



Harmonics

What are conservation of energy and energy conservation?

Every living thing, from the tiniest microbe to the largest mammal needs energy in order to survive. Energy is what allows us to move, to think, to grow. Living creatures get their energy from food. Non-living things need energy too; your computer and television get their energy from electricity, your car and skidoo from gas. In fact, everything which produces heat or moves needs energy.

Defining energy is a little tricky. You can't actually see energy - unless you count when your little brother is running around like crazy - but you can sometimes measure it. For scientists and engineers, energy is the measurable ability to do work. Measuring energy is important because it allows us to figure out how much electricity we need to run a town for a year, or how much diesel we need to get a ship from a southern port to Tuktoyaktuk.



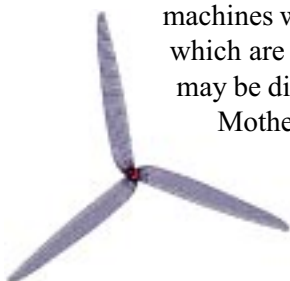
More important than measuring energy is understanding that energy cannot be created or destroyed. Energy can be changed from one type of energy to another, like when the movement of water becomes electricity. It can also be moved from one object to another, like when one pool ball hits another. But, no matter how it changes or moves, in the end, we always have the same amount of energy. This means that all the energy we use today was here at the very beginning of time. So energy, like everything else, is a gift from the Creator which we need to use with respect and care.

Conservation of energy is one of the most important ideas in science and engineering. You learn about it in physics class. By understanding that energy is never created or destroyed, people have been able to figure out how to get to the moon and back, how to make cars run and how to make roller coasters scary but safe.

On Turtle Island, we use lots of energy to light our homes, run our vehicles and cook our food. We even use lots of energy to watch TV and surf the Net. We use more energy per person than people just about anywhere else on the planet. Too much energy use can hurt Mother Earth, because sometimes changing energy from one form to another has side effects. For instance, running a boat to go seal hunting produces carbon dioxide, one of the gases which contributes to the greenhouse effect that is warming the planet. In order to protect and care for the Earth we talk about energy conservation; using less of it so we do less damage.

Scientists and engineers are involved in energy conservation as well. They look for ways to make machines work better so they require less energy to run. They also look for new sources of energy which are less harmful to us and to the Earth. While conservation of energy is something which may be difficult to understand, energy conservation is for everyone. We can all do things to help

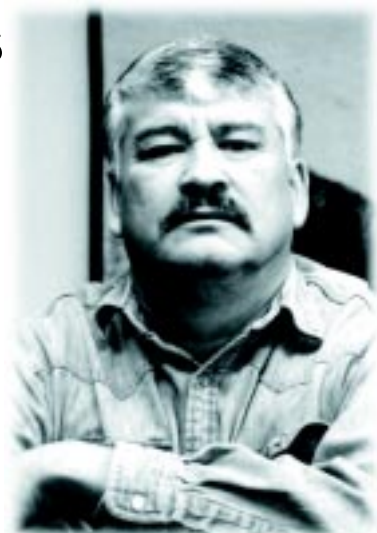
Mother Earth - turning off lights when we leave a room; keeping our cars, boats and other vehicles tuned up; walking to school; turning down the heat a few degrees. There are even things you can do at school. For ideas, check out these web sites with your teacher: Destination Conservation, <http://www.dc.ab.ca> and the Green Schools program, <http://www.greenschools.ca>.



Native Engineers & Scientists

A place to meet people from your community.

Name: Elmer N. Ghostkeeper
Nation: Métis
School (s) Attended: Northern Alberta Institute of Technology
 University of Alberta
Degree (s): Diploma of Civil Engineering Technology
 Bachelor of Arts
 Master of Arts in Anthropology
Job Title: Chairman/President & CEO, SunStar Resources Inc.
Favorite thing about job: "Experiencing other people."



Elmer Ghostkeeper has great respect for Mother Earth. He knows the Creator gave us the land, air and water only once, and so he believes, "We must practice sustainability and attempt to repair damages to these sacred gifts, restoring them to their original creation. We must work with the land, air and water and not off them."

A member of the Métis Nation, Elmer lives on a ranch outside Edmonton with his family. He is the President and CEO of SunStar Resources Inc., an oil and gas company on the Paddle Prairie Métis Settlement. Sunstar is wholly-owned and operated by the Métis people. Elmer says that this job "Is the largest and most significant project I have worked on to date." And that is saying something, before coming to SunStar, he was Regional Manager of Aboriginal Health Services for the Capital Health Authority in Edmonton. There he developed a unique programme to help people live with and manage diabetes. Elmer has also been the Assistant City Engineer of Whitehorse in the Yukon Territory. "I try not to think about the stress of making SunStar into a major player."

SunStar Resources Inc. was incorporated in July 2001. It has a young board of directors who are all Métis and live in the Paddle Prairie community. According to Elmer, this is a crucial aspect to the company's philosophy and success. As SunStar grows it will need engineers and skilled professionals to fill positions. Elmer wants to hire Aboriginal people to fill these jobs, so he encourages native youth to stay in school and study math and sciences. "Aboriginal wisdom is extremely important to the economic development and self-sufficiency of Aboriginal communities. With the right education there's every reason to believe our young people can work for companies like SunStar."

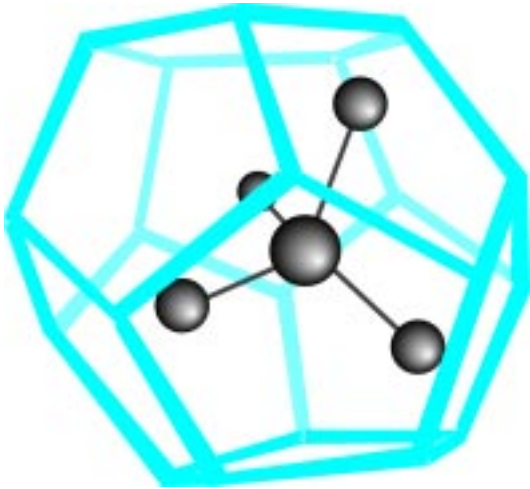
Still, Elmer knows that school can be difficult, especially math and science courses. But, he says if you "let the numbers dance for you, then math and science classes will become enjoyable." He recalls that in his own student days, "I could not wait for some classes to begin because I enjoyed them so much." He adds, "learn to follow your heart, it will direct you to your purpose in life. Always keep in mind that engineering and science is just another way to understand Mother Earth and her sacred gifts."

Outside of work Elmer is actively involved in a number of projects. He has been a member of the Native Access to Engineering Programme's Circle of Advisors since it was established in 1995; the members guide and oversee the work of the NAEP and its initiatives. He has been a Fellow of the Arctic Institute of North America since 1996. Elmer has also authored a book, *Spirit Gifting: A Concept of Spiritual Exchange*, and developed *Weche Teachings, A Partnership of Aboriginal Wisdom and Western Scientific Knowledge*. He uses these teachings to explain and analyze modern day puzzles affecting Aboriginal peoples. He also enjoys raising horses for pleasure and sale.



Fiery Ice: Gas Hydrates

In the rock, deep below the Arctic ice, lies an untapped energy source called gas hydrate. It is of great interest to oil and gas companies and research agencies because it is a high yield, clean burning fossil fuel. In other words, when it is processed and used to heat homes, run vehicles or cook food, it does less damage to the environment than other fossil fuels like oil or coal.



Gas hydrates are crystal-like structures in which a natural gas molecule - usually methane - is trapped inside a cage of water molecules. They form under conditions of low temperature and high pressure. Gas hydrate looks like ice, but acts like coal: put a match to it and it burns with a soft orange flame.

No one really knows how much gas hydrate exists, but it is estimated that the Earth holds more of it than all remaining fossil fuels combined. That's another reason people are so interested in gas hydrate; it has the potential to fuel our cars and homes long after oil reserves dry up.

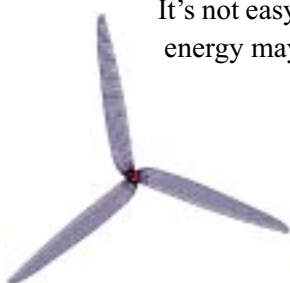
Sounds too good to be true? It may be. While gas hydrate is abundant, there is no cost-efficient way to remove it from the Earth yet. In addition, disturbing gas hydrate can be dangerous. If it is heated or depressurized to the point where the methane escapes its water molecule cage while underground, large pockets of pressurized, explosive gas can form. There is also some concern that gas hydrate can speed up the pace of the green house effect. While gas hydrates burn cleaner than other fossil fuels, they are more damaging to the environment if accidentally released before burning. Finally, as far as we know, gas hydrate is only found in the very fragile ecosystems of the high Arctic and deep ocean, so bringing it to the surface may disrupt animal and plant life in these areas.

To try and figure out whether gas hydrates can eventually be used as an energy source, an international group of scientists and engineers - led by researchers from Natural Resources Canada - have established a test site in the Northwest Territories. Lying right on the coast of the Beaufort sea, the Mallik test site is about 70 km west of Tuktoyaktuk and 150 kilometers north of Inuvik. From December 2001 to April 2002 the researchers created three research wells, and recorded their experiences and observations about the process of removing gas hydrate from 1200 meters below the Earth's surface. While their results are not yet complete, they are particularly interested in determining how gas hydrates might impact the greenhouse effect.

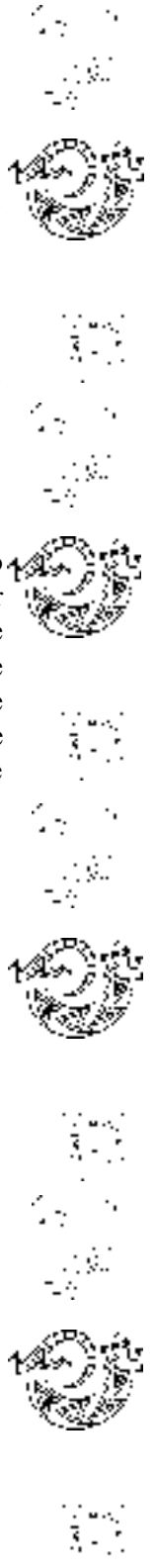


The Mallik 2002 site

It's not easy to decide how to balance people's need for energy with the potential harm getting that energy may do. What would you do if gas hydrates were found under your Nation's land?



For more information go to <http://www.gashydrate.com/mallik2002/home.asp>.



Community Profile

Kuujjuarapik, Quebec (Nunavik)

Kuujjuarapik, a community of more than 600 people, is nestled at the mouth of the Great Whale River, on the southeastern shore of Hudson's Bay. It is Nunavik's (northern Quebec's) southernmost village. It is a unique community because it is bicultural, and those cultures are Inuit and Cree.

Kuujjuarapik is one of the few places in Canada with four official names. It is known by its Inuit name, Kuujjuarapik, which means "little great river;" its Cree name, Whapmagootsui, which means "where there are whales;" its French name, Poste-de-la-Baleine, which means "place of the whale;" and, by its English name, Great Whale River. The principal languages spoken in the community are Inuktitut and English.



Kuujjuarapik is also known as Whapmagootsui, Poste-de-la-Baleine and Great Whale.

Once the most important community in the area, Kuujjuarapik's population decreased significantly in 1985. Many families, fearing negative impacts from the proposed Great Whale II hydro-electric dam, decided to relocate to Umiujaq, another Inuit community about 160 km to the north. Hydroelectric development in northern Quebec has been very controversial because of its impact on the land, animals and peoples who live there.

The land is around the community flat, covered in a carpet of moss and rock. Kuujjuarapik's breath-taking landscape and location are an ideal shelter for birds, seal, whale and beluga. Many people in Kuujjuarapik make their living from the land and the water, hunting for caribou, seal and beluga whale, and fishing for arctic char, salmon and trout. Even though the people of Kujjuarapik are active in other areas such as retail sales, arts and crafts, the fur trade, petroleum distribution and recreational development, the development of the Great Whale Project would be devastating to the community's economy.



Fun facts and things to think about



Did you know ...

The International Space Station (ISS) is fueled mainly by the sun? The ISS needs electricity to power lighting, run computers, recycle waste water and support life! It gets electricity from 8 solar arrays, which stick out from the station like huge wings. Each array is 34 meters long by 11 meters wide. Together they hold more than a quarter million solar cells. For the 36 minutes of each orbit that the ISS is in the Earth's shadow, electricity is supplied by rechargeable batteries.

Source: NASA
<http://liffoff.msfc.nasa.gov/news/2001/news-stationpower.asp>

I have learned through bitter experience the one supreme lesson to conserve my anger, and as heat conserved is transmitted into energy, even so our anger controlled can be transmitted into a power that can move the world.

- Mahatma Gandhi



Do you live near a saw mill?

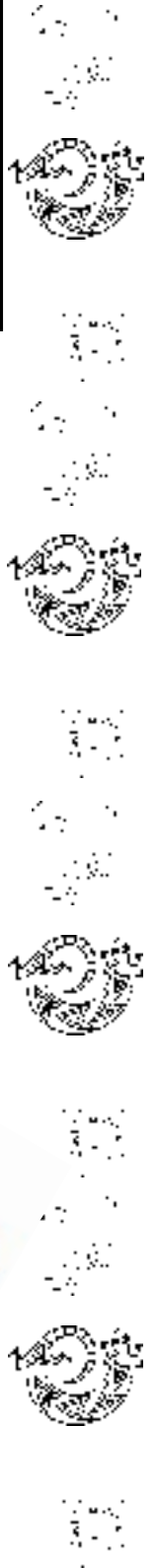
Small pieces of wood, tree bark and sawdust make a great fuel for generating electricity. In fact, wood waste is one of the most widely used renewable energy resources in Canada.

Source: Natural Resources Canada

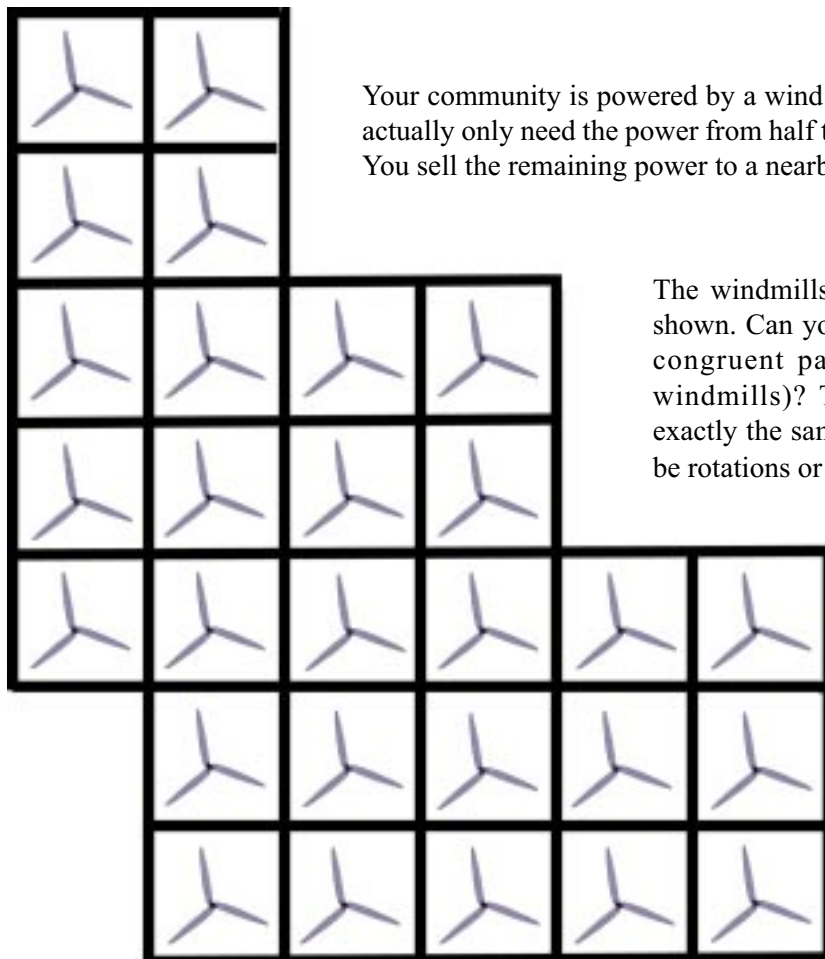


This is only a test
 For one year starting in March 2002, the City of Montreal is running 155 buses on recycled vegetable oil and animal fat. The fuel, known as biodiesel, is actually a mixture of the animal and vegetable oils with regular petroleum-based diesel. By following the buses, the City and its research partners hope to prove that biodiesels are usable in cold climates throughout the year. The test vehicles are being called Biobuses.

Source: Montreal Transit Society
<http://www.stcum.qc.ca/English/info/a-biobus.htm>

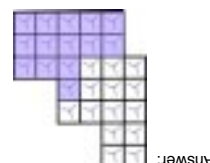


Wind Power

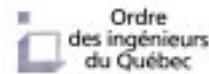


Your community is powered by a wind farm with 28 windmills. You actually only need the power from half the windmills to run the town. You sell the remaining power to a nearby community.

The windmills are laid out in a field as shown. Can you divide the field into two congruent parts (each containing 14 windmills)? The two parts should be exactly the same size and shape, but may be rotations or reflections of each other.



The NAEP thanks the following organizations for their support:



All about us

The Native Access to Engineering Program at Concordia University is mandated by the Department of Indian Affairs and Northern Development to provide culturally relevant opportunities in science, math, engineering and technology to Aboriginal students and their teachers across Canada. Established in 1993, the project's ultimate goal is to increase the representation of Aboriginal peoples among the ranks of professional engineers in Canada.

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You can reach us at:

Native Access to Engineering Programme
Engineering and Computer Science
Concordia University
1455 de Maisonneuve West, LB 1015
Montreal, Quebec H3G 1M8
Tel: (514) 848-7847
Fax: (514) 848-4596
Email: nativeaccess@nativeaccess.com
URL: www.nativeaccess.com