

00Watt Classroom Toolkit

Appendix to the Teacher's Guide

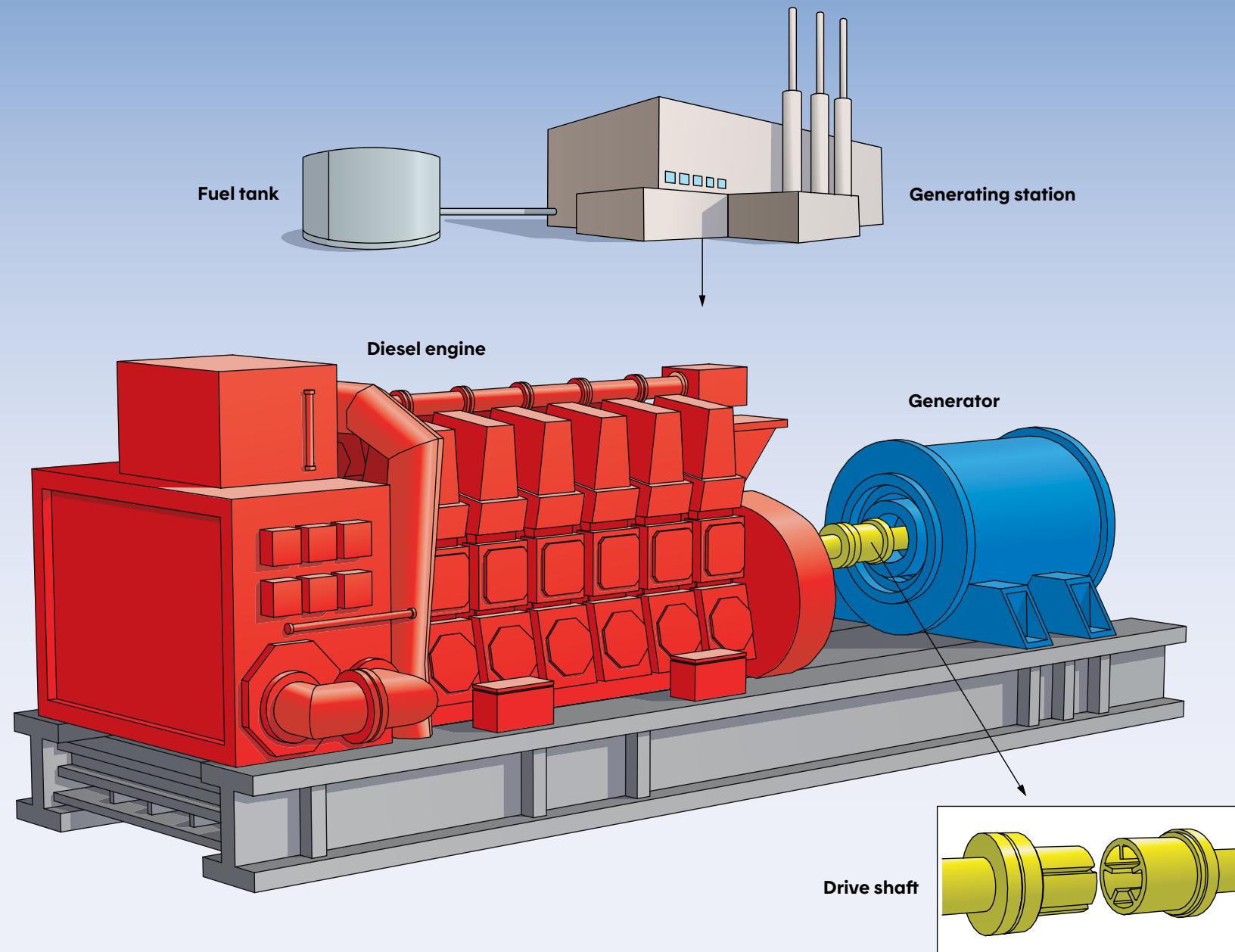
Activity 2.7

ENERGY
WISE

Hydro
Québec



Diesel-powered thermal plants





Length

30 minutes



Vocabulary

Activity 2.7

How a Thermal Generating Station Works

Diesel-Powered Stations

Goal of the Activity

Although hydroelectric generating stations produce most of the electricity in Québec, some communities are supplied by another type of generating station: diesel-powered thermal plants. Students living in these communities are invited to discover the characteristics of the facilities and the reasons for their use.

Materials Required

- 9 cards featuring:
 - the *Overview of Generating Facilities* map on the front;
 - the *Diesel-powered thermal plants* diagram on the back.

Steps

- Divide the class into teams of three or four students. The teams are not in competition with one another.
- Each team receives a card.
- Initiate the discussion by asking the students the questions set out in the following pages.
- After each question, teams have a few minutes to confer and come up with an answer.
- Each team presents its answer. Write the answers on the board, comment on them as required and confirm the right answer.
- Explain the vocabulary as required.





Link with the QEP

Science and Technology

Questions and Answers

Q1. Approximately 97% of the electricity produced in Québec comes from hydroelectric generating stations. Do hydroelectric facilities supply power to our community?

A1. No. A number of communities such as ours are not connected to Hydro-Québec's main grid. Instead, they are connected to a local system that distributes power generated by means other than the force of water.

Q2. Can you name any other communities that are not connected to Hydro-Québec's main grid? (see map.)

A2. Nunavik, Golfe-du-Saint-Laurent, Haute-Mauricie, Îles-de-la-Madeleine and Île-d'Anticosti.

Q3. With reference to the digital game *An Adventure Right down the Line!* (Activity 2.4), what steps would have to be taken to connect our community to Hydro-Québec's main grid?

A3. Connecting our community to the main grid would involve building a power transmission line to our community and linking it, through a transformer substation, to the existing distribution system. Substantial investments would be required to install the new facilities, lines and transformer substations.

Q4. Why do you think communities such as ours are not connected to the main grid?
Hint: There are two main reasons.

A4. Because of (1) their small population and (2) their distance from the main grid. It would be much too costly.

Communities like ours could be supplied by a hydroelectric facility if they were located close to a high-flow river that lent itself to the construction of a reservoir and could meet the power needs of the population. However, most of these communities do not have a suitable river nearby.

In the few places where such a river exists, studies have shown that the construction of a hydroelectric generating station would not be technically or economically feasible, or, in cases where it would be, a majority of residents don't support such a project.

Explanation





Note

Spark your students' curiosity!

Q5. So how can off-grid communities enjoy the benefits of electricity, just like other Quebecers?

A5. Power must be produced locally. Diesel generating stations provide the most efficient, least costly and most reliable solution. They generate electricity using fossil fuels.

Q6. What are fossil fuels?

A6. Fossil fuels are energy sources produced by the decomposition of organic matter (trees, plants and animals). They are typically found deep in the ground and are non-renewable, unlike water, wind and sun.

Q7. What are some examples of fossil fuels?

A7. Coal, natural gas and crude oil (petroleum), as well as petroleum derivatives: gasoline, fuel oil and diesel.

Q8. Referring to the illustration of a diesel-powered thermal plant, can you guess how it works?

A8. The main steps to generate electricity in a diesel-powered thermal plant are as follows:

- The fuel extracted from the ground is refined (rid of its impurities), transported by boat or truck and stored in giant tanks near the plant.
- This type of plant does not have a turbine. Instead, a diesel engine, which runs on the fuel, drives a generator to produce electricity.

Note

For more information on the different types of thermal generating stations, visit hydroquebec.com/learning/autres-sources/fossile.html



Q9. In your opinion, what are the **advantages** of diesel generating stations?

A9. Advantages

- They supply power to communities that are too isolated or too remote to be connected to the main grid.
- They meet all the power needs of the community for less than the cost of connecting it to the main grid.
- They provide a stable power supply at all times, which is not the case for wind farms.

Q10. What are the **disadvantages** of diesel generating stations?

A10. Disadvantages

- Unlike water, wind and sun, fossil fuels are non-renewable resources.
- Producing energy from fossil fuels has negative impacts on the environment. It contributes to greenhouse gas (GHG) emissions, global warming, as well as air and water pollution.

Q11. What do you think could be done to reduce pollutant emissions?

A11.

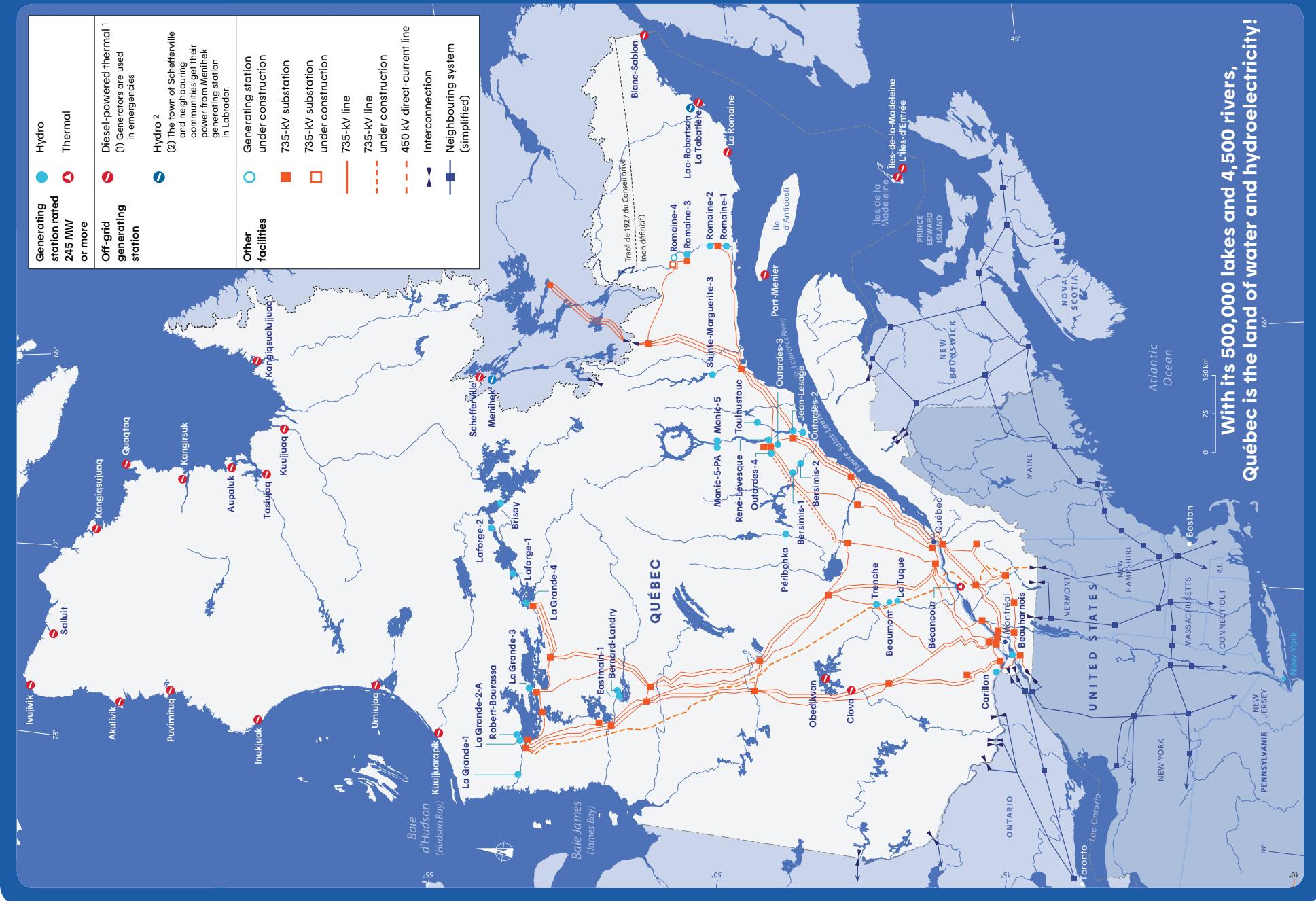
- Heat homes with fuel oil rather than using electricity produced by a thermal generating station. To heat a home, an oil furnace uses half the amount of fuel that a thermal plant uses to produce enough electricity for the same purpose.
- Pair wind turbines with diesel power to generate the same quantity of electricity with less fossil fuel. In some communities, like Îles-de-la-Madeleine, the strong, stable winds could produce electricity 30% of the time.
- Use less electricity at home! ●

Knowledge is power

To reduce pollutant emissions, Hydro-Québec keeps fuel use to a minimum. For example, the new thermal generating station in Kuujjuaq is equipped with diesel engines that partly operate on electronically injected fuel, to boost efficiency and reduce diesel consumption.



Overview of Generating Facilities



Hydro-Québec

Coordinated by Communication marketing
for Direction – Programmes commerciaux, expertise énergétique et affaires réglementaires
978-2-550-89621-0

June 2021

Ce document est également publié en français.

