



ENERGY MIX FOR THE FUTURE

SNC1W



Big Ideas

The production and consumption of electrical energy has social, economic and environmental impacts that can be addressed through sustainable practices.





MINDS ON

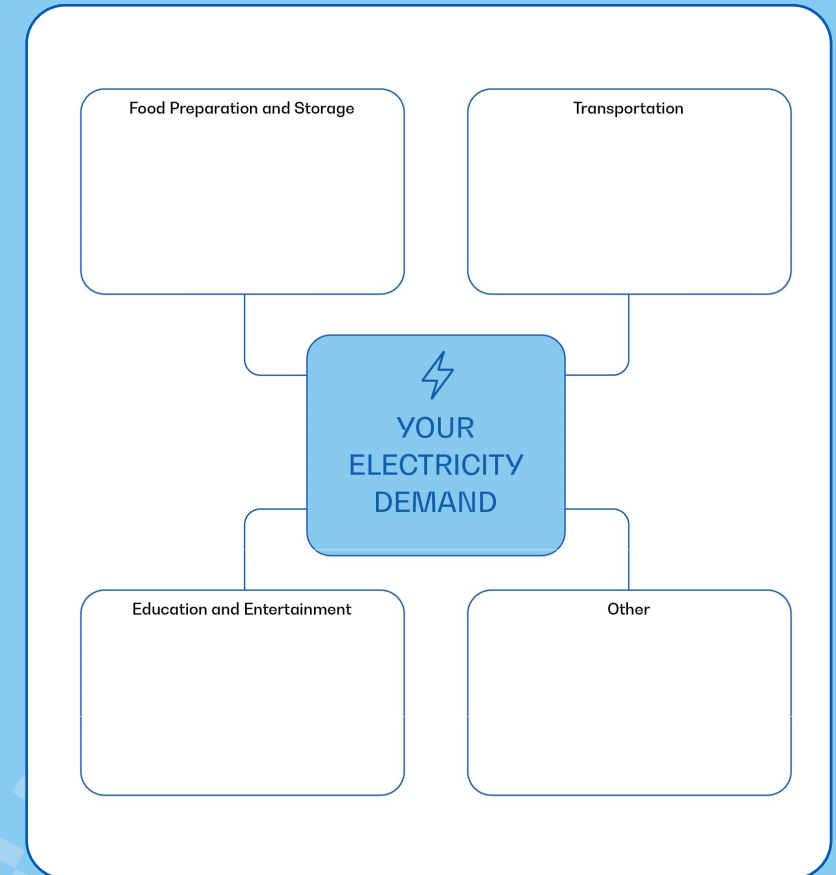
Your Electricity Demand
Today and Beyond



WARM UP: Your Electricity Demand

What electrical devices do you use daily?

1. Make a list of all the electrical devices and technologies that you use in a day.
2. Cross out the devices that your parents used at your age.
3. Circle all the “new” devices and technology that have emerged in the last five years.

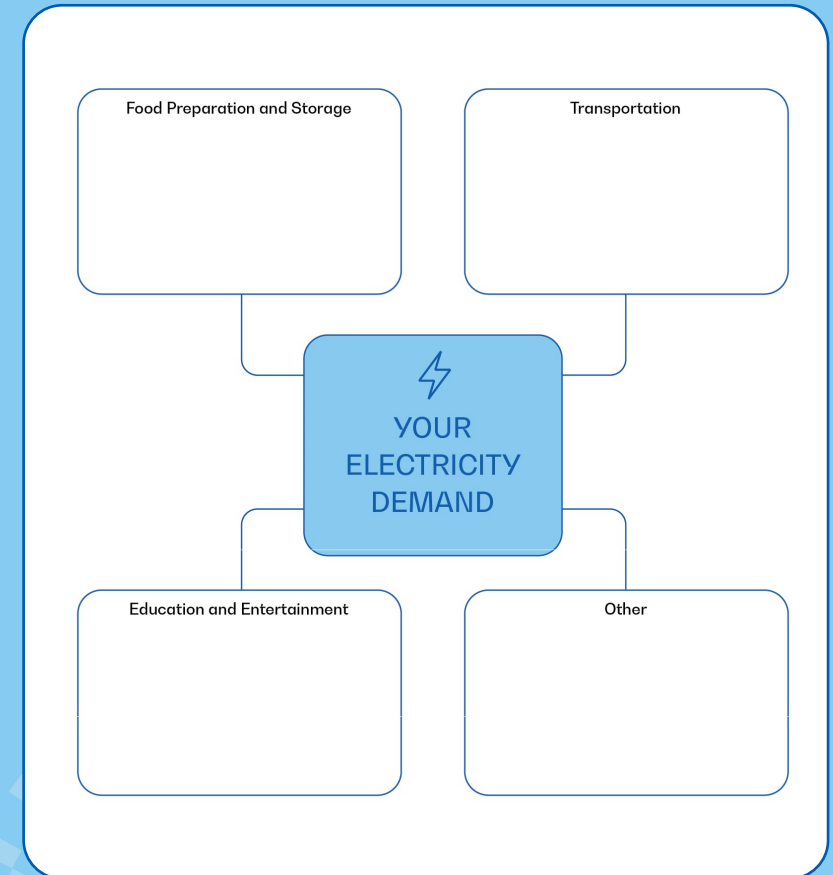


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The need for electricity changes as technology changes!





ACTION

The Future of Ontario's Energy Demand
Electricity Generation in Ontario
Energy Mix Activity



The Future of Ontario's Electricity Demand



Go to [WattNext.ca](https://wattnext.ca) and review “**Transforming our Energy System**” to complete the worksheet.

SNC1W LESSON 2 : ENERGY MIX FOR THE FUTURE



THE FUTURE OF ONTARIO'S ELECTRICITY DEMAND

Search WattNext.ca for “Transforming our Energy System”

Ontario's Population 	1. What was the population of Ontario in 2024? (Use the Population Growth graph.) 2. What is the predicted population of Ontario by 2047?
Agriculture 	Why does growing food in Ontario require electricity?
Industrial & Technological Developments 	1. Identify two uses of computational power that require a substantial amount of electricity. 2. How much more energy does the average AI query use compared to a standard search engine?
Electrification 	What does electrification mean? Transportation: Gasoline burning cars, trucks and buses are being replaced by

The Future of Ontario's Electricity Demand

It is expected that Ontario's demand for electricity could increase by 65% by 2050



The Future of Ontario's Electricity Demand

WHY A 65% INCREASE?

- **Population growth**
Ontario has **16 million** people today—over **21 million** are expected by 2050
- **Agriculture**
Growing more food in Ontario means more **greenhouse lighting**
- **Industrial and technological developments**
Increased computational energy requirements (e.g., **ChatGPT, cryptocurrency**)
- **Electrification**
Process of replacing fossil fuel technologies with technologies using clean electricity as an energy source
 - Industry replacing blast furnaces with electric **arc furnaces**
 - Transportation using more **electric vehicles**
 - Electric **heat pumps** replacing gas furnaces

FUN FACT

AI queries use **10 times** more energy than a traditional search engine!

Conservation: Part of the Solution

What can you do to help conserve electricity at home?



FUN FACT

Devices left in
standby mode make
up about 10% of a
home's electricity use.

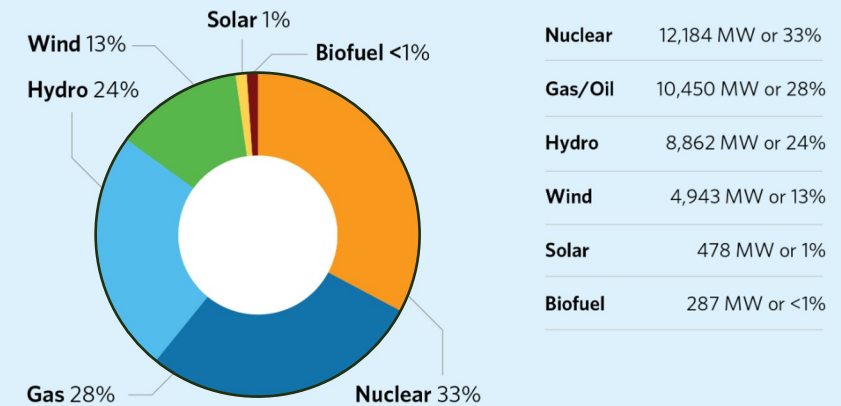
ONTARIO'S ENERGY MIX

Background Information

Where do we get our electricity?

- What source provides the largest portion of Ontario's electricity?
- Track Ontario's power grid by the hour!
Go to <https://gridwatch.ca/>

Ontario's Current Energy Mix



Transmission-Connected Capacity as of December 19, 2024 (Source: Reliability Outlook)

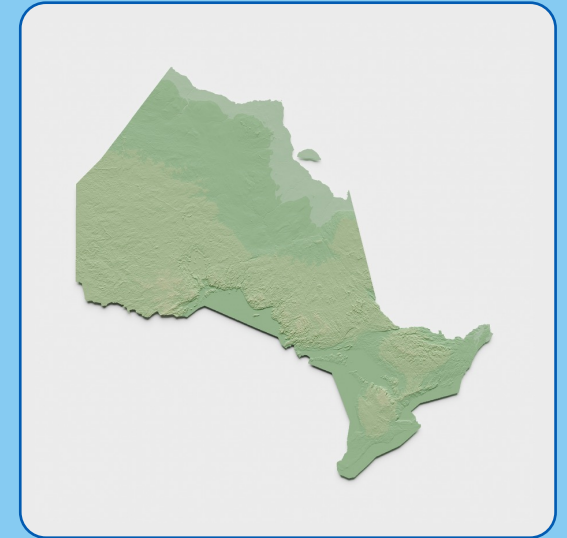
ONTARIO'S ENERGY MIX

Background Information

Why is it a Mix?

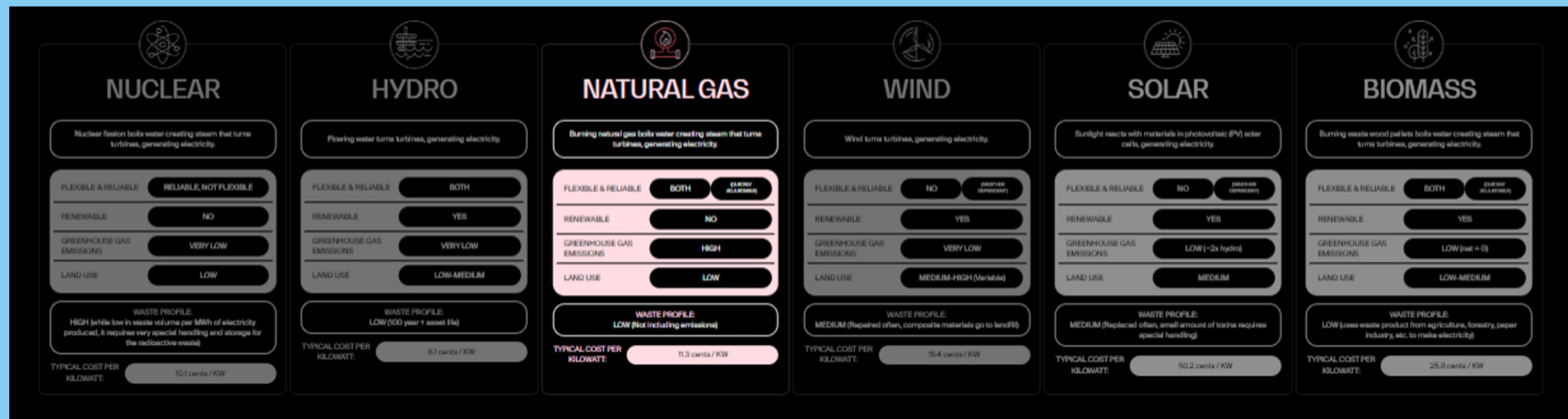
Which source of electricity generation we use depends on many factors including:

- Availability of natural resources (like fossil fuels)
- Local geology (Is there geothermal activity? Flowing water? Stable bedrock?)
- Weather or season (solar and wind energy availability changes)
- Adaptability to variable demand (like A/C use during hot days)
- Sustainability (e.g.: choosing renewable energy sources or those with lower greenhouse gas emissions)
- Cost



ENERGY MIX FOR THE FUTURE

- Currently, there is no perfect energy source.
- Each energy source has its advantages and disadvantages.
- Check out: WattNext.ca: <https://wattnext.ca/energy-source-characteristics/>
- Examine the “ENERGY SOURCE CARDS”



ENERGY MIX ACTIVITY

The Future of Power Generation in Ontario

Part 1: Characteristic Optimization

- Choose one characteristic.
- Decide which power sources you would use to get the **best result** (optimizing) for that characteristic.
- Consider how much of Ontario's electricity (as a percentage, if any) should come from each source.
- Must add up to 100%.
- Show your energy mix as a pie chart.
- Colour code your legend to identify each source in your pie chart.
- Repeat for two other characteristics.

SNCIW LESSON 2 : ENERGY MIX FOR THE FUTURE

ENERGY MIX ACTIVITY -
The Future of Power Generation in Ontario

FACT: Electricity use in Ontario is predicted to increase 65% by the year 2047. Ontario will need to generate more electricity to meet this demand.

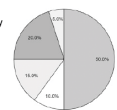
Energy generation methods vary greatly in their reliability, land use, waste, carbon emissions, etc.

HYDRO

Energy Cards summarize the information in seven characteristics. Use this information to choose the best energy sources for each situation.

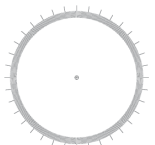
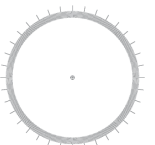
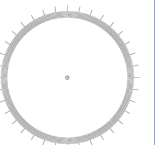
Represent your energy mix with a pie chart.

PIE CHART
A graph that divides a circle into pieces that represent percentages of a whole



PART 1: Characteristic Optimization

Make **individual pie charts** that optimize the energy generation mix for any three characteristics.

Optimizing Characteristic 1:	Optimizing Characteristic 2:	Optimizing Characteristic 3:
		
LEGEND ☐ Biomass ☐ Hydro ☐ Natural gas ☐ Nuclear ☐ Solar ☐ Wind		

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ENERGY MIX ACTIVITY

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Optimization:
Making the best or most efficient use of a resource

SNCIW LESSON 2: ENERGY MIX P

ENERGY MIX ACTIVITY

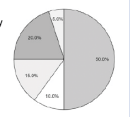
The Future of Power Generation in Ontario

FACT: Electricity use in Ontario is predicted to increase significantly by 2050. Energy generation methods vary greatly in their environmental impacts.

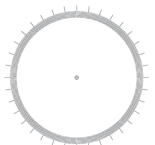
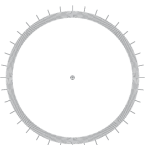
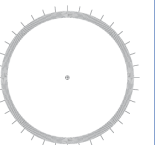
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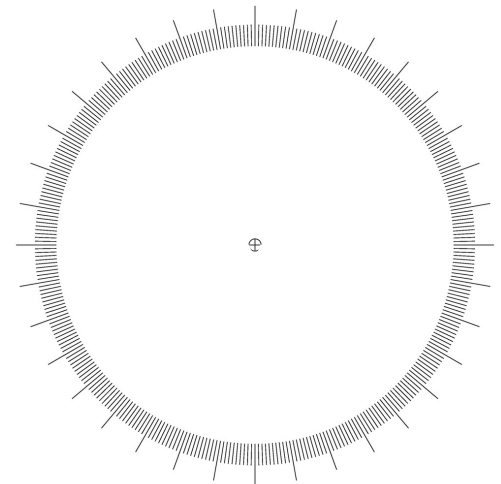
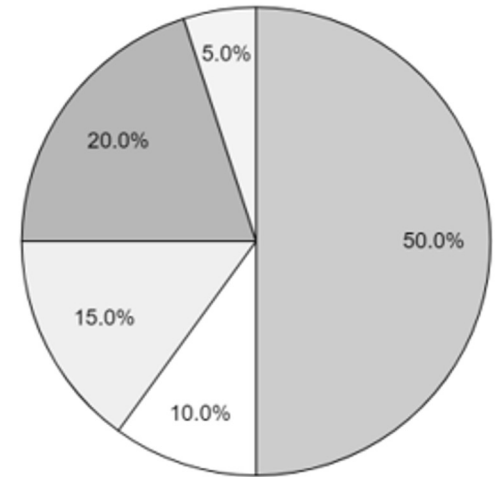
Pie Chart Instructions

- Every circle has 360°.
- The whole circle is 100%.
- For each percent you give an energy source, divide by 100 then multiply by 360°.

e.g.: nuclear power at 25%

$$\begin{aligned}\frac{25}{100} \times 360^\circ \\ = 0.25 \times 360^\circ \\ = 90^\circ\end{aligned}$$

- Each large tick mark represents 10° on the circle provided.



ENERGY MIX FOR THE FUTURE

PART 2: Develop a Plan of Action

- Rank from 1-7 what you think the priorities for Ontario should be for the year 2050. (Highest priority =1)
- Thinking of your top three priorities, how would you optimize Ontario's power mix to best meet these objectives? Create your 2050 Energy Mix!

SNCIW LESSON 2 : ENERGY MIX FOR THE FUTURE

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ENERGY MIX ACTIVITY - The Future of Power Generation in Ontario

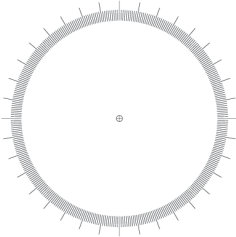
PART 2: Develop a plan of action to address Ontario's future electrical energy production needs

YEAR 2050 Electrical Energy Generation Priorities.

Rank the priorities from 1-7, with 1 being the most important.

flexibility	low greenhouse gas	low waste profile
reliability	emissions	low cost
renewable	low land use	

Choose your top three priorities as optimization criteria to create your energy generation mix for 2050.



☐ Biomass	LEGEND	☐ Solar
☐ Hydro	☐ Natural gas	☐ Wind
	☐ Nuclear	

Discussion Questions:

1. Explain why the energy mix changes depending on the characteristics chosen (examine your pie charts in Part 1)
2. Which characteristic was your top priority for energy generation in 2050? Why?
3. Find someone whose energy mix was different. What did they choose to prioritize and why?
4. Which source of energy generation do you believe should be reduced or phased out by 2050? Why?
5. Compare your 2050 energy mix with Ontario's current mix.



ENERGY MIX FOR THE FUTURE

PART 2: Develop a Plan of Action

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Share your 2050 Energy Mix with the class.
Prepare to defend your choices.

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ENERGY MIX ACTIVITY - The Future of Power Generation in Ontario

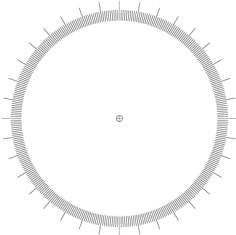
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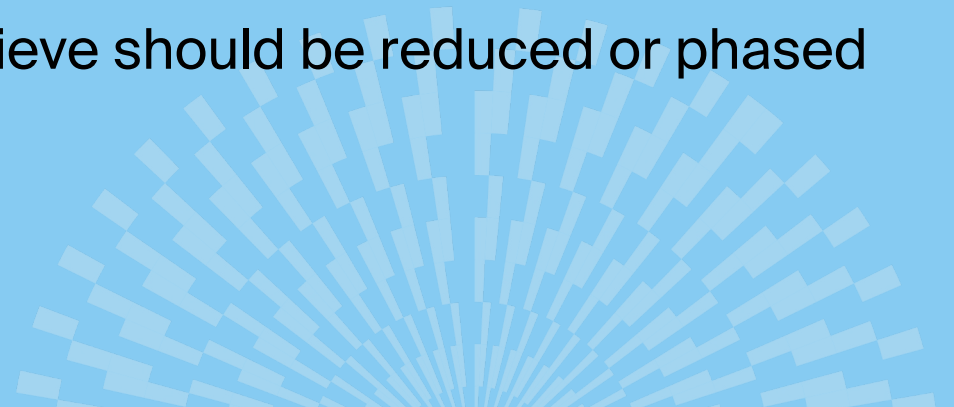
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2.
 - a. Which characteristic was your top priority for energy generation in 2050? Why?
 - b. Find someone who's energy mix was different than yours. What did they choose to prioritize and why?
3. Which source(s) of energy generation do you believe should be reduced or phased out by 2050? Why?



Consolidation/Extension:



Persuade the Government

- You are presenting to the **Ontario Ministry of Energy and Mines** about the future of Ontario's energy mix. Persuade the Ministry that your 2050 energy mix is right for the province.
- Justify your priorities and support your energy mix with facts.

Options:

1. Write a persuasive paragraph to support your Energy Mix.
2. Record a short video to explain your choices. Include your 2050 pie chart.
3. Create an animated slide (using Slides, PowerPoint or another appropriate program) to annotate your Energy Mix pie chart. Your reasons (in point form) should pop up when you click.

See rubric: 2.6 ENERGY MIX 2050 JUSTIFICATION Rubric