

The Atomic Age in Canada

What impact has the introduction of nuclear power generation had on Canada over the past 50 years?



overview

LESSON CONTEXT

On June 4, 1962, the NPD nuclear reactor in Chalk River, Ontario delivered the first nuclear-generated electricity to a Canadian electrical grid. Today, nuclear energy produces approximately 15% of Canada's electricity needs and nuclear material produced in reactors is used in a wide range of medical and industrial applications.

LEARNING GOALS

- Analyze from a variety of perspectives the risks and benefits to society and the environment of applying scientific knowledge or introducing a technology.
- Synthesize information from multiple sources or from complex and lengthy texts.
- Evaluate evidence and consider alternative perspectives, ideas and explanations.

LEARNING ACTIVITIES

In this lesson, students will explore, analyze and evaluate the impact of nuclear energy on various aspects of Canadian society through the use of the consequence map instructional strategy.

BIG IDEAS

The development of nuclear technology has had a significant economic, environmental, political, scientific, social and technological impact on Canada.

assessment & evaluation

PRIOR KNOWLEDGE AND SKILLS

- Experience locating legitimate information using internet sources
- Experience working in cooperative small groups
- Have students read background information on the Canadian nuclear industry (see Background Information section)

SUCCESS CRITERIA

- Students participate in group discussions
- Student consequence maps include appropriate and relevant information
- Students work effectively in small groups

ASSESSMENT STRATEGIES

- Review of **Student Self-Assessment BLM**



time

90-105

MINUTES PLUS TIME
OUTSIDE OF CLASS



subjects

PHYSICS
SCIENCE








ENVIRONMENTAL SCIENCE
TECHNOLOGY
HISTORY
SOCIAL STUDIES



skills

CRITICAL THINKING
COLLABORATION
COMMUNICATION

resources & materials required

-   **BLM – Consequence Map Rubric** – one per student
-   **BLM – Consequence Map Worksheet** – one per student
-   **BLM – Student Self-Assessment** – one per student
-  Curriculum alignment

- Electronic device with internet access
- Computer and LCD projector, interactive whiteboard, blackboard or chart paper

minds-on

 20–30 MINUTES

- Introduce the students to some of the more extreme predictions of the future made by nuclear power advocates and futurists related to nuclear power in the 1950s [see the Background Information section for some examples – nuclear-powered aircraft, locomotives, automobiles, etc. Selected pages from [The Atomic Revolution comic book](#), published in 1957 and also found in the Background Information section, could provide good reading for the students or display on an interactive whiteboard or LCD projector].
- Discuss with the class the feasibility of some of these potential applications of nuclear technology, including benefits and hazards related to them. Have any of these technologies been adopted? Should they be?
- Introduce the concept of a consequence map as a focused type of brainstorming. Pose the key question, “What impact has the introduction of nuclear power generation had on Canada over the past 50 years?”
- Have students THINK individually about some of the effects that the nuclear power industry has had on Canada over the past 50 years, then PAIR with another student and SHARE their ideas.

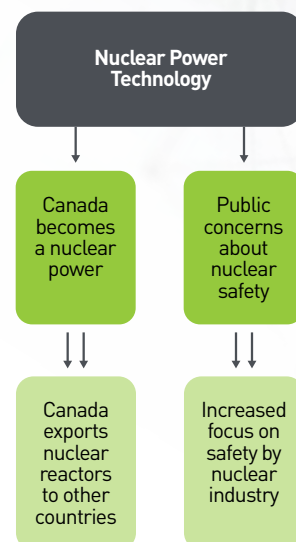
IMPLEMENTATION OPTION

- Have the students read the [Research reactors](#) page of the Canadian Nuclear Association website before or after the THINK-PAIR-SHARE activity.

action

 45 MINUTES PLUS RESEARCH TIME OUTSIDE CLASS

- Begin creating the consequence map by writing the words “Nuclear Power” in an oval in the centre of the consequence map.
- Brainstorm with the students the primary (direct) consequences and add them to the consequence map. Encourage the students to think in broad terms – such as economic, environmental, political, scientific, social and technological consequences.
- Once a number of primary consequences have been written, choose one to develop further by considering the secondary and tertiary consequences that result from that primary consequence.
- After the consequences have been recorded, analyze each one and determine, as a class, whether the consequence is positive or negative in its impact. Discuss the justifications for these classifications.



SMALL GROUP

 20 MINUTES PLUS RESEARCH TIME OUTSIDE CLASS

- Divide the class into small groups. Assign each group a primary consequence for which they must think of secondary and tertiary consequences.
- Provide students with the **Consequence Map Rubric BLM** and the **Consequence Map Worksheet BLM** at this point.
- Students can research these consequences outside of class time and then present their consequences to the class. Groups will research the secondary and tertiary consequences of the primary consequence that they were assigned (see Background Information and the **Consequence Map Worksheet BLM** for some suggested resources; please note that this is not intended as an exhaustive list).
- Once the consequences have been listed, the students will analyze them and classify them as positive or negative. Justifications must be provided for their classifications and should be recorded in their notebooks.
- Groups will take turns presenting their secondary, tertiary and possible further consequences of the primary consequence that they researched, along with their analysis of the net benefit of those consequences.
- After each group's presentation, the class will discuss the consequences, suggesting alternative consequences and discussing the positive/negative analysis of the consequences.
- After all of the presentations have been completed, have the groups make any desired changes to their consequence maps. Once all of the desired modifications have been made to each group's consequence map, make a consolidated consequence map poster with all of the group's analyses on it.
- Finally, have the students reflect on whether, looked upon as a whole, they believe that nuclear power has been a net benefit to Canadian society, and whether they would support further expansion of nuclear power in Canada.



WHAT IS A CONSEQUENCE MAP?

A consequence map is a graphic organizer that requires students to think about the potential long-term impacts of a real or imaginary event, issue, problem, trend or developing technology. Consequence mapping encourages deeper thinking about interrelationships and cause and effect.

IMPLEMENTATION OPTION

- Extend the consequence map into the future – have the students predict the effects that an expanded nuclear power program would have on Canada over the next 50 years.

additional resources

CANADIAN NUCLEAR ASSOCIATION WEB PAGES

- [Economic costs](#)
- [Economic benefits](#)
- [Uranium mining](#)
- [Uranium processing](#)
- [How reactors work](#)
- [Types of reactors](#)
- [CANDU technology](#)
- [Research reactors](#)
- [Waste production](#)
- [Storage solutions](#)
- [Long-term disposal](#)
- [Climate change](#)
- [Life-cycle emissions](#)

RELATED TEACHNUCLEAR LESSON PLANS

- **Picture This: Scientists on Stamps**

background information

[Retrieved August 2019]

FOR LESSON INTRODUCTION

- **The Atomic Automobile – Damn Interesting**

An illustrated article on Ford's Nucleon, nuclear-powered car concept from 1959, including a discussion of the pros and cons on the concept of the nuclear-powered car.

- **The Atomic Revolution comic book**

This comic book, produced in 1957, is a fascinating glimpse into the optimism of the early years of the Atomic Age. All 24 pages of the comic are available as hi-resolution JPEGs on this site.

- **Resuscitating the Atomic Airplane: Flying on a Wing and an Isotope – Scientific American**

An illustrated article on the history of the Aircraft Nuclear Propulsion program from the 1950s, as well as discussion on the pros and cons of nuclear-powered aircraft.

- **Atomic Planes Are Closer Than You Think – Mechanics Illustrated**

This vintage article from August 1955 examines the likelihood that nuclear powered planes were in the near future. A host of other illustrated articles about atomic energy can be found by searching the word "Atomic" on the website.

FOR STUDENT RESEARCH

- **Canada's Nuclear History Chronology – Canadian Nuclear Society**

A comprehensive timeline of nuclear energy in Canada with references to global developments as well.

- **The Canadian Nuclear Industry and its Economic Contributions – Natural Resources Canada, Government of Canada**

Statistics on the nuclear industry's impact on the Canadian economy.

- **The 'National Research Universal' reactor – CBC**

CBC digital archives highlights an early video about the National Research Universal (NRU) reactor in Chalk River, ON.

- **Economic Impact in Northern Saskatchewan – Cameco**

Statistics on how the uranium mining industry currently impacts Saskatchewan's economy.