



LESSON # 6:

Wind Power and Your Community



INTRODUCTION

The territorial and federal governments are currently focusing on alternative, environmentally friendly ways of generating energy to supplant the use of fossil fuels and particularly the use of diesel fuel to generate electricity in northern communities. Student will investigate the current and historical costs of producing electricity, with diesel fuel, with research focusing on the “cost effectiveness” of hydro, diesel, solar and wind. They will then focus on the potential applications of wind power in their community or region as a possible source of power.

As small working groups students will explore current alternative energy projects in the north by conducting an online search to find out more about each project and its intended outcomes. They will compare and contrast the cost (financial, environmental, societal) of producing electricity by wind, solar, hydroelectric and diesel power. With this background information students will be asked to consider the viability of wind power in their home community and or for use on the land.

Students will require access to the internet and use the key word search to find information on GHG emissions and ways of producing alternative forms of electrical energy to offset diesel- electric generation. Students will also have access to six handouts and two teacher handouts to support the collection and presentation of data and information.



LESSON PLAN #6: WIND POWER AND YOUR COMMUNITY

Author: Liz Girard

GOAL

To help students explore wind power as a possible alternative energy source to reduce green house gas (GHG) emissions and provide in a sustainable manner.

KEY WORD SEARCH

Alternative energy cost kilowatt, renewable energy sources, non-renewable energy, wind turbine, greenhouse gases, climate change, cost effective energy sources, green energy futures, circumpolar alternative energy, carbon offset strategies, climate change strategy NWT, GHG mitigation, wind energy map Canada, climate change, greenhouse gases (GHG), alternative energy, sustainability, mitigation, wind generators

TIME

CURRICULUM CONNECTION

Experiential Science 10, Unit 4 Resource Management and Population Dynamics

General Learning Outcome:

- Students will gain an understanding of the basic processes to ensure sustainable resources.

Specific learning Outcome:

- Students will gain an understanding of the foundations of a sustainable future, economics and ethics by: Investigating the uses of renewable resources in the sub-Arctic and Arctic to reduce the ecological footprint with regard to: Renewable sources of energy, and cost effectiveness
- Researching and developing a media promotion campaign that would encourage people to gain an appreciation of the “Beauty of the Land” and the need to preserve it for future generations.

Experiential Science 20, Unit 4, Petrology and the Ocean Environment

General Learning Outcome:

- Students will gain a general understanding of the petroleum industry including the processes involved in manufacturing petroleum products, the environmental impact of this industry and the careers available related to the petroleum resource industry.

Specific Learning Outcome:

- Students will gain an understanding of the environmental issues surrounding the petroleum resource industry by: Evaluating alternative renewable forms of energy (e.g. wind, geothermal, solar, biomass, heat pumps) by considering: i. Availability ii. Cost and efficiency iii. Environmental impact iv. Other relevant cultural considerations

Associated Curricular Connections

- Language Arts, Social Sciences, reading, analysis, interpretation of information, synthesis, cooperative group work, social activism. Indigenous language and place names can be incorporated into this activity as many geographical features have cultural significance and add context to local discussions.

PROGRESSION AND METHODS

1. Ask open-ended questions about climate change to assess student background understanding of climate change, renewable and non-renewable forms of energy production. This will also give you an opportunity to assess the student's attitudes, conceptions and misconceptions of climate change and renewable forms of energy. Use backgrounder #1 Climate Change Agreements: what's the big deal? and backgrounder #13 Renewable energy opportunities to refresh student understanding of climate change.
2. As an attention getter ask students how they would respond to a headline that said "Diesel to be Phased Out for NWT Power Generation in Three Years". Although this is fictitious at this point in time, the governments of Canada and the NWT have committed to reducing diesel consumption and greenhouse gases as part of international agreements on climate change. This could include replacing of diesel-electric generation with sustainable and reliable forms of alternative energies as the primary source and diesel becomes the backup source. For a case study, Divert students towards Diavik Wind Power Presentation as well as Diavik Wind Power Video.
 - a) Ask student to assess the current use of diesel in their community and see if there are ways of reducing or offsetting diesel consumption by 50%. i.e. high arctic solar panels producing electricity all day, all summer long to offset diesel usage.
 - b) Student can brainstorm and list alternate forms of energy production, then determine which one(s) they think would work best for their community to offset the use of diesel fuel the most.
 - c) Students can then break up into research teams to quickly search for what other circumpolar communities are using to offset fossil fuel use to generate electricity and heat buildings. This will help focus student discussion on alternative energy production options of various scales.
3. Students should realize that no one technology would provide all of the clean energy for a community as most mitigation strategies will have to rely on multiple forms of alternate energy generation to ensure reliable sources of energy throughout the year. Using the research conducted in step 2, limit the list to options students think would be suitable for their community and allow them to justify their choice(s).
4. Divide the class up into Expert Working Groups, where each group will research the Pros and Cons of different types of renewable energy that they brainstormed earlier. They should focus on how a particular power source limits GHG's and environmental impacts, to benefit society by creating a sustainable and reliable power source in an arctic environment. Direct Students towards Lesson #6 Student Handout 1,2,3 for more details on the assignment.
5. Student, in their expert working groups, would then present their summarized findings to the class and answer any questions others may have of the type of this particular type of technology.
6. Students will then focus on how wind power could be used in their community (in town / on the land) as an option to generate power. Tie this into previous brain storming activities and discussions on how wind power could be used to offset the use of fossil fuel for daily activities on the land or in town.

SHARING THE MESSAGE

Students can post their assignments on the school website or use social media to share their project.

ENRICHMENT ACTIVITIES/FAST FINISHERS

As an extension to this activity you could include experimental forms of alternate sustainable clean reliable energy, i.e. thermoelectric, wave generators, space-based solar power etc.

STUDENT HANDOUTS

Students and instructors should be familiar with the basic science of climate change either through past experience or the Experiential Science curriculum. The following Backgrounders provide details on climate change for this activity.

- Diavik Wind Power Video <https://www.youtube.com/watch?v=gSjzxhPCnq8>
- High School Backgrounder #1: Climate Change: What's the Big Deal?
- High School Backgrounder #13: Renewable Energy Opportunities
- Lesson #6 Student Handout part 1,2,3
- Lesson #6 Peer Evaluation

EVALUATION

This activity engages students in group work, research, building and defending an argument as well as public speaking and presentations. As a class develop a scoring rubric that focuses on these skills sets and is reflective of what the students see as important for key messaging on renewable resources. Refer to Lesson #6 Peer Evaluation to have students evaluate each other's presentations.

Evaluator's Name: _____

PEER EVALUATION	
Presenter's Name(s):	Topic:
Use the following scale to rate the presenter: 1 = strongly disagree 2 =disagree 3 =somewhat agree 4 =agree 5 =strongly agree	
The presenter (or presenting group) spoke clearly and loudly	1 2 3 4 5
The Infographic / visual supports helped me understand the message	1 2 3 4 5
The presenter (or presenting group) explained unfamiliar vocabulary.	1 2 3 4 5
The presentation was well organized and followed a logical order.	1 2 3 4 5
The speaker gave interesting facts and examples.	1 2 3 4 5
The presenter (or presenting group) listed feasible strategies to reduce the NWT's reliance on diesel	1 2 3 4 5
Overall, I felt that the speakers presentation was well done.	1 2 3 4 5

Comments:

SUMMARY SHEET: EXPERT WORKING GROUPS

STUDENT HANDOUT #1

As an Expert Working Group create an information chart to summarize your research into the Pros and Cons of the renewable energy sources you have been assigned.

In your summary ensure that you indicate the type of renewable energy and address:

- its positive and negative effects on the environment
- its reliability
- costs
- generation of GHG's
- climate change mitigation
- use in your community
- potential energy production
- sustainability
- applications in an arctic environment
- how it offsets the reliance on fossil fuels

SOURCES OF INFORMATION

STUDENT HANDOUT #2

List the sources of information that you used from your expert working group to summarize the Pros and Cons of alternative forms of green energy. This should include all internet as well as library sources of information. Use proper formatting practices for citations of internet and print resources, as this will be shared with your classmates.

FINAL ASSIGNMENT

STUDENT HANDOUT #3

As a culmination to this activity do one of two assignments:

OPTION 1: ENERGY VISION OF THE FUTURE

Students are to generate a presentation, such as an essay, poster or info-graphic, on how they envision energy production in their community 50 years from now.

OPTION 2: A WIND FARM IN YOUR COMMUNITY

Students are to create a presentation with visual supports that demonstrate the viability of wind power in their community to generate energy and offset the use of non-renewable forms of energy. The presentation should have supporting information on why and where the wind farm should be located, it's required capacity and potential costs, savings and reduction of greenhouse gases.

Students should investigate possible jobs that would be required to plan, acquire, set –up and maintain this type of energy production.