this type of storage. He believes that buried fuel still contains enough energy to be reused. "For the moment," he explains, "it is more cost-effective to use inexpensive uranium from mines in Saskatchewan. However, if this natural fuel becomes scarce one day, we would know where to find the uranium bundles to continue lighting and heating our homes. Recycling used fuels will be a challenge for the researchers of the future. . . ."

"We'll find solutions," he adds. "It's just a matter of time."

Source: Mathieu Robert-Sauvé, "Le retour du nucléaire," *L'actualité* [online edition], November 15, 2005 (accessed May 25, 2009). *[Translation]*

Information documents (*continued*)

Tides of promise

The majestic Bay of Fundy is the best location in North America to harness tidal energy—and entrepreneurs are anxious to start

By John DeMont

. . . No one is calling tidal the next big energy thing. But global interest in ocean power has never been greater: soaring oil prices, immense supply uncertainties, and growing pressure to curb greenhouse gas emissions and slow climate change are pushing the search for new energy sources. Clean, renewable tidal power stacks up well against the alternative energy competition: it's more dependable than solar and provides more bang per buck than wind. (Water is denser than air, so fewer tidal turbines than windmills are needed to produce the same amount of power.) Furthermore, nobody's likely to grouse that an underwater tidal turbine is ugly or too noisy—the most common complaint against wind turbines. . . .

That seems particularly true in Atlantic Canada, a region hampered by a dearth of energy alternatives. The Nova Scotia government, for example, has decreed that by 2013, the province will generate almost 20 percent of its electricity through renewable sources, nearly double the current level. But which ones? The province's rivers are too small for hydro to be a major part of the energy mix. Wind power can't do it all: air currents are capricious enough that even the most active turbine produces power less than 50 percent of the time. And the NIMBY backlash against wind turbines has already surfaced in the province: singer Anne Murray made headlines last summer by publicly complaining about proposed windmills near her Nova Scotian summer home. . . .

The growing list of green-energy venture capitalists, scientists and entrepreneurs lining up to harvest the untapped power from the world's oceans have no intention of building big dams that block the flow of water and potentially screw up ecosystems. . . .

This is, after all, still an upstart industry using new technologies with little or no track record. In many cases, the developers are unsure how much the turbines will even cost. No one is exactly certain what awaits when they expose their turbines to Fundy's harsh tides, floating debris and winter ice. . . .

The players are taking it a single step at a time: build one turbine, test it, and if successful, add more. The Nova Scotia government is equally cautious: a sweeping environmental assessment will be carried out before a single turbine enters the province's waters. That's unlikely to be a rubber stamp: “Every proponent says their turbine is eco-friendly,” says Graham Daborn, former director of Acadia University's Arthur Irving Academy for the Environment. “But there's been very little work done on the impact these turbines will have on the environment.” The Nova Scotia government has also issued a call for tenders for companies interested in teaming together as part of a joint tidal demonstration site in the Minas Passage.

Information documents (*continued*)

Tides of promise (*continued*)

Even that kind of go-slow approach can't dampen the building excitement. The fog begins to lift as James Taylor picks his way over the loose beach rock. He describes in almost-loving detail a day when his company could have 300 turbines in carefully chosen sites nearby, powering thousands of Nova Scotia homes, while at the same time, diminishing the world's carbon footprint. It's a hopeful image—particularly from a guy who has spent a large chunk of his career managing coal-fired power plants. “It's great,” Taylor says, “to be on the leading edge of something.” And greater still if all those decades of waiting are finally over.

Source: Canadian Wildlife Federation, “Tides of Promise,” *Checkerspot Magazine* [online edition], November 25, 2007 (accessed May 25, 2009).