

**Electric Math!**

The following math questions contain item names from the *Electricity* poster. Your task is to find the items on the inside part of the poster, fill in the appropriate number and solve the problem! The first one is done as an example.

1. Hydroelectric dam  $\times 8 = \underline{\boxed{56}}$
2. Wind Turbine - \_\_\_\_\_ = LRT power line
3. Residential Electrical Panel  $\times 8 = \underline{\hspace{2cm}}$
4.  $7 \times \underline{\hspace{1cm}} =$  Battery and Simple Circuit
5. Household Light Bulb -  $4 + 6 = \underline{\hspace{2cm}}$
6.  $45 \div$  Electric Switch Diagram = \_\_\_\_\_
7. Power generation using uranium as a fuel source +  $9 - \underline{\hspace{1cm}} = 7$
8. Our most common artificial lighting source  $\times$  biomass power generation = \_\_\_\_\_
9.  $(35 + 6) -$  Equipment used to collect energy from the sun = \_\_\_\_\_  
(*hint: not on the house*)
10.  $(16 + \underline{\hspace{1cm}}) \div 3 =$  Tidal Power Generation
11. (Biomass Power Generation + Hydro Electric Dam)  $\times 11 + 13 = \underline{\hspace{2cm}}$
12.  $9 \times$  (Hydro turbine + 6) = \_\_\_\_\_
13.  $7 \times 3 - \underline{\hspace{1cm}} = 13$

A riddle!! I have blades, but they are not sharp.  
They spin in circles when the wind blows.  
An electric generator at my base,  
And into the grid my electricity goes!

### ***Electricity Facts:***

#### **Whitecourt**

A power generating station in the Whitecourt area uses bark and other waste wood (also known as biomass) from forestry production to make electricity.

#### **Jasper/Banff**

The Miette and Radium hot springs use the heat from the earth's core to heat water pools. This form of renewable energy is called geothermal power.

#### **Bighorn Area**

The Bighorn Dam, at 91 metres high, provides hydroelectricity to central Alberta and created Alberta's largest constructed reservoir, Abraham Lake.

#### **Bruce Area**

A biogas (another type of biomass energy source) plant at a Hutterite colony near Bruce takes the waste from an intensive livestock operation and through the process of anaerobic digestion creates electrical and thermal energy, reusable water and a dry nutrient-rich organic material.

#### **Calgary**

Calgary is retrofitting 49 000 streetlights on residential roads. The existing sodium bulbs are being replaced with lower wattage bulbs in different fixtures, greatly reducing wasted light. The program will save \$2 million per year in electrical costs and will reduce carbon dioxide emissions from gas and coal-burning power plants by up to 16 000 tonnes per year. The streetlight system is Calgary's largest single consumer of electricity.

#### **Okotoks**

Conservation programs have reduced energy consumption by 650 000 kilowatt hours per year within the water distribution system in this southern Alberta town. Heat-reflective ceilings, low-energy light bulbs and efficient furnaces have also been installed at the town's recreation centre resulting in electricity savings and a 4000 gigajoules (gJ) reduction in natural gas consumption.

#### **Pincher Creek**

Pincher Creek is one of the windiest areas in Alberta. Using large turbines, especially on Cowley Ridge, renewable energy from the wind is harnessed and used to make electricity. Wind power is the fastest-growing energy source technology worldwide.

### Wabamun Lake

The largest coal-fired generating plant in western Canada (nearly 2000 megawatts output) is near Wabamun Lake. It consumes 9.3 million tonnes of coal a year, all mined from the adjacent Highvale coal mine (the largest in Canada covering 12 239 hectares or 30 221 acres). This generating plant, Sundance, has the capacity to supply almost half of Alberta's electrical requirements. The plant produces enough energy each year to supply the equivalent of two million households.

Alberta is both the largest coal-producing and coal-consuming province in Canada. As in the other producing provinces, coal is the main energy source for electricity generation.

### Edmonton

- a) On top of a 75 metre (21 storey) office tower roof, a 13.4 kilowatt photovoltaic (PV) solar array generates its own electricity and, at times, even contributes excess power to the electric grid\*.
- b) Decomposing garbage produces methane gas. Edmonton's Clover Bar Landfill collects the methane and supplies an electricity generating station.

### Chipewyan Lake

Many small communities in northern Alberta are not on the electric grid\*. Chipewyan Lake is an example of a community where homes are powered using a remote or separate generating station. Remote generating stations are usually powered by easily transported fuels, such as diesel.

### Athabasca Basin Area

Located over the border of northern Alberta and Saskatchewan, this region comprises approximately 100 000 km<sup>2</sup>. It holds the largest and highest-grade uranium ore deposits in the world. Uranium ore is an essential component of the fuel pellets used in nuclear power plants. Uranium mines have operated 15 km from the Alberta border in this area.

### Grande Prairie

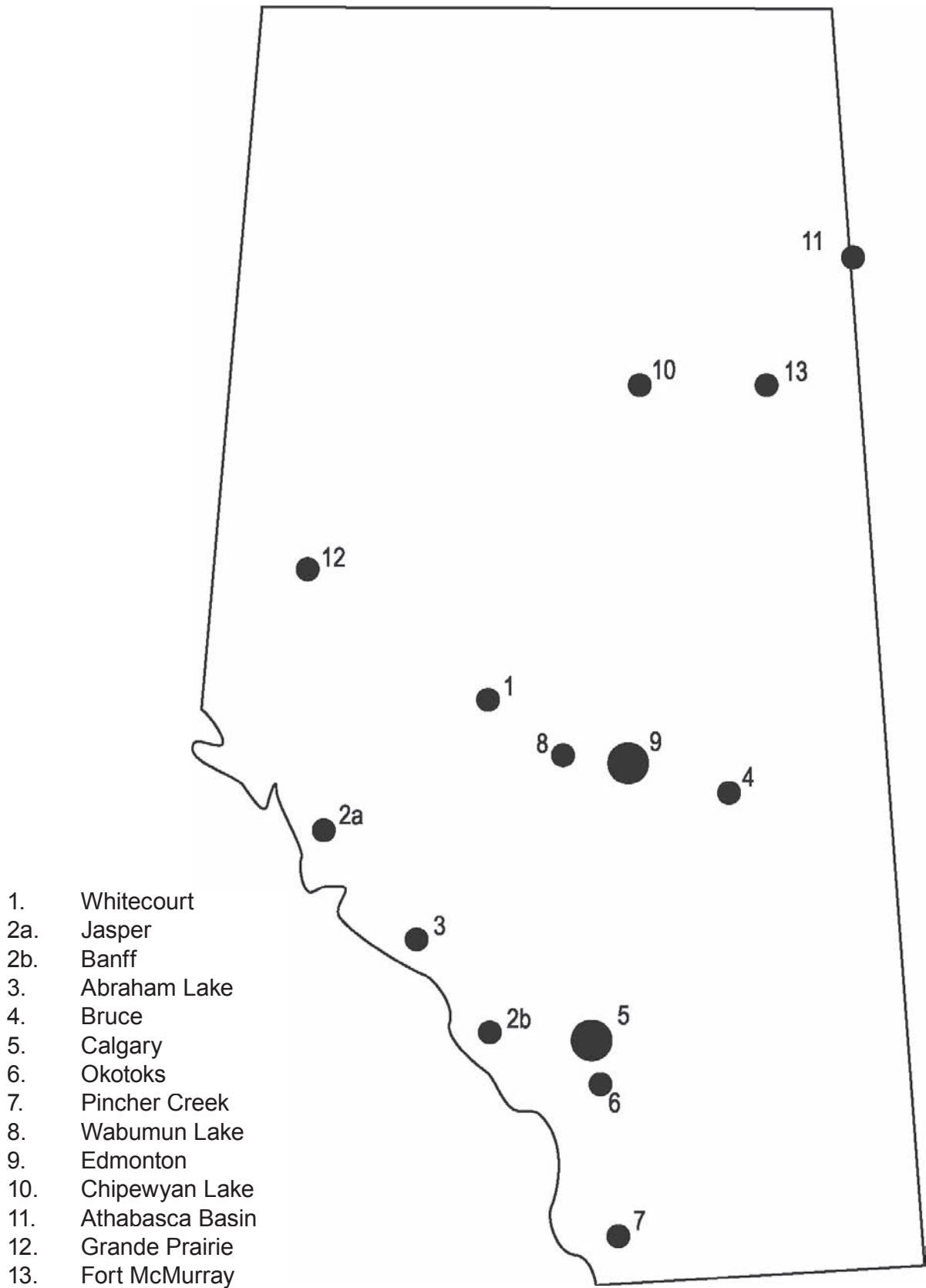
A new, 25 megawatt biomass electricity plant will generate electricity and steam for use in the Grande Prairie area, utilizing sawmill wood waste as a fuel. This is enough electricity to provide power to approximately 21 000 households.

### Fort McMurray

Natural gas is used both to generate steam and electricity to extract the bitumen (heavy crude oil) from the oil sands and to convert the bitumen into usable crude oil. Currently, oil sands operations consume approximately 9.3 billion cubic metres per year of natural gas.

\*An *electric grid* is a network of wires that connect sources of power and deliver electricity to homes and businesses throughout populated areas.

# ELECTRICITY TOUR OF ALBERTA – Facts and Map



**Instructions:** Using the scientific method and the discussions held in class, predict the results of an experiment that compares incandescent light bulbs and compact fluorescent light bulbs. Conduct the experiment and record your results.

**Part A**

1. Pick two topics from the list made by the class. Develop a question for each of the topics that will help you determine the efficiency of both bulbs.

a. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

b. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

2. For both of your questions develop a prediction about what the answer will be.

a. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

b. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. How will you test your predictions? Describe the experiments that you will use.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

4. Record the results from your experiments.

Incandescent bulb \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Compact fluorescent bulb \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Part B**

5. Using the light bulb packages write down any additional information that you can about your light bulbs.

Incandescent bulb \_\_\_\_\_

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Compact fluorescent bulb \_\_\_\_\_

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6. Using the information from the light bulb packages, the *Electricity* poster and the background information discuss the following:
- Were the results of your experiment accurate?
  - Was there anything that you did not consider in your predictions that you should have?
  - Which light bulb do you now think is the most effective and why?

## WHAT DOES IT TAKE TO MAKE ELECTRICITY? - Student Activity

Date: \_\_\_\_\_

Group: \_\_\_\_\_

Topic: \_\_\_\_\_

### Work Outline

#### **Research:**

The research should be divided up so that each student is doing an equal part. List which student is doing the research in the space provided.

#### **Research Areas:**

1. Where does this energy source come from? Is it renewable or non-renewable (explain)? Where is it used in Alberta and Canada? \_\_\_\_\_

(researching student)

2. How is electricity produced from this energy source? \_\_\_\_\_

(researching student)

3. What are the benefits and challenges related to this energy source (environmental, economic, social)? \_\_\_\_\_

(reasearching student)

#### **Project:**

Your fist task as a group is to decide what type of presentation you want to make. Will it be a poster? Maybe a PowerPoint presentation? A skit? Once you have decided, assign each group member a specific job.

For example:

Presentation: Poster

Student #1 – Collects pictures and labels them.

Student #2 – Prints out information required for the poster as collected from other students' research.

Student #3 – Title, placement and finishing details.

\_\_\_\_\_  
(student)

\_\_\_\_\_  
(specific job)

\_\_\_\_\_  
(student)

\_\_\_\_\_  
(specific job)

\_\_\_\_\_  
(student)

\_\_\_\_\_  
(specific job)

## WHAT DOES IT TAKE TO MAKE ELECTRICITY? - Evaluation

Date: \_\_\_\_\_

Group: \_\_\_\_\_

Topic: \_\_\_\_\_

Evaluation Rubric	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Group Score
<b>Work Outline</b>	Outline vague and unclear about what student tasks are.	Outline complete but work and tasks are not distributed equally among members.	Outline is complete; work was distributed equally but outline was not followed (some members did not follow the outline).	Outline is complete; work was distributed equally among all group members and outline was followed.	
<b>Research</b> 1. Where does energy source come from / where is it used?	Missing three or more elements. See box 4 for list of elements.	Missing any two elements. See box 4 for list of elements.	Missing any one element. See box 4 for list of elements.	<ul style="list-style-type: none"> <li>• Source stated and description of origin present.</li> <li>• Designated renewable or non – renewable with explanation.</li> <li>• Location of use in Alberta and Canada is given.</li> </ul>	
<b>Research</b> 2. How is electricity produced from this energy source?	Missing three or more elements. See box 4 for list of elements.	Missing any two elements. See box 4 for list of elements.	Missing any one element. See box 4 for list of elements.	Includes description of processing, transportation to power plant if necessary and power generation explained.	
<b>Research</b> 3. What are the benefits and challenges related to this energy source?	Only 2 costs and/or benefits of using the source are examined and not all areas are recognized (environmental, social and economic).	Includes 3 costs and/or benefits of using the source and not all areas are recognized (environmental, social and economic).	Includes 4 costs and/or benefits of using source and not all areas are recognized (environmental, social and economic).	Includes at least 5 costs and/or benefits of using source and all areas are recognized (economic, social and environmental).	
<b>Presentation of Topic</b>	Missing three or more elements. See box 4 for list of elements.	Missing any two elements. See box 4 for list of elements.	Missing any one element. See box 4 for list of elements.	Presentation is visually pleasing; neat and organized; easy to read and understand; pictures and /or diagrams enhance understanding of the topic.	

## **WHAT DOES IT TAKE TO MAKE ELECTRICITY? - Evaluation**

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Date: \_\_\_\_\_

Group: \_\_\_\_\_

Topic: \_\_\_\_\_

### **Peer Evaluation**

Please rate yourself and your group members on the contributions to the project. Your ratings will be used to determine each students' mark along with the group mark.

Do not base your evaluations on friendship or personality conflicts. Your input is valuable to assessing contributions fairly. **THESE EVALUATIONS WILL NOT BE SEEN BY OTHER GROUP MEMBERS.**

Use the four point scale below to rate yourself and your peers. Insert your name in the first column and your group members' names in the remaining columns.

- 4 — Superior
- 3 — Above Average
- 2 — Average
- 1 — Weak

<b>Name</b>				
Participated in group discussions.				
Contributed useful ideas and information.				
Respects and listens to group members' opinions.				
Quantity (amount) of work done.				
Quality of work done.				
Total Score				



