

Activity Preparation for Chapter 8

Activity/Investigation	Advance Preparation	Time Required	Other Considerations
<i>Find Out: Energy Consumption at Home</i> (page 164) (TR page 191)	<ul style="list-style-type: none"> • 1 day before <ul style="list-style-type: none"> – Photocopy BLM 8–2 Energy Consumption and Assessment Master 4 Lab Report Rubric. 	<ul style="list-style-type: none"> • 70 min 	<ul style="list-style-type: none"> • Provide students with calculators if they do not have their own. • Pair students with weak math skills with those who have stronger skills.
<i>Try This!</i> (page 166) (TR page 193)	<ul style="list-style-type: none"> • Day of <ul style="list-style-type: none"> – Gather a list of several devices with power ratings. – Photocopy OHT B–15 Energy Consumption at Home. 	<ul style="list-style-type: none"> • 15 min for introduction • additional time for homework 	<ul style="list-style-type: none"> • Caution students not to move large appliances to find power rating labels. • Provide some alternatives if students cannot find power rating labels.
<i>Find Out: How Much Energy Do We Consume?</i> (page 168) (TR page 194)	<ul style="list-style-type: none"> • Several days before <ul style="list-style-type: none"> – Book the computer lab, if using. • 1 day before <ul style="list-style-type: none"> – Photocopy BLM 8–3 Dial Meter Readings and/or BLM 8–4 Smart Meter Readings, if using. 	<ul style="list-style-type: none"> • 10 min for introduction • 5 to 10 min per day for 1 week for readings and calculations 	<ul style="list-style-type: none"> • Provide students with calculators if needed. • Partner students who do not have access to dial meters or smart meter readings with those who do. • If students do not get meter readings, provide BLM 8–3 Dial Meter Readings or BLM 8–4 Smart Meter Readings.
<i>Find Out: Make a Home Energy Plan</i> (page 172) (TR page 198)	<ul style="list-style-type: none"> • 1 week before <ul style="list-style-type: none"> – Obtain copies of the EnerGuide Appliance Directory or book computers with Internet access. • 1 day before <ul style="list-style-type: none"> – Have students find EnerGuide ratings for four older electric appliances at home. – Photocopy any assessment masters you decide to use. 	<ul style="list-style-type: none"> • 140 min (15 min for introduction; 30 min for EnerGuide Appliance Directory; 95 min for completing activity) 	<ul style="list-style-type: none"> • Remind students not to move heavy appliances to find EnerGuide labels.

Materials Needed for Chapter 8

Activity/Investigation	Apparatus	Materials	Blackline Masters
<i>Find Out: Energy Consumption at Home</i> (page 164) (TR page 191)	<ul style="list-style-type: none"> calculators (1 per student) 		Recommended BLM 8–2 Energy Consumption OHT 3 Centimetre Grid OHT B–15 Energy Consumption at Home Assessment Master 4 Lab Report Rubric
<i>Try This!</i> (page 166) (TR page 193)			Recommended OHT B–15 Energy Consumption at Home
<i>Find Out: How Much Energy Do We Consume?</i> (page 168) (TR page 194)	<ul style="list-style-type: none"> computers with Internet access 		Optional BLM 8–3 Dial Meter Readings BLM 8–4 Smart Meter Readings
<i>Find Out: Make a Home Energy Plan</i> (page 172) (TR page 198)	<ul style="list-style-type: none"> print copies of EnerGuide Appliance Directory or computers with Internet access (1 per group) will vary depending on format for presentations 	<ul style="list-style-type: none"> will vary depending on format for presentations 	Recommended Assessment Master 1 Co-operative Group Work Checklist Assessment Master 2 Co-operative Group Work Rubric Assessment Master 15 Visual Presentation Checklist Assessment Master 16 Visual Presentation Rubric

CHAPTER 8 Reducing Energy Consumption (page 158)

SUGGESTED TIMING

15 min

Overall Expectations

PEEV.02 – investigate the factors that affect the generation and use of electricity

PEEV.03 – analyse the social, economic, and/or environmental implications of the sources and uses of electrical energy

SIMV.03 – evaluate claims and presentations of science-related information in media

Activity Planning Notes

As a class, have students discuss the visual and questions on page 158. Questions 1 and 2 provide an introduction to reducing energy consumption and a lead-in to section 8.1.

Have students answer and then take up question 3.

Reading Icon Answers (page 158)

1. Students should circle: lights for reading; lights upstairs; heat escaping from open window; heat going up chimney; heating oven.
2. a)–e) Students should list five ways to save electric energy, such as:
 - turn off the lights in unoccupied rooms
 - use a reading lamp instead of an overhead light to read
 - replace regular incandescent bulbs with more energy-efficient bulbs
 - shut windows to keep warm air inside
 - turn down heat and wear warmer clothing instead of opening windows
 - heat food in a microwave or toaster oven instead of a large oven

Check Your Understanding Answers (page 158)

3. a) –c) Students should give three reasons to save electric energy, such as:
 - save money on electric bills
 - decrease the likelihood of blackouts
 - reduce pollution and impact on the environment

8.1 Comparing Our Choices (page 159)

SUGGESTED TIMING

70 min including the Science and Media Link and the Science and Math Link

MATERIALS

- markers
- sample EnerGuide labels
- computer with Internet access

BLACKLINE MASTERS

BLM 8–1 Comparing Costs
OHT B–11 Energy Consumption
OHT B–12 EnerGuide Ratings
OHT B–13 and OHT B–14
Comparing Costs

Specific Expectations

PEE1.03 – determine quantitatively and/or qualitatively the energy and power associated with electrical devices

PEE2.04 – determine and record the electrical energy and power of electrical devices

PEE2.05 – communicate information using appropriate formats for specific purposes and audiences

SIM1.01 – identify the ways in which scientific information is conveyed

Science Background

Although using electric energy to heat buildings or water may not be very efficient, using other energy sources, such as wood or natural gas has an environmental impact. Wood stoves produce air pollution, including smoke and greenhouse gasses. Natural gas furnaces and heaters produce greenhouse gas in the form of carbon dioxide. In addition, methods to extract and transport natural gas from fossil fuel deposits can have a negative impact on the environment.

EnerGuide labels appeared in 1978 in an effort to protect Canadian consumers from exaggerated claims of energy efficiency. The concept was later incorporated into a Green Plan for Canada. Currently, there are two types of EnerGuide labels: one type provides the typical energy consumption in kWh/year of major household appliances; the other provides the energy efficiency ratio of room air conditioners. Students focus on the first type of label in Chapter 8.

EnerGuide ratings for major household appliances are a kind of power rating. Chapter 5 discusses two other kinds of power ratings: wattage or watts (W) and kilowatt hours (kWh). EnerGuide ratings give typical power ratings for a year.

Key Terms Teaching Strategies

Have students complete some or all of the following activities to help them learn and remember the key terms:

- Write definitions for these terms in their Science Log. You may wish to have students keep a glossary at the back of their Science Log.
- Write two or three sentences explaining how the two key terms are related.

Help students remember the key terms by posting them on a science word wall or electricity bulletin board.

Reading Icon Answer (page 159)

4. Students should highlight: type of home you live in; your lifestyle; number of people in your household.

Reading Icon Answer (page 160)

1. Students should circle: 901 kWh per year.

Reading Icon Answer (page 162)

1. Students should highlight the lowest EnerGuide rating:
 - washing machine: 779
 - fridges: 514

Accommodations

- Some students may have difficulties interpreting pie graphs. Remind them that the graphs do not show amounts of energy consumption in joules or kilowatts; rather, the graphs show the relative amount (percentage) of electric energy used for specific purposes.
- Some students will not relate the calculations in the Science and Math Link on page 162 to the cost calculations they did in Chapter 5. Guide students through the calculations as if students are learning them for the first time.
- Provide students with calculators if they do not have their own.

Activity Planning Notes

Discuss the meanings of the terms “consume” and “consumption” in different contexts. For example, we consume food for energy. Consumption is the amount of food we eat. Similarly, electric devices consume electric energy. Consumption is the amount of energy we use.

As a class, read the information on page 159. Use **OHT B–11 Energy Consumption** to explain and discuss the pie graphs.

Have students work individually or in pairs to complete questions 4 and 5 on page 159, and then take up the answers as a class. Students should recognize that electric energy not used for heating can be used for other purposes—or not at all. Point out that it takes a great deal of electric energy to heat water, and have students consider how they use hot water in their daily lives.

This section emphasizes EnerGuide ratings and labels. Help students connect their learning to the real world by bringing in some additional examples of EnerGuide labels from home or the Internet.

Have students work in small groups to interpret the EnerGuide label on page 160 and then complete the Science and Media Link on page 161. Consider using **OHT B–12 EnerGuide Ratings** to walk students through the EnerGuide labels on pages 160 and 161. Solicit input from each group as you take up the answers to the questions.

Have students read the introductory paragraph on page 162 and then answer question 1. Ask students what the lowest EnerGuide ratings share in common. Students should note that, in general, the newer the model, the lower the EnerGuide rating of the appliance.

Use **OHT B–13** and **OHT B–14 Comparing Costs** to help walk students through the Science and Math Link calculations on pages 162 and 163. Students did similar cost calculations in Chapter 5. Some students may remember that to find the total cost, they must multiply the amount of energy by the price of energy.

As you circulate, coach students who are experiencing difficulty with the cost calculations.

You may wish to provide additional practice problems for students to complete individually or in pairs using **BLM 8–1 Comparing Costs**. If students work on their own, have them check their calculations with a partner afterward.

Consider using the following blackline master and overhead transparencies:

- **BLM 8–1 Comparing Costs**
- **OHT B–11 Energy Consumption**
- **OHT B–12 EnerGuide Ratings**
- **OHT B–13 and OHT B–14 Comparing Costs**

Check Your Understanding Answers (page 159)

5. a) 54
b) heating water

Check Your Understanding Answers (page 160)

2. kWh per year
3. a) HIGH
b) 264 kWh per year
c) 1052 kWh per year

Making Connections Answer (page 160)

4. Use EnerGuide ratings to purchase an appliance model with low energy consumption.

Check Your Understanding Answers (page 161)

1. a) 460 kWh
b) 400 kWh
2. Model A. Sample answer:
 - Model A consumes an average of 460 kWh per year compared to Model B, which consumes an average of only 400 kWh per year.

3. Answers will vary. For example:

- expected lifespan
- consumer reports on reliability
- warranty information, including potential hidden warranty costs
- quality of construction

Comparing Costs Answers (page 163)

2. a) **STEP 1:** EnerGuide rating = 1214 kWh/year
Total cost for one year = *Energy consumed in a year* \times *Price of energy*

STEP 2: How much it would cost to use the clothes dryer for one year.

STEP 3: Cost for one year = $1214 \text{ kWh/year} \times 10.0\text{¢/kWh} = 12\,140\text{¢}$
 $12\,140\text{¢} \div 100 = \121.40

- b) **STEP 4:** Cost over lifespan = $\$121.40/\text{year} \times 18 \text{ years} = \2185.20

Ongoing Assessment

- Use the answers to question 5 on page 159 to assess students' abilities to interpret pie graphs.
- Use the answers to questions 1 to 3 on page 161 to assess students' abilities to interpret the information on EnerGuide labels.
- Use question 2 on page 163 and **BLM 8–1 Comparing Costs** to assess students' work.

Technology Links

- For more information on EnerGuide ratings, go to www.mcgrawhill.ca/books/Se10 and follow the links to EnerGuide Ratings.

8.2 Tracking Energy Consumption

(page 164)

SUGGESTED TIMING

30 min
70 min for Find Out: Energy Consumption at Home
15 min for Try This!
10 min for introduction; 5 to 10 min per day for 1 week for readings and calculations for Find Out: How Much Energy Do We Consume?

BLACKLINE MASTERS

BLM 8–2 Energy Consumption
BLM 8–3 Dial Meter Readings
BLM 8–4 Smart Meter Readings
OHT 3 Centimetre Grid
OHT B–15 Energy Consumption at Home
Assessment Master 4 Lab Report Rubric

Specific Expectations

PEE1.03 – determine quantitatively and/or qualitatively the energy and power associated with electrical devices

PEE2.01 – locate and select information from various sources to identify factors affecting generation and use of electricity

PEE2.04 – determine and record the electrical energy and power of electrical devices

PEE2.05 – communicate information using appropriate formats for specific purposes and audiences

SIM2.02 – research science-related information from a variety of electronic and other sources

Key Terms Teaching Strategies

Have students complete some or all of the following activities to help them learn and remember the key terms:

- Write definitions for these terms in their Science Log. You may wish to have students keep a glossary at the back of their Science Log.
- Write the script for a public service announcement explaining the key terms.

Help students remember the key terms by posting them on a science word wall or electricity bulletin board.

Reading Icon Answers (page 167)

7. 23 030 kWh
8. Students should highlight: smart meters have digital displays; smart meter measures energy consumption for about an hour and sends the reading directly to the power company.

Reading Icon Answer (page 169)

8. Students should highlight: off-peak periods.

Activity Planning Notes

By completing the Find Out activity on page 164, students will relate electric energy consumption issues to their own experience and practise their graphing skills. The Try This! activity on page 166 can be done immediately following the

Find Out activity. It provides another opportunity for students to work with energy consumption calculations.

Introduce the section on electric meters by asking the class if they know how their own household energy consumption is tracked. Some students may have seen dial meters or smart meters at home and be able to describe these tools. Have students complete questions 7 and 8 on page 167 individually and then work with partners to check their responses and complete questions 9 and 10. Take up the questions in a class discussion.

Have students complete the Find Out activity on page 168, in which they track household energy consumption for a week. Use the activity as a lead-in to a discussion about how to best save electric energy.

Discuss on-peak periods and off-peak periods on page 169. Mention that using electric energy in off-peak periods can help prevent power outages.

Check Your Understanding Answers (page 167)

9. a) Add hourly or daily data recorded by a smart meter (available by phone or online), or take two dial meter readings one week apart.
- b) Get smart meter readings (available on phone or online). (It would be difficult to measure hourly consumption by taking dial meter readings an hour apart unless the quantity of electric energy consumed was substantial.)

Making Connections Answer (page 167)

10. Answers may vary. Sample answers:

- to predict how much it will cost per month to live in their home
- to decide when and how to use electric energy in order to reduce consumption

Check Your Understanding Answer (page 169)

9. Consume electric energy during off-peak periods when electric energy costs the least.

Find Out Activity (page 164)

Energy Consumption at Home

Purpose

- Students calculate daily and monthly energy consumption and costs for four electric devices, and graph the data.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 day before	• Photocopy BLM 8–2 Energy Consumption and Assessment Master 4 Lab Report Rubric .

APPARATUS	MATERIALS
• calculators (1 per student)	

Suggested Timing

70 min

Activity Planning Notes

As a class, read the directions on page 164. Encourage discussion to ensure that everyone understands what to do. Have students work individually to complete question 1 and fill in columns A and B in the table on page 165.

Use **OHT B–15 Energy Consumption at Home** to

show students how to complete the rest of the columns in the table. Complete the calculations for the example of the 60 W lamp given in the student resource.

Some students may be concerned about correctly recording the hours used per day for each device. Assure students that reasonable estimates are acceptable.

Students could work in pairs to complete their tables. Although they will be using different numbers, they could check each other's work or work through the calculations together.

Provide students with **BLM 8–2 Energy Consumption** to graph their results. Have students complete the graph and questions 5 and 6 on page 166.

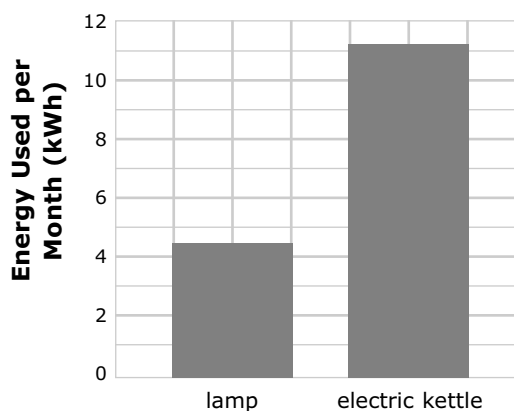
Accommodations

- Provide students with calculators if they do not have their own.
- Coach students who need some help with completing the bar graph. Consider using **OHT 3 Centimetre Grid** to model an example.
- Students with weak math skills could be paired with students who have stronger skills.

Find Out Activity Answers (pages 164–166)

1. Students should highlight four devices in the table.
2. and 3. Answers will vary depending on the devices students choose and hours used per day. Check to ensure students have correctly converted from W to kW (Column B), and correctly calculated the energy used per day (Column E) and energy used per month (Column F).
4. Graphs will vary depending on the data. Check that the *x*-axis is titled “Electric Devices” and that the *y*-axis is titled “Energy Used per Month (kWh).” The graph should be titled. A sample graph is provided for a 60 W lamp used for 2.5 h a day and a 1500 W electric kettle used for 0.25 h (15 min) a day.

Monthly Electric Energy Consumption for Two Devices



Electric Devices

5. a) Answers will vary. Students should mention the device with the tallest bar on the graph. The energy consumption will depend on the wattage of the device and how much it is used.

- b) Students should use the steps outlined on page 162 and 163. Using the data for a 60 W lamp:

STEP 1: Total cost for one month =
 Energy consumed in a month \times Price of energy
 Price of energy = 8.0¢/kWh
 Energy consumed in a month = 4.5 kWh
 (Column F from table)

STEP 2: How much it will cost to use the lamp for one month.

STEP 3: Total cost for one month =
 Energy consumed in a month \times Price of Energy = 4.5 kWh \times 8.0¢/kWh = 36¢

6. Use power ratings as a guide for choosing devices that consume less electric energy. Students might suggest using power ratings to target items at home that should be used less often.

Activity Wrap-up

- Have students take up the questions on pages 165 and 166 in a class discussion. You may wish to use a sample set of data provided by students and **OHT 3 Centimetre Grid** to produce a bar graph with student input.

- Have students respond to the following questions:
 - Which devices used the most electric energy each month? Why?
 - Which electric devices used the most electric energy each month? Why?
 - What could you do to reduce or get better use from the electric devices that you highlighted?

Try This! Activity (page 166)

Purpose

- Students use the power rating of three electric devices to calculate how much electric energy each device uses in a month.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
Day of	<ul style="list-style-type: none">• Gather a list of several devices with power ratings.• Photocopy OHT B–15 Energy Consumption at Home.

Suggested Timing

15 min for introduction; additional time for homework

Activity Planning Notes

In case some students do not gather data about electric devices, have a list of several devices and their power ratings on hand for them to use.

You may wish to photocopy **OHT B–15 Energy Consumption at Home** for students to use. If so, cover the last row on the table as students need only space for three devices. Alternatively, have students prepare a data table similar to the one on page 165. If possible, students should complete Columns A to D at home.

Advise students that not all devices provide power rating information. Light bulbs and major appliances sometimes have power rating labels. Students can also check the manuals that come with appliances.

If students find only EnerGuide labels, they can work out monthly energy consumption by dividing the EnerGuide rating by 12. If labels give amperes, students should multiply by 120 volts to get the power rating in watts.

If students are unable to locate power ratings on devices at home, help them find typical ratings for electric devices online or provide data for electric devices that you prepared in advance.

Have students calculate the energy used per day (kWh) and energy used per month (kWh) for each device. They can complete the calculations at home using the steps outlined in Find Out: Energy Consumption at Home, or in class with your guidance.

Accommodations

- Caution students not to move large appliances to find power rating labels.
- Provide students with calculators if they do not have their own.
- Students with weak math skills could be paired with students who have stronger skills.

Technology Links

- For a listing of typical power ratings of common appliances, go to www.mcgrawhill.ca/books/Se10 and follow the links to Power Ratings.

Activity Wrap-up

- Have students share their completed data table with the class. You may wish to record the monthly energy consumption of several devices using student input and **OHT B–15 Energy Consumption at Home**.
- Discuss which devices consumed the most energy and why.

Find Out Activity (page 168)

How Much Energy Do We Consume?

Purpose

- Students track household electric energy consumption for a week by reading dial meters or using smart meter readings.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
Several days before	• Book the computer lab, if using.
1 day before	• Photocopy BLM 8–3 Dial Meter Readings and/or BLM 8–4 Smart Meter Readings , if using.

APPARATUS	MATERIALS
• computers with Internet access	

Suggested Timing

10 min for introduction; 5 to 10 min per day for 1 week for readings and calculations

Activity Planning Notes

Introduce the activity and read the directions on page 168 together as a class.

For students who will not take meter readings, you can provide them with copies of **BLM 8–3 Dial Meter Readings** or **BLM 8–4 Smart Meter Readings**.

Explain how to take electric meter readings. Review how to read dial meters or how to look up smart meter readings online, depending on the method students will be using. For dial meters, remind students to record the lower number if the dial is between two numbers. Advise students to take their readings at approximately the same time each day.

Show students how to calculate the difference between the daily readings (last column in data table). Have students perform the calculation at the start of each class. Check the meter readings and calculations at the start of each class for one week.

On the last day, have students work in pairs to complete questions 4 to 7 on pages 168 and 169.

Accommodations

- Provide students with calculators if they do not have their own.
- Pair students who do not have access to dial meters or smart meter readings with students who do.

Technology Links

- For instructions and practice reading online electric meters, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Reading an Electric Meter.

Find Out Activity Answers (pages 168–169)

3. Answers will vary. The following table is based on data from **BLM 8–3 Dial Meter Readings**. The difference between daily readings on the table shows the kWh used each day.

Date	Reading (kWh)	Difference Between Daily Readings (kWh)
Day 1 Dec 1	5123	
Day 2 Dec 2	5139	16
Day 3 Dec 3	5158	19
Day 4 Dec 4	5178	20
Day 5 Dec 5	5192	14
Day 6 Dec 6	5206	14
Day 7 Dec 7	5218	12

The difference between the daily readings will be very low in smart meter readings. In this case, the second column will show the kWh used each day.

4. a) Answers will vary. For students using **BLM 8–3 Dial Meter Readings** or **BLM 8–4 Smart Meter Readings**, the household consumed the most electric energy on Day 4 (assuming the reading was taken in the evening).
- b) Answers will vary. Look for one possibility such as:
- It was hot and the air conditioner was on all day.

- It was very cold and the electric baseboards were on all day.
 - Someone did all the laundry.
 - The oven and other kitchen appliances were used to cook a large meal.
 - Someone used a computer for many hours.
5. If using dial meter readings, students can determine the total electric energy consumption for the week by subtracting the Day 1 reading from the Day 7 reading. Or, students could add the difference between the daily readings recorded in the third column. If using smart meter readings, students can determine the total electric energy consumption for the week by adding up the daily readings from the second column. For students using **BLM 8–3 Dial Meter Readings** or **BLM 8–4 Smart Meter Readings**, the total consumption was 95 kWh.
6. Students should use the steps outlined on pages 162 and 163. Using the data from the blackline masters:

STEP 1: Total cost for one week =
 Energy consumed in a week \times Price of energy
 Price of energy = 10.0¢/kWh
 Energy consumed in a week = 95 kWh

STEP 2: How much it costs for the household to use electric energy for one week.

STEP 3: Total cost for one week = 95 kWh \times 10.0¢/kWh = 950¢
 950¢ \div 100 = \$9.50

7. Look for one reasonable way to reduce consumption such as:
- Cut back on the activity that caused a spike in electric energy consumption.
 - Turn off the television when no one is watching.
 - Use low power lights.
 - Turn down air conditioners, electric hot water heaters, and electric base board heaters.
 - Run the dishwasher only when full.

Activity Wrap-up

- If students are comfortable doing so, encourage volunteers to share their results in a class discussion.
- Discuss questions 4 to 7 on pages 168 and 169.
- Discuss why different households might consume different amounts of electric energy.

Ongoing Assessment

- Assess students' work during Find Out: Energy Consumption at Home using **Assessment Master 4 Lab Report Rubric**.
- Use student work during the Try This! to assess students' ability and accuracy in calculating electric energy that devices use.
- Use answers to questions 9 and 10 on page 167 and work during Find Out: How Much Energy Do We Consume? to assess students' understanding of how to track energy consumption and the importance of doing so.

Technology Links

- For online interactive energy calculators including a pollution calculator, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Energy Calculator.
- For an electricity cost calculator to find monthly electricity costs, go to **www.mcgrawhill.ca/books/Se10** and follow the links to Electricity Cost Calculator.

8.3 Efficiency and Conservation

(page 170)

SUGGESTED TIMING

30–40 min including the Science
and Literacy Link
140 min for Find Out

BLACKLINE MASTERS

Assessment Master 1 Co-operative
Group Work Checklist
Assessment Master 2 Co-operative
Group Work Rubric
Assessment Master 15 Visual
Presentation Checklist
Assessment Master 16 Visual
Presentation Rubric

Specific Expectations

PEE2.01 – locate and select information from various sources to identify factors affecting generation and use of electricity

PEE2.04 – determine and record the electrical energy and power of electrical devices

PEE2.05 – communicate information using appropriate formats for specific purposes and audiences

PEE3.02 – design and implement a plan to reduce electrical consumption at home, at school, or in a workplace, based on identified consumption patterns

SIM3.04 – communicate science-related information to a workplace audience

Key Terms Teaching Strategies

Have students complete some or all of the following activities to help them learn and remember the key terms:

- Write definitions for these terms in their Science Log. You may wish to have your students keep their own glossary at the back of their Science Log.
- Take turns giving examples of how to save electric energy and classifying the examples as energy efficiency or energy conservation.

Help students remember the key terms by posting them on a science word wall or electricity bulletin board.

Reading Icon Answers (page 170)

1. Students should highlight:
 - a) use electric devices less
 - b) use energy-efficient electric devices
2. Answers may vary. For example:
 - Close windows and doors.
 - Turn down the heat.

- Close the fridge door.
- Turn off devices that no one is using, such as the electric fireplace, computer, television, radios, and lights.

Reading Icon Answers (page 171)

1. Answers will vary depending on students' homes and lifestyles.

Accommodations

- Pair ESL and LD Learners with students who have stronger language skills. Partners can take turns reading aloud the energy-saving tips.

Activity Planning Notes

Introduce the concepts of energy efficiency and energy conservation, and have students brainstorm some other examples from their own lives of each of these two ways to reduce consumption. Have them identify each example as either energy efficiency or energy conservation. Have students work in pairs to complete questions 3 and 4 on page 170.

Introduce the energy-saving tips on page 171 and have students complete the activity individually before discussing question 2 as a class. Students will refer to the energy-saving checklist in the Find Out activity.

Check Your Understanding Answers (page 170)

3. Look for one reasonable example of energy conservation. Sample answer:
 - Instead of playing video games, I could play soccer.
4. Look for one reasonable example of energy efficiency. Sample answer:
 - Instead of using high-wattage, regular light bulbs, I could use low-wattage light bulbs.

Check Your Understanding Answers (page 171)

2. Look for an “E” for the following lettered items: b), d), e), f), g), h), i), j), k), and l). Students might reasonably argue that e) and f) are examples of energy conservation because by keeping out heat or cold, a household can use the air conditioner or heating system less. However, these actions are typically considered examples of energy efficiency.

Find Out Activity (page 172)

Make a Home Energy Plan

Purpose

- Students develop a home energy plan based on improving energy efficiency and energy conservation.

Advance Preparation

WHEN TO BEGIN	WHAT TO DO
1 week before	<ul style="list-style-type: none">• Obtain copies of the EnerGuide Appliance Directory or book a computer lab with Internet access.
1 day before	<ul style="list-style-type: none">• Have students find EnerGuide ratings for four older electric appliances at home.

- Photocopy any assessment masters you decide to use.

APPARATUS	MATERIALS
<ul style="list-style-type: none">• print copies of EnerGuide Appliance Directory or computers with Internet access (1 per group)• will vary depending on format for presentations	<ul style="list-style-type: none">• will vary depending on format for presentations

Suggested Timing

140 min (15 min for introduction; 30 min for EnerGuide Appliance Directory; 95 min for completing activity)

Safety Precautions

- Remind students not to move heavy appliances to find EnerGuide labels.

Activity Planning Notes

Be sure that students understand the difference between energy efficiency and energy conservation and have completed the energy-saving checklist on page 171 before beginning the activity.

Introduce the activity at the end of class by reading steps 1 to 4 on page 172 as a class. For homework, have students find the EnerGuide ratings for four older appliances in their homes. They should record the data in the table under step 4 before the next class.

Begin the following class by ensuring everyone has the data they need. If students are missing data, they can use print copies of the EnerGuide Appliance Directory or look up ratings online after you read the directions for Part 2 on page 173 as a class. Students can work in small groups to complete Parts 1 and 2.

Write the following focus questions on the chalkboard:

- Are the appliances in your home energy efficient? Which ones should be replaced?
- How could you conserve electric energy more often?

Tell students to keep the focus questions in mind as they work on their own to complete question 6 on page 173.

Students can work in small groups to complete their presentations based on their individual responses to question 6. Remind them that everyone should contribute to the group's presentation. You might reinforce the importance of group work by having students review **Assessment 1 Co-operative Group Work**.

Provide students with **Assessment Master 15 Visual Presentation Checklist** and highlight the criteria for making an effective presentation.

Accommodations

- Provide EnerGuide ratings for students who have difficulties obtaining information from home.
- Some students may require assistance with making a plan and preparing a presentation. Pair students with complementary skills.

Technology Links

- To access the Energy Guide Appliance Directory online, go to www.mcgrawhill.ca/books/Se10 and follow the links to EnerGuide Appliance Directory.

Find Out Activity Answers (pages 172–173)

4. Answers will vary. Students should provide data for four appliances.
5. Answers will vary but should be based on tips from the energy-saving checklist on page 171 that students do not use at home.
6.
 - Look for up to four inefficient appliances that should be replaced based on energy efficiency scores of 2 or 3.
 - Look for three tips to conserve energy (based on answers to question 5).
 - Look for two benefits of reducing energy consumption such as:
 - reducing pollution or other impacts on the environment
 - reducing the likelihood of power outages
 - saving money on electric bills
7. Student presentations should include contributions from all group members and the ideas from question 6.
8. **a) and b)** Answers will vary.
9. **a)** Answers will vary. Students should note actions that target the greatest use or waste of electric energy at home.
b) Answers will vary. Accept any reasonable response such as:
 - reduce electric energy costs
 - help reduce environmental impact
 - help prevent power outages

Activity Wrap-up

- Provide time for students to present their work. Remind students that in order to answer question 8, they will need to listen carefully to the other groups.
- Have students work individually to complete questions 8 and 9 on page 173 before discussing the answers in a class discussion. You may wish to note students' suggestions on the chalkboard.

Ongoing Assessment

- Use the answers to questions 3 and 4 on page 170 and question 2 on page 171 to assess student understanding of energy efficiency and energy conservation.
- Assess the quality of group work during the Find Out activity using **Assessment Master 2 Co-operative Group Work Rubric**. Assess students' presentations using **Master 16 Visual Presentation Rubric**.

Alternative Activity

- Have students work in small groups and use the Internet to add to the list of energy-saving tips on page 171. Have each group add two tips to the list and classify each tip as an example of energy efficiency or energy conservation.

Technology Links

- For information on energy conservation and energy efficiency, go to www.mcgrawhill.ca/books/Se10 and follow the links to Energy Efficiency and Energy Conservation.

Chapter 8 Review (page 174)

SUGGESTED TIMING

75 min to complete and take-up the review, and then assign the Practice Test

BLACKLINE MASTERS

Master 5 Certificate
Master 6 List of Skills
BLM 8–5 Chapter 8 Practice Test
BLM 8–6 Chapter 8 Test
BLM 8–7 BLM Answers

Using the Chapter Review

Depending on your class, students should be able to work through the review at their own pace. In order to have success with the Chapter Review, some students may need to do it in chunks, by completing several questions and then taking them up before continuing. This process will prevent students from completing many questions incorrectly.

Some students may need to review the information about watts and kWh presented in Chapter 5. Students work with these terms throughout Chapter 8.

Once the review is completed and taken up, assign **BLM 8–5 Chapter 8 Practice Test** for students to answer individually. They may wish to use their completed review to help them.

Accommodations

- Allow students to make a chapter summary page of the key ideas/skills from the chapter. The back of the student resource provides space to do this. Alternatively, you might develop a chapter summary as an entire class.
- If students have difficulty with a particular review question, use the Review Guide to identify the section they need to review.
- **BLM 8–5 Chapter 8 Practice Test** can be customized to produce extra reinforcement questions.

Review Guide

Question	Section(s)	Refer to
1 to 2	8.1	EnerGuide Ratings (page 160)
3	8.2	Find Out: Energy Consumption at Home (page 164)
4	8.1	Comparing Our Choices (page 159)
5	8.3	Efficiency and Conservation (page 170)
6	8.2	At the Peak (page 169)
7	8.3	Efficiency and Conservation (page 170)
8 a)	8.1	EnerGuide Ratings (page 160)
8 b)	8.3	Efficiency and Conservation (page 170)
9	8.2	Find Out: Energy Consumption at Home (page 164)
10	8.1	Science and Math Link (page 162)
11	8.2	Electric Meters (page 166)
12	8.3	Efficiency and Conservation (page 170) Science and Literacy Link (page 171)

Summative Assessment

- Have students complete **BLM 8–6 Chapter 8 Test** to assess individual skills.
- You may wish to develop **Master 5 Certificate** to show students what they have learned during this chapter. Cut and paste the related skills from **Master 6 List of Skills**.

Chapter 8 Review Answers (pages 174–175)

1. c) EnerGuide rating
2. b) kWh
3. f) watt
4. g) energy consumption
5. d) energy efficiency
6. e) off-peak periods
7. a) energy conservation
8. a) Yes. The EnerGuide label shows that compared to similar models this clothes dryer uses less energy than most.
b) Look for one reasonable suggestion for each, such as:
 - energy conservation: hang clothes outside or use a drying rack
 - energy efficiency: use the dryer only when it is full
9. The higher the power rating for a TV, the more electric energy it will consume when it is on. Therefore, a TV with a high power rating will cost more to run than a TV with a low power rating.
10. a) dishwasher: (cost in ¢) $11.0¢/\text{kWh} \times 1026 \text{ kWh/year} = 11286¢$; (cost in dollars) $11286 \div 100 = \$112.86$
b) freezer: (cost in ¢) $11.0¢/\text{kWh} \times 376 \text{ kWh/year} = 4136¢$; (cost in dollars) $4136 \div 100 = \$41.36$
c) cooking range: (cost in ¢) $11.0¢/\text{kWh} \times 225 \text{ kWh/year} = 2475¢$; (cost in dollars) $2475 \div 100 = \$24.75$
11. Students may describe smart meter use or dial meter use.
 - Smart meter: Look up the readings online or check the readings by phone.
 - Dial meter: Take two readings over a given period of time, and then subtract the final reading from the initial reading.
12. a) Answers will vary. Look for one action. For example:
 - Put up a reminder note to turn off the light.
 - Connect the light to a motion-sensitive switch.b) Answers will vary. Look for one action. For example:
 - Replace the bright light bulb with an energy-efficient, low-wattage fluorescent light bulb.

Unit B Task: Design a School Energy Plan (pages 176–179)

SUGGESTED TIMING

2 class periods of 60–75 min each (includes introducing the task, completing the audit, brainstorming, choosing a project, and preparing a presentation)

30–40 min for Science and Media Link

MATERIALS

- markers
- presentation materials (e.g. poster paper, felt pens, video cameras)
- chart paper

BLACKLINE MASTERS

Master 2 Writing an Opinion Paragraph

BLM B–1 Power Rating Conversions

BLM B–2 Design a School Energy Plan

OHT B–16 School Energy Audit

OHT B–17 Reducing Energy Consumption

Assessment Master 1 Co-operative Group Work Checklist

Assessment Master 2 Co-operative Group Work Rubric

Assessment Master 15 Visual Presentation Checklist

Assessment Master 16 Visual Presentation Rubric

Specific Expectations

PEE2.01 – locate and select information from various sources to identify factors affecting generation and use of electricity

PEE2.05 – communicate information using appropriate formats for specific purposes and audiences

PEE3.01 – compare technologies used for generating electrical energy, including their social, economic, or environmental implications

PEE3.02 – design and implement a plan to reduce electrical consumption at home, at school, or in a workplace, based on identified consumption patterns

SIM1.01 – identify the ways in which scientific information is conveyed

SIM2.03 – interpret research data, including analysis for accuracy and bias as appropriate, using a range of strategies for reading for information

SIM3.04 – communicate science-related information to a workplace audience

Activity Planning Notes

In advance, decide how students will collect information for the home energy audit. You could conduct the audit as a class, or small groups could travel together to collect information for the entire table or one part of the table. Let other staff know when students will be coming by to conduct the energy audit.

As a class, read the task to get an overview. Use **OHT B–16 School Energy Audit** and complete the first two rows as a sample. Then have students complete the chart in their groups of three or four.

To complete the information on power ratings, students can record wattages or EnerGuide ratings in kWh/year. You may wish to have students convert power

Technology Links

- For a listing of typical power ratings of common appliances, go to www.mcgrawhill.ca/books/Se10 and follow the links to Power Ratings.
- To access the Energy Guide Appliance directory online, go to www.mcgrawhill.ca/books/Se10 and follow the links to EnerGuide Appliance Directory.

Accommodations

- If students need more room to record their ideas for the School Energy Plan, have them use **BLM B–2 Design a School Energy Plan**.
- If students have difficulties finding power ratings for the School Energy Audit, provide typical power ratings in watts or EnerGuide ratings from the EnerGuide Appliance Directory for students to use as estimates.
- Some students will need additional reinforcement to process the information and the instructions. Alternatively, such students could be paired with students who have stronger skills.
- Pair ESL and LD Learners with those who have stronger language skills to develop the presentations.
- If you have access to a computer lab, allow students to use clip art and graphics software packages to create their posters or pamphlets. The zoom feature on most photocopiers can be used to enlarge images to poster size.

Summative Assessment

- Students can use **Assessment Master 1 Co-operative Group Work Checklist** and **Assessment Master 15 Visual Presentation Checklist** for self-assessment of their work on the task.
- Assess students' energy audit charts and presentations. Consider using **Assessment Master 2 Co-operative Group Work Rubric** and **Assessment Master 16 Visual Presentation Rubric** to assess student work on the task.

ratings in W to kWh by dividing the W by 1000 and multiplying by the approximate number of hours the device is used in a given time. This is the same technique that was used on page 165 in Chapter 8 of the student resource. Students can use **BLM B–1 Power Rating Conversions** to complete these calculations. You may wish to adjust column F to “Energy Used per School Year” for devices that are not used on weekends or during summer. Students could multiply Column E (“Energy Used per Day”) by 295 days to account for holidays and weekends.

After completing the audit, as a class fill out the chart on **OHT B–16 School Energy Audit** for everyone to see.

Let students know how their energy plans will be evaluated. Have students work on their plans and share them with you before they begin working on their presentations. You could have a class brainstorming session using **OHT B–17 Reducing Energy Consumption**. If students are stuck, have them review the Energy-Saving Tips on page 171.

Explain that the presentations should be geared towards a workplace audience who might include the school principal or school board trustees. Remind students of the following criteria:

- Oral presentations should be no more than 5 minutes long.
- Each presentation should include at least three activities or devices that could be changed to reduce electric energy consumption.
- The explanation should note whether the proposed actions are ways to conserve energy or ways to improve energy efficiency.

Have student groups present their school energy plans. During the presentations, the audience could record the best ideas from the other groups.

After viewing each presentation, ask students to identify the type of media used. Ask how each presentation got its message across.

Wrap up with a class discussion on the best ideas to reduce energy consumption at school. You could record the final list on a poster. If possible, have students work with school staff to carry out their school energy plans.

Consider using the following blackline masters and overhead transparencies:

- **BLM B–1 Power Rating Conversions**
- **BLM B–2 Design a School Energy Plan**
- **OHT B–16 School Energy Audit**
- **OHT B–17 Reducing Energy Consumption**
- **Assessment Master 1 Co-operative Group Work Checklist**
- **Assessment Master 2 Co-operative Group Work Rubric**
- **Assessment Master 15 Visual Presentation Checklist**
- **Assessment Master 16 Visual Presentation Rubric**

Science and Media Link (page 179)

Do this activity either before or after students start the task. Introduce the activity by asking students how their municipality disposes of batteries.

As a class, read the Science and Media Link. Ask students why it might be useful to label batteries with disposal instructions. Ask how labels should appear in order to be effective. Should they draw attention with a title such as “**ATTENTION**” or “**WARNING**”? Should the labels be removable?

Have students discuss the advantages and disadvantages of using battery-disposal labels. Record their ideas on chart paper before assigning questions 1 and 2.

Have students complete question 3 using **Master 2 Writing an Opinion Paragraph**. You might ask students to share their responses in a class discussion.

Accommodations

- Pair ESL and LD Learners who need assistance with writing an opinion paragraph with those who can help. Alternatively, consider allowing students to present their opinions orally.

Making Connections Answers (page 179)

1. Students may answer YES or NO. Sample disposal instructions:

- **ATTENTION** This battery contains nickel-cadmium. **DO NOT** dispose in household garbage. Please take the battery to a recycling depot in your area.

2. Answers may vary. Students might argue that electric devices with batteries need not include battery disposal instructions, since it is up to the consumer to deal with the batteries and the

labelling is an unnecessary expense. Students might otherwise argue that people would find the labels useful and that labelling electric devices with battery disposal instructions would encourage recycling and help prevent toxic chemicals from ending up in landfill. Such labelling might also discourage some people from purchasing the devices.

3. Answers will vary. After outlining their opinion in the student resource, students should complete the sentence stems that are provided in **Master 2 Writing an Opinion Paragraph**.

Alternative Activity

- Have students design battery-disposal labels. They should work with a checklist of information to include on the labels, such as the type of battery (what chemicals it contains), whether or not it can be recycled, and whether it should be thrown away in household trash or taken to a hazardous waste depot. Students could draw their labels on blank paper or create labels with computer drawing programs.

Ongoing Assessment

- Use questions 1 and 2 on page 179 and student-designed labels to assess student understanding of the issues around battery disposal.
- Use students' opinion paragraphs to assess understanding of issues around battery use and disposal, as well as writing skills.

Technology Links

- For information from the Rechargeable Battery Recycling Corporation, go to www.mcgrawhill.ca/books/Se10 and follow the links to Batteries and Environmental Issues.
- For information on issues around battery disposal, go to www.mcgrawhill.ca/books/Se10 and follow the links to Batteries in the Garbage.