

TEACHER'S GUIDE



EXPLORING CANADA'S ENERGY FUTURE

A lesson plan for Canadian geography and science classes, grades 9 through 11

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Overview

ABOUT THIS RESOURCE

This guide has been created to support teachers in using the **Exploring Canada's Energy Future Interactive Tool** with their students available at www.neb-one.gc.ca/energyfuturesdata.

This interactive tool allows users to explore how possible energy futures might unfold for Canadians over the long term. This analysis is not a prediction of what will take place, nor does it aim to achieve certain goals like Canada's climate targets. Rather, Exploring Canada's Energy Future employs economic and energy models to make projections — based on a certain set of assumptions — given past and recent trends related to technology, energy and climate policies, human behaviour, and the structure of the economy. The activities were developed by Beyond the Blackboard Educational Consulting (<http://beyondblackboard.ca/services.html>) for the Ingenium and the National Energy Board.

What is the National Energy Board (NEB)?

The National Energy Board (NEB) — <http://www.neb-one.gc.ca/index-eng.html> — is an independent national energy regulator. Its role is to regulate, among other things, the construction, operation, and abandonment of pipelines that cross provincial or international borders, international power lines and designated interprovincial power lines. The NEB also regulates the imports of natural gas and exports of crude oil, natural gas liquids, natural gas, refined petroleum products, and electricity, as well as oil and gas exploration and production activities in certain areas. In addition, the NEB is charged with providing timely, accurate, and objective information and advice on energy matters.

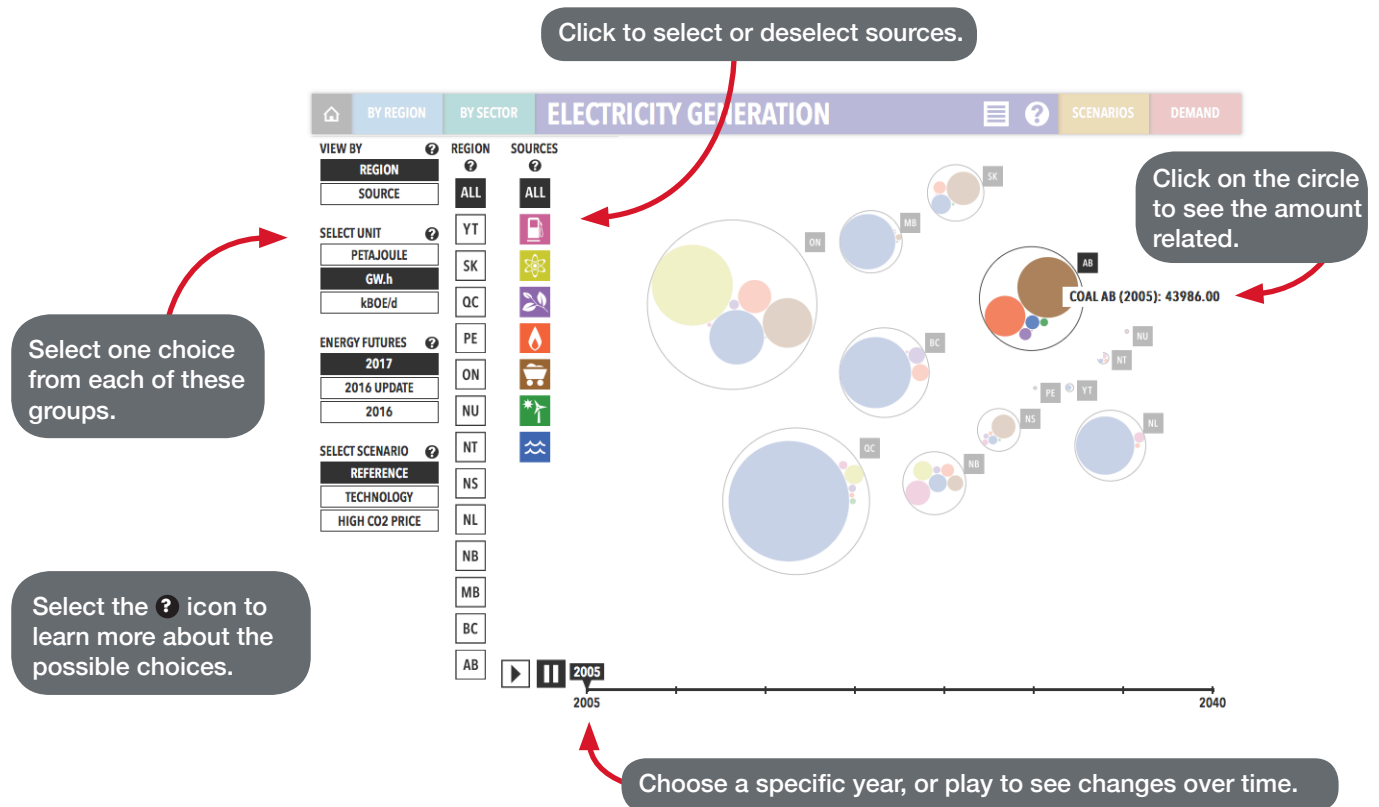
PEDAGOGICAL APPROACH

The activities in this guide have been designed to promote small group and whole class discussion on factors that affect energy consumption and production trends, anchored in evidence provided by the online tool. The development of media literacy skills has also been targeted by demonstrating how different stakeholders can use the information to support their own energy “stories.” As such, the guide seeks to highlight the nature of geographical thinking, which is more than memorizing facts and figures. Rather, students are asked to analyze elements of time, place, and energy through various economic, political, technological, cultural, and environmental lenses.



TIPS FOR USING THE VISUALIZATIONS

Take a few moments to show the students the salient features of the visualization, such as:



NAVIGATION: individual aspects can be selected (e.g. provinces/territories, sectors, energy sources, etc.) and, in some cases, the timeline can be manipulated to see how the story changes over time.

VARIED UNITS: when students are comparing one visualization to the next, they should ensure that the units are comparable (e.g. both should be in Petajoules or both in GW.h). Furthermore, they should pay attention to the variation in scale on the Y axis, such as k (kilo or 10^3), m (milli or 10^{-3}) and μ (micro or 10^{-6}).

SCENARIOS: discuss the importance of providing a reference case, as well as scenarios that account for technological innovation and policies such as carbon taxing. While there is always a reference case included, scenarios differ for each report. For instance, the scenarios from the 2017 report are:

The **Reference Case** provides a baseline outlook with a moderate view of energy prices and economic growth, and climate and energy policies announced at the time of analysis.

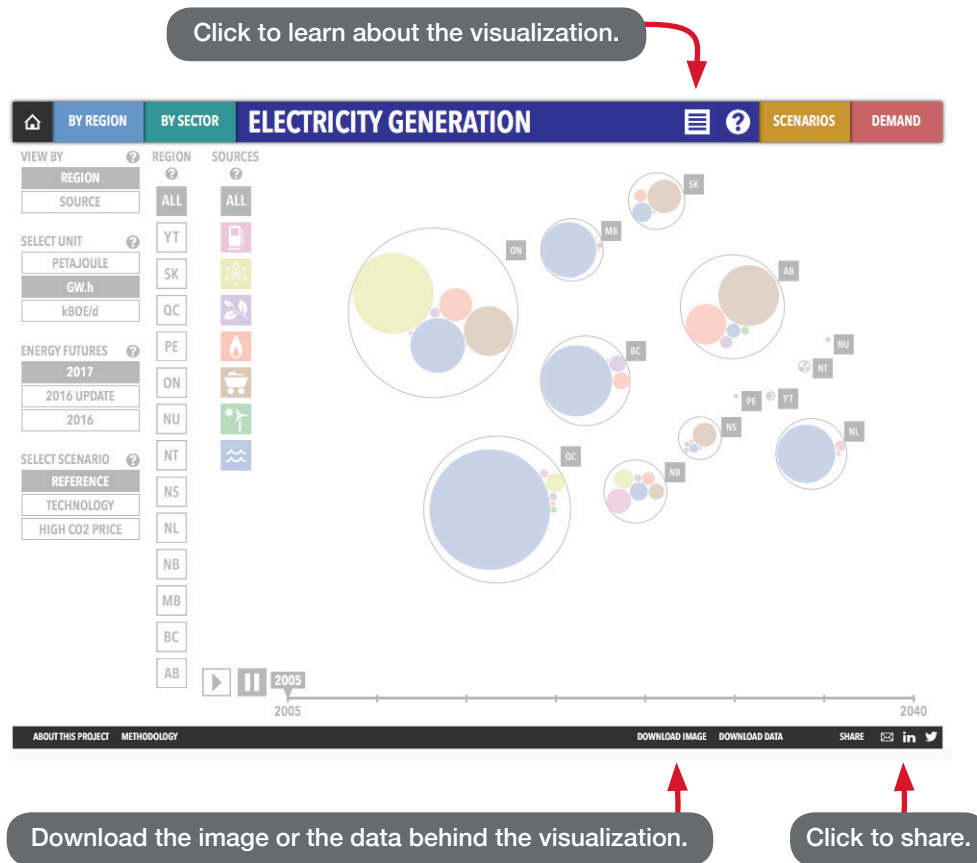
The **Technology Case** considers higher carbon prices than the Reference Case and greater adoption of select emerging production and consumption energy technologies.



TIPS FOR USING THE VISUALIZATIONS

The **Higher Carbon Price Case** explores the impact of higher carbon pricing than in the Reference Case in the longer term.

If a case is not specified in an activity, students should use the Reference Case.



EXPANDABLE GLOSSARIES: use the question marks above titles to display definitions and concepts.

DOWNLOADABLE DATA AND CHART IMAGES: data and chart images can be downloaded to manipulate in Excel or to paste into a document.

SHAREABLE LINKS: persistent links can be copied and pasted to display information combinations created by the students. Selecting the Twitter icon provides a short bit.ly link.



TIPS FOR USING THE VISUALIZATIONS

Recommended Resources

Canada's Energy Future (www.neb-one.gc.ca/nrg/ntgrtd/fttr/index-eng.html): This visualization is based on the NEB's flagship publication that outlines the key assumptions made in developing the models, as well as five key findings with respect to possible future trends.

Recent Climate Policy Developments (www.neb-one.gc.ca/nrg/ntgrtd/fttr/2017/ppndx-eng.html): This resource describes many recent climate policy developments — at both the provincial and federal levels — used in the analysis of Canada's Energy Future 2017.

Feature Article: Canadian innovations continue to shape the future of energy (www.neb-one.gc.ca/nrg/ntgrtd/mrkt/fttrtcl/2017-06-29cndnnnvtns-eng.html): This article provides interesting examples of technological innovations that could contribute to energy consumption and production trends, now and in the future.



ACTIVITY 1: CANADIAN ENERGY STORIES

OVERVIEW	Students look at the <i>Electricity Generation</i> visualization (bubbles) for a specific province/territory and attempt to make sense of the information they are seeing. Note that the data can be manipulated and viewed in a number of ways using the online tool. Note as well that ‘electricity generation’ refers to the energy being produced in the province and is different from the energy being consumed (see the province of PEI for example) Extension activities propose sample questions for exploring the <i>Energy Demand by Sector</i> and <i>Energy Demand by Region</i> visualizations.
LEARNING OUTCOMES	<ul style="list-style-type: none"> • Recognize that provinces and territories have different energy stories • Ability to manipulate NEB visualization tools to have the energy stories emerge
MATERIALS	<ul style="list-style-type: none"> • Student handout: Activity 1: Canadian Energy Stories • Computer access (One computer per two to three students)
NEB VISUALIZATION(S)	<ul style="list-style-type: none"> • Explore Electricity Generation (bubbles) http://bit.ly/2mBo6Db • Energy Demand by Sector (extension) http://bit.ly/2myqEEK • Energy Demand by Region (extension) http://bit.ly/2mBoYaV
WHAT TO DO	<ol style="list-style-type: none"> 1. Assign one province/territory per group of two or three students. 2. Ask students to explore the Electricity Generation visualization for their province/territory and answer the questions on the handout. (5–10 min) <ul style="list-style-type: none"> • What is happening? In a few lines, summarize your province or territory’s energy story. • What surprised you? What caught your attention? • Does changing the scenario (reference, technology, high CO₂ price) change the trajectory? How? • Does focusing on one energy source in particular change the story? How? Teacher tip: when all energy sources are shown at once, smaller energy productions such as renewables are not highlighted. By focusing on one energy source in particular, we are better able to see its trend. Example: Solar/Wind/Geothermal Electricity Generation http://bit.ly/2myU6Yq 3. Pair students from another province to further their analysis. Point out that provinces can be compared by selecting one or many provinces (5–10 min) 4. What are some similarities? Brainstorm some hypotheses to explain the similarities. 5. What are some differences? Brainstorm some hypotheses to explain the differences. 6. Are these trajectories etched in stone? Why or why not? TEACHER TIP: read the NEB’s Recent Climate Policy Developments (www.neb-one.gc.ca/nrg/ntgrtd/fttr/2017/ppndx-eng.html) and the feature article <i>Canadian innovations continue to shape the future of energy</i> (www.neb-one.gc.ca/nrg/ntgrtd/mrkt/fttrtcl/2017-06-29cndnnn-vtns-eng.html) to help support your students with their answers. 7. Students share their findings with the class. (2–3 min per province/territory).



HOMEWORK	<ul style="list-style-type: none"> • Ask students to research a question that arose during the activity (e.g. Why is coal not being phased out in Saskatchewan?). Provide a resource list to help them along. • Ask students to provide one fun fact about the energy demand or production in their province or territory for a bonus mark (provide the link to the province/territorial market snapshots).
EXTENSION ACTIVITIES	<ul style="list-style-type: none"> • Find another province/territory that has a similar trajectory to yours. Can you brainstorm reasons why this might be? TEACHER TIP: availability of resources, provincial climate policies, economic growth, and adoption of technological innovation may all influence trajectories. <p>ENERGY DEMAND BY SECTOR VISUALIZATION</p> <ul style="list-style-type: none"> • Take a look at the Energy Demand by Sector visualization. Does focusing on one sector in particular (residential, commercial, industrial, manufacturing) change the story? • Does focusing on one energy source in particular change the story? Teacher tip: when all energy sources are shown at once, smaller energy productions such as renewables are not highlighted. By focusing on one energy source in particular, we are better able to see its trend. Example: Solar/Wind/Geothermal Electricity Generation in Ontario: http://bit.ly/2mwsDGV • Which sector uses the most oil products? In Canada, transportation is the most heavily reliant on oil. In fact, Canada is the third-largest consumer of oil per person among the world's most economically-advanced countries. • Why would Canada consume more oil than most other countries? The transportation sector accounts for 60% of Canadian oil demand. The relatively sparse population, number of vehicles on the road, and the long distances across which people and goods must be transported may explain Canada's relatively high transportation fuel consumption per capita. <p>ENERGY DEMAND BY REGION VISUALIZATION</p> <ul style="list-style-type: none"> • Think about energy demand in your province or territory. Would you expect energy demand to increase, decrease, or stay the same over time? <i>Students may suggest that it will increase with an increase in population.</i> • Take a look at the Energy Demand by Region visualization. Does the trend correspond with what you were thinking? Is a province's energy demand always proportional to its population? TIP: Find the province/territory populations on the Statistics Canada website. • Can you provide hypotheses for why energy demands may decrease or stabilize, even though the population is increasing? <i>Energy demand in Canada may peak and start a decline within the next 40 years. The overall decrease in demand is primarily due to conservation efforts, improvements in energy efficiency (e.g. light bulbs such as LED which use up to 85% less energy thanks to LED and CFL technologies, appliances such as refrigerators and freezers, which comprise up to 12% of household energy use, have also become more energy efficient both at the residential and industrial levels). Energy demand will depend on policies such as climate change targets, environmental regulations, electric vehicle subsidies, and carbon taxing.</i>



REFERENCE MATERIALS FOR STUDENTS	<ul style="list-style-type: none">• Canada's Energy Future 2016: Province and Territory Outlooks• Provincial and Territorial Energy Profiles
PORTALS TO GEOGRAPHICAL THINKING	<ul style="list-style-type: none">• spatial significance• patterns and trends• interrelationships• geographical perspective• evidence and interpretation



Team members: _____

Assigned province/territory: _____ Date: _____

WHAT TO DO?

1. Open the Exploring Canada's Energy Future Electricity Generation visualization (<http://bit.ly/2mBo6Db>).
2. Select only your province or territory.
3. Scroll along the timeline to see your province or territory's energy story emerge. Then discuss the following questions:

What is happening? In a few lines, summarize your province or territory's energy story.

What surprised you? What caught your attention?

Was there a moment in time where things started to change?

Does changing the scenario (reference, technology, high CO₂ price) change the trajectory? How?

4. Pair up with students from another province or territory and compare your analyses.

What are some similarities? Brainstorm some hypotheses to explain the similarities.

Possible reasons: _____

What are some differences? Brainstorm some hypotheses to explain the differences.

Province/Territory: _____ Province/Territory: _____

Possible reasons: _____

Are these trajectories guaranteed? Why or why not?

ACTIVITY 2: ENERGY FACT SLEUTHS

OVERVIEW	Students use the NEB visualizations to support or refute the statements made about energy demand and production in Canadian provinces and territories.
LEARNING OUTCOMES	<ul style="list-style-type: none"> • Identify the information available through the NEB visualization tool • Manipulate the visualization tool to find evidence that supports their claim • Employ media literacy skills to determine fact from fiction
MATERIALS	<ul style="list-style-type: none"> • Slides template (access to the same document for all of the teams) with provincial/territory statements • Computer access (easier to manipulate on computers/laptops than on tablets) • Projector
NEB VISUALIZATION(S)	<ul style="list-style-type: none"> • All may be used
WHAT TO DO	<ol style="list-style-type: none"> 1. Download the slides template and upload to a file-sharing platform, such as Google Slides or Microsoft Office 365 (this will make it easier for students to present their findings). 2. Demo the activity with the example slide on the overhead projector. Point out the 'Twitter' button to shorten the link when embedding it in the presentation. Point out the 'Download Image' button so that they can include a snapshot of their file. Remind them that they can use any visualization, or a combination of visualizations to make their argument. (5 min) 3. Assign one province or territory per group of two or three students (total: 14 groups). Each slide contains true and false statements regarding energy in a specific province or territory. Teacher tip: snapshots have been rated on a scale of one (easiest) to three (challenging) to enable task differentiation. 4. Students read through short market snapshots for their assigned province/territory, then use the NEB data visualizations to prove or refute the statement. (20 min) 5. Students copy the URL link for their evidence and paste it under the relevant statement. The students should all be working simultaneously on the same document. Teacher tip: although sample visualizations have been provided in the key to support or refute the statement, students may manipulate the tool differently to come up with similar conclusions. 6. Students present their work to the class using a single Google Slides document. (20 min) <p>TEACHER TIP: the links provided in the table below are for your information. Many of the links would provide students with the answer without having to manipulate data.</p>
PORTALS FOR GEOGRAPHICAL THINKING	<ul style="list-style-type: none"> • Spatial significance • Patterns and trends • Interrelationships • Geographical perspective • Evidence and interpretation



ACTIVITY 2: ENERGY FACT SLEUTHS – TEACHER KEY

LEV-EL	PROV	STATEMENT	TRUE/ FALSE	VISUALIZATION
2	AB	In 2038, BC and Alberta will have similar population totals. Their total energy demand will therefore be very similar.	F	BC Population 2038 https://apps.neb-one.gc.ca/ftppndc/dflt.aspx?GoC-TemplateCulture=en-CA and AB Population 2038 https://apps.neb-one.gc.ca/ftppndc/dflt.aspx?GoC-TemplateCulture=en-CA and Total Energy Demand 2038 http://bit.ly/2A5UaZm
2	AB	In 2018, about 90% of electricity in Alberta is produced from fossil fuels.	T	Electricity generation Alberta 2018: https://bit.ly/2A4pHZA See Provincial and Territorial Energy Profiles - Alberta https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmp-rls/ab-eng.html
1	BC	BC is expected to produce more electricity from renewables than from natural gas and oil combined during the entire projection.	T	Electricity generation BC 2030 https://bit.ly/2PtDVsj See Canada's Energy Future 2016: Province and Territory Outlooks https://www.neb-one.gc.ca/nrg/ntgrtd/fttr/2016pt/k-fndngs-prvnc-trtr-eng.html
2	BC	BC is expected to be the province with the highest demand for electricity in transportation by 2040.	F	Energy demand by Sector http://bit.ly/2v22oMq Correct answer: QC and ON expected to have approximately three times more electricity demand than BC in the transportation sector.
1	MB	Manitoba is one of the top producers of natural gas in Canada.	F	Natural gas production MB https://bit.ly/2Ef7D32 Correct answer: Manitoba does not produce natural gas.
2	MB	Renewable electricity generation in MB is projected to take up a larger share of the total generation mix in 2040 compared to 2016.	T	Electricity Generation MB (2016 and 2040) http://bit.ly/2A0UAjK See Canada's Energy Future 2016: Province and Territory Outlooks https://www.neb-one.gc.ca/nrg/ntgrtd/fttr/2016pt/k-fndngs-prvnc-trtr-eng.html
1	NB	Most of New Brunswick's electricity is expected to be generated by nuclear by 2040.	T	Electricity Generation NB (2040) http://bit.ly/2A33NrD



ACTIVITY 2: ENERGY FACT SLEUTHS – TEACHER KEY

LEV-EL	PROV	STATEMENT	TRUE/ FALSE	VISUALIZATION
2	NB	Generation from solar/wind/geothermal power in New Brunswick is projected to increase from none in 2005 to approximately 5% of total generation in 2040.	F	Electricity Generation NB (2005 and 2040) http://bit.ly/2A33NrD Hint: Click the “Download data” along the bottom to easily calculate the percentage. Correct answer: it is projected to increase to approximately 15% of total generation by 2040. See Provincial and Territorial Energy Profiles – New Brunswick https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmpfrls/nb-eng.html
1	NL	Newfoundland and Labrador generate approximately 95% of their electricity from hydro sources in 2018. It is projected to produce even more electricity from hydro resources in 2040.	T	Electricity Generation NL (2018 and 2040) http://bit.ly/2A4Dy44
1	NL	In 2015, the largest sector for energy demand in Newfoundland and Labrador was industrial. In 2040, the NEB projections show residential will be the largest sector for energy demand.	F	Energy Demand by Sector NL (industrial and residential) http://bit.ly/2uVrRaf Correct answer: It will still be industrial. See Provincial and Territorial Energy Profiles – Newfoundland and Labrador https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmpfrls/nl-eng.html
1	NS	Although coal was the main source of electricity generation in 2005, hydro is expected to take the lead by 2040.	F	Electricity Generation NS (2005 and 2040) http://bit.ly/2A5iJFF Correct answer: Natural gas is expected to take the lead by 2040.
2	NS	Nova Scotia currently produces natural gas, but is expected to stop producing over the projection period.	T	Gas Production NS http://bit.ly/2oVku5Y



ACTIVITY 2: ENERGY FACT SLEUTHS – TEACHER KEY

LEV-EL	PROV	STATEMENT	TRUE/ FALSE	VISUALIZATION
3	NU	Almost all of Nunavut's electricity is generated from importing diesel fuel.	T	<p>Oil Production NU</p> <p>https://bit.ly/2CBRqDh</p> <p>and</p> <p>Total demand NU:</p> <p>http://bit.ly/2uYA6IU</p> <p>and</p> <p>Total Electricity Generation NU:</p> <p>http://bit.ly/2v0EsJ5</p> <p>Note: "Total electricity generation" is the total electricity generated within the province, regardless where the fuel comes from. In this case, it is interesting to note that importing diesel is its main fuel source. Shorter ice road access caused by climate change has major implications for diesel transportation.</p> <p>See The ice roads of Northern Canada are disappearing (CBC) https://www.cbc.ca/radio/day6/episode-335-100-days-of-sean-spicer-disappearing-ice-roads-beatles-live-retro-futurism-at-expo-67-and-more-1.4084549/the-ice-roads-of-northern-canada-are-disappearing-1.4084560</p>
1	NU	Nunavut's largest consuming sector for electricity in 2015 was transportation. This is expected to still be true in 2040.	F	<p>Energy Demand by Sector (transportation)</p> <p>https://bit.ly/2QLf43w</p> <p>See Provincial and Territorial Energy Profiles - Nunavut</p> <p>https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/nu-eng.html</p>
2	NWT	In 2018, natural gas production in the Northwest Territories represents more than 10% of Canadian natural gas production.	F	<p>Gas production in NWT (2018)</p> <p>http://bit.ly/2l8thUE</p> <p>Correct answer: it accounts for less than 1% of Canadian natural gas production.</p> <p>See Provincial and Territorial Energy Profiles - NWT</p> <p>https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/nt-eng.html</p>
3	NWT	The Government of NWT's Draft 2030 Energy Strategy drafted in 2017 proposed the installation of wind turbines in Inuvik to reduce reliance on diesel generation.	T	<p>Energy demand by sector (Wind/Solar/Geothermal)</p> <p>http://bit.ly/2E75ZjX</p> <p>See Provincial and Territorial Energy Profiles - NWT</p> <p>https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmprfls/nt-eng.html</p>



ACTIVITY 2: ENERGY FACT SLEUTHS – TEACHER KEY

LEV-EL	PROV	STATEMENT	TRUE/ FALSE	VISUALIZATION
3	ON	In 2017, about 85% of electricity in Ontario is produced from zero-carbon emitting sources.	T	Electricity Generation Ontario 2017: http://bit.ly/2yiKaKW See Provincial and Territorial Energy Profiles - Ontario https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmpr-fls/on-eng.html
1	ON	A sharp increase in energy demand is forecasted in Ontario between 2020 and 2040.	F	Total Energy Demand ON http://bit.ly/2mEdxiH
2	PEI	PEI generates enough electricity to meet its own electricity demand.	F	Total Energy Demand PEI http://bit.ly/2E9cRgM and Electricity generation PEI: http://bit.ly/2mBSRYr Hint: remind students to keep units the same (petajoule vs. GW.h vs. kBOE/d in left column) Correct answer: PEI does not generate enough electricity to meet its own electricity demand.
2	PEI	PEI's electricity generation from solar/wind/geothermal is predicted to nearly double between 2014 and 2040.	T	Electricity Generation PEI (2014 and 2040) http://bit.ly/2mBIJPt
1	QC	In 2018, hydroelectric stations generate most of Quebec electricity. Wind is the second-largest source of electricity generation in Quebec.	T	Electricity Generation QC (2018) http://bit.ly/2mDlJrI See Provincial and Territorial Energy Profiles – Quebec https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmpr-fls/qc-eng.html
1	QC	Quebec will be significantly increasing its nuclear energy production by 2040 compared to 2005 levels.	F	Electricity Generation QC (2005 and 2040) http://bit.ly/2mCofpG Correct answer: Nuclear energy is no longer produced as of 2013.



ACTIVITY 2: ENERGY FACT SLEUTHS – TEACHER KEY

LEV-EL	PROV	STATEMENT	TRUE/ FALSE	VISUALIZATION
2	SK	Renewables' share of the electric capacity mix in Saskatchewan is projected to grow substantially between 2015 and 2040.	T	Electricity Generation SK (2015 and 2040) http://bit.ly/2uZMt0L Note: In the fall of 2015, Saskatchewan announced a target of 50% renewable power by 2030. In the Energy Future 2016 projections, which were completed before this announcement, the share of renewable capacity increases from 25 to 40% over the projection period. Currently, SK relies on coal for baseload generation. See Canada's Energy Future 2016: Province and Territory Outlooks https://www.neb-one.gc.ca/nrg/ntgrtd/fttr/2016pt/k-fndngs-prvnc-trrtr-eng.html
2	SK	Saskatchewan is Canada's second-largest producer of oil, behind Alberta.	T	Oil Production Canada http://bit.ly/2l5vHn1 See Canada's Energy Future 2016: Province and Territory Outlooks https://www.neb-one.gc.ca/nrg/ntgrtd/fttr/2016pt/k-fndngs-prvnc-trrtr-eng.html
1	YT	In 2018, Yukon has significant commercial crude oil production.	F	Oil Production YK (2018) http://bit.ly/2l5vHn1 Correct answer: Yukon does not produce crude oil.
2	YT	In 2018, Yukon's total energy demand was the smallest in Canada.	T	Total energy demand (2018) http://bit.ly/2mBoYaV Hint: It is so small that it can't be seen when all provinces are selected. Students must look at YT individually to see its energy demand. Students should note that the "k" in petajoules represents thousands. The "k" is absent when it comes to YT! See Provincial and Territorial Energy Profiles – Yukon https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmp-rfls/yt-eng.html
2	CAN	Only high CO ₂ prices would result in lower energy demand across Canada compared to the reference scenario. Innovative technology would not affect energy demand.	F	Total demand by region (Canada): http://bit.ly/2mBy5ln Correct answer: Both high CO ₂ prices and efficient technology would result in lower energy demand across Canada compared to the reference scenario. See Recent Climate Policy Developments http://www.neb-one.gc.ca/nrg/ntgrtd/fttr/2017/ppndx-eng.html and Canadian innovations continue to shape the future of energy http://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/fttrtcl/2017-06-29cndnnnvtns-eng.html



ACTIVITY 2: ENERGY FACT SLEUTHS – TEACHER KEY

LEV-EL	PROV	STATEMENT	TRUE/ FALSE	VISUALIZATION
2	CAN	Ontario ranked at the top in Canada in terms of its total amount of installed solar/wind/geothermal capacity in 2017. Between 2007 and 2017, the solar/wind/geothermal capacity of Ontario has grown almost 30 fold.	T	Electricity Generation Solar/Wind/Geothermal (2007 and 2017): http://bit.ly/2mEdXFN See Market Snapshot: Ontario and Quebec are among the leaders in North American wind power capacity https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/snpsht/2018/05-01ntrqbcldrs-eng.html
1	CAN	In 2018, Alberta is the largest producer of crude oil in Canada, accounting for approximately 80% of total production.	T	Oil production Alberta (2018) http://bit.ly/2ili9eN Hint: Click the “Download data” along the bottom to easily calculate the percentage. Students should filter only 2018 data in the spreadsheet. See Provincial and Territorial Energy Profiles - Alberta https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmpfrls/ab-eng.html



ACTIVITY 3: ENERGY DRAGONS: INVEST IN THIS!

OVERVIEW	Students represent various stakeholders and must convince the “Dragons” to invest in their idea rooted in NEB visualizations. The idea can either be based on the current trend or by arguing that their idea could significantly change the trajectory.
LEARNING OUTCOMES	<ul style="list-style-type: none"> • Recognize that a visualization tool may be manipulated to support arguments from various stakeholders • Provide scientific evidence to support a decision to pursue an idea and to persuade an audience
MATERIALS	<ul style="list-style-type: none"> • Activity description and stakeholder profiles, including judging rubric (double-sided) • CanGeo Energy IQ map found at https://energyiq.canadiangeographic.ca/main/energy_map#1&-197&84&1&0&1
WHAT TO DO	<ol style="list-style-type: none"> 1. In groups of 2 or 3, provide students with a stakeholder profile as well as a copy of the CanGeo Energy IQ map (link above). There are 16 stakeholder profiles. TEACHER TIP: students will be more motivated if they get to choose their own profile. Although more than one group may choose a profile, their interpretation of it will be different. 2. Explain that each group will have to make a “pitch” to the Dragons (one or several teachers) to invest in an idea that is supported by one or more NEB visualizations. The idea can either be based on the current trend or by arguing that their idea could significantly change the trajectory. 3. The Dragons use the evaluation sheet to rate the ideas.
EXTENSION ACTIVITIES	<ul style="list-style-type: none"> • Assign students in the class to be Dragons for their classmates, in order to stimulate participation. Each dragon receives an evaluation sheet and is encouraged to ask questions. • The audience (other students) may choose to support (if alliance is possible to their service or product) or argue against the idea. • Have students record their pitch in a two-minute video. • Pair up with another group and record a mini Dragons episode: each group pitches their idea to the other team’s Dragons. Although they may include comedic relief, the Dragons must provide at least 2–3 reasons why they choose to support or not to support an idea. Share the episodes in class with popcorn!
NEB VISUALIZATION(S)	<ul style="list-style-type: none"> • All may be used



REFERENCE MATERIALS FOR STUDENTS	<ul style="list-style-type: none"> • Canadian Geographic's Provincial/Territorial Energy Snapshot Infographic • NEB Energy Market Snapshots www.neb-one.gc.ca/nrg/ntgrtd/mrkt/snpst/index-eng.html • Energy Markets Feature Articles www.neb-one.gc.ca/nrg/ntgrtd/mrkt/fttrtcl/index-eng.html • Provincial and Territorial Energy Profiles www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmpfrls/index-eng.html • Inter-American Development Bank (ideas for inspiration; energy datasets for various countries, including Canada) www.iadb.org/en/dataset-energy-database • Hydro Quebec, Comparison of Electricity Prices, www.hydroquebec.com/residential/customer-space/account-and-billing/understanding-bill/comparison-electricity-prices.html
PORTALS TO GEOGRAPHICAL THINKING	<ul style="list-style-type: none"> • spatial significance • patterns and trends • interrelationships • geographical perspective • evidence and interpretation • ethical ment

Below are the profile descriptions along with some suggested questions and ideas, to inspire students in their brainstorming session (should they require inspiration!).

1. TOURISM: You are a tourism operator looking to promote a region's eco-friendly energy approach. You must propose a strategy to the Dragons that either highlights an existing eco-friendly area or an investment opportunity to develop an eco-friendly area.	What types of energy-friendly technologies would tourists be interested in? Do certain energy installations change the landscape?
2. SERVICE INDUSTRY: You are seeking an investment from the Dragons to develop a personal service to individuals living in a certain area, or a professional service to businesses or organizations operating in a certain area.	What types of services might various energy-related companies require? For example, a catering service for oil and gas companies operating in remote areas, or a relocation service for companies requiring highly-skilled labourers from other parts of the country.
3. EXTRACTION EQUIPMENT MANUFACTURER: You are currently an oil rig manufacturer seeking to expand your business to develop equipment for a new industrial sector.	Which areas have high energy consumption by the industrial sector? Which industries might these be?
4. LEED ARCHITECT: You are a young architect who has been working on LEED projects (Leadership in Energy and Environmental Design) for the past five years. You are seeking an investment from the Dragons to build a model commercial building that encourages sustainable practices design.	Which areas have high electricity and heating prices? Which areas have tight energy production vs. demand? These are areas where an incentive to introduce energy efficiencies is the highest.



5. CRYPTOCURRENCY START-UP: You are an entrepreneur looking to start a cryptocurrency mining datacentre. You are asking the Dragons to invest in your start-up.	Where are there cheap electricity prices and abundant sources with low demand? That means that you have room to demand a lot more without putting pressure on the system to increase prices (cryptocurrency requires large amounts of electricity).
6. ELECTRIC VEHICLE MANUFACTURER: You are an electric vehicle manufacturer who has had a lot of success in California. You are asking the Dragons to invest in a charging station pilot project in a specific area of Canada.	Which provinces provide the most/best incentives to buy EVs? Which seem most aggressive with regards to lowering the carbon footprint? Add prices of gasoline and electricity to create an appealing story where demand would switch from hydrocarbons to electricity in transportation by virtue of price differential.
7. ENVIRONMENTAL ENTERPRISE: You seek an investment to develop a product or offer a service that benefits the environment. Your idea could have national potential or could target a specific province or territory.	Are there places that could benefit from lowering their carbon footprint?
8. TECHNOLOGICAL INNOVATION DEVELOPER: You are seeking an investment from the Dragons to develop an energy-related technological product or service, such as an app or a technological tool for a specific industry. This product or service could be marketed to manufacturers, governments, or citizens.	Technology to increase energy efficiency (e.g. biofuels or increased efficiency of wood waste, battery storage to increase range of renewable energy), digital technology to create efficiencies or virtual imaging to test the construction of infrastructure projects to detect errors prior to physical construction (save millions), smart grids.
9. OIL AND GAS PRODUCER: You have had much success in Western Canada and are looking to expand your business in another Canadian territory or province.	Where are current resources (oil and gas) located? Are there some provinces that don't produce oil and gas whereas their neighbours do? Perhaps this is a good place to discuss the emergence of fracturing technology to develop unconventional resources.
10. TRANSPORTATION COMPANY: Your company is looking to expand its business and provide transportation of energy products from areas of supply to potential areas of demand. For example, you can build pipelines to move natural gas and crude oil, and power lines to move electricity.	Finding matches between high-production areas with high demand areas. Or combining ideas that will create higher demand growth (policymaker groups suggesting policies that will create economic growth) and this group would ensure that energy was delivered to or from to complete the circle. Could they even expand into the transportation of people?
11. RENEWABLE ENERGY DEVELOPER: Your company has had much success in developing solar, wind, algal, geothermal, and tidal energy projects in Norway and India. You are looking for an investment from the Dragons to develop a new renewable energy project in a specific province in Canada.	Look at demand growth combined with solar radiation and wind maps. Combine renewable energy projects with Smart Grids technology for inserting renewable energy into existing grids. Are there articles that relate to technologies not yet being used, such as algal-based energy?



<p>12. INDIGENOUS ENTERPRISE: You are an entrepreneur based in an Indigenous community. Use the visualization tool to justify creating a product or service with a positive impact on Indigenous communities.</p>	<p>There are numerous examples in Canada where indigenous communities have entered into relationships with energy producers/providers to achieve best results for their communities. You can look for examples and use them for this exercise.</p>
<p>13. ENVIRONMENTAL NGO: You are a non-governmental organization that seeks to promote environmental conservation with respect to energy production and consumption. You are seeking funding from the Dragons' not-for-profit fund, to further your cause in either a specific province or territory (or nationally).</p>	<p>The visualizations would help choose areas of interest where improvements can be made. For instance, examine Northern Canada where the use of hydrocarbons is prevalent. Focus on how technology and adaptation of new energy technologies to northern conditions will advance sustainability in the North.</p>
<p>14. RESEARCHER: You lead a team of Canadian researchers with various research interests (e.g. policy impact, social impact, science, technology, environmental). You are seeking funding from the Dragons to research a specific energy-related topic for one of your research team members, located in a specific university.</p>	<p>This holds many opportunities. Could they collaborate with any of the other stakeholders to research impact or need?</p>
<p>15. POLICYMAKER: You are a policymaker looking for an investment in a specific sector to stimulate economic growth, or to speed up/slow down predicted trends in your province or territory.</p>	<p>There is much that can be done if you can combine the different sources' production and demand with data on prices and population. For instance, abundant electricity generation combined with low demand and low prices could be a good spot to develop "computing clouds." Note that the scenarios reflect policies that are already in place, hence, the analysis has to take this into consideration.</p>
<p>16. DATA VISUALIZATION DESIGNER: You are looking for an investment in your new business creating data visualizations, to help companies share and analyze their information.</p>	<p>Looking at the regions that have either high production and/or high demand, you would identify where and if there is a concentration of headquarters and capital cities for provincial governments. These are likely to be the best markets for data visualization services.</p>



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STAKEHOLDER PROFILE: TOURISM

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STAKEHOLDER PROFILE: LEED ARCHITECT

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 - Energy Markets Feature Articles <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/fttrtcl/index-eng.html>
 - Provincial and Territorial Energy Profiles <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/nrgsstmpfrls/index-eng.html>
 - Inter-American Development Bank (offers ideas for inspiration, and energy datasets for various countries including Canada) <https://www.iadb.org/en/dataset-energy-database>
3. Brainstorm ideas with your team.
4. Create a two to five-minute presentation, including images from the visualization tool and other sources, to convince the Dragons to invest in your idea. **TIP:** you may want to see if you can build alliances with other stakeholders to increase your desirability factor.

HELPFUL HINTS FOR INSPIRATION

- Think about what you want to see in the future. Do you want to change the trajectories? How can you do that?
- Do you see anything in the current trajectories that you can use to make plans for the future?
- What are the current resources available in your province of choice?
- What might there be in other provinces that could be in your province of choice?
- Do you know of things that are working in other countries that might work in Canada?
- What types of businesses already operate in your province of choice?
- Why is your chosen province the most profitable for this business?
Why is Canada a good place to start this business?
- Who will be your clients/customers?
- Who will benefit from your business?
- Will anyone be against this business or suffer hardship because of it?

Many stakeholders use the National Energy Board's data visualization tool to inform their decisions, from entrepreneurs to policy makers. In this challenge, your team must come up with an idea to implement in a specific province or territory, using the visualization tool to convince the Dragons to invest in your idea.

WHAT TO DO?

1. Read your stakeholder profile.

STAKEHOLDER PROFILE: INDIGENOUS ENTERPRISE

You are an entrepreneur based in an Indigenous community. Use the visualization tool to justify creating a product or service with a positive impact on Indigenous communities.

2. Find out more about the energy profiles of various Canadian provinces and territories by using the following resources:
 - Canadian Geographic's Provincial/Territorial Energy Snapshot Infographic
 - Exploring Canada's Energy Future visualization tool <http://bit.ly/2iTOcg9>
 - NEB Energy Market Snapshots <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/snpst/index-eng.html>
 - Energy Markets Feature Articles <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/fttrcl/index-eng.html>
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WHAT TO DO?

1. Read your stakeholder profile.

STAKEHOLDER PROFILE: ENVIRONMENTAL NGO

You are a non-governmental organization that seeks to promote environmental conservation with respect to energy production and consumption. You are seeking funding from the Dragons' not-for profit fund to further your cause, either nationally or in a specific province or territory.

2. Find out more about the energy profiles of various Canadian provinces and territories by using the following resources:
 - Canadian Geographic's Provincial/Territorial Energy Snapshot Infographic
 - Exploring Canada's Energy Future visualization tool <http://bit.ly/2iTOcg9>
 - NEB Energy Market Snapshots <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/snpsht/index-eng.html>
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WHAT TO DO?

1. Read your stakeholder profile.

STAKEHOLDER PROFILE: RESEARCHER

You lead a team of Canadian researchers with various research interests (e.g. policy impact, social impact, science, technology, environmental). You are seeking funding from the Dragons to research a specific energy-related topic for one of your research team members located in a specific university.

2. Find out more about the energy profiles of various Canadian provinces and territories by using the following resources:
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 - Exploring Canada's Energy Future visualization tool <http://bit.ly/2iTOcg9>
 - NEB Energy Market Snapshots <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/snpsht/index-eng.html>
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WHAT TO DO?

1. Read your stakeholder profile.

STAKEHOLDER PROFILE: DATA VISUALIZATION DESIGNER

You are looking for an investment in your new business creating data visualizations, to help companies share and analyze their information.

2. Find out more about the energy profiles of various Canadian provinces and territories by using the following resources:
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 - Exploring Canada's Energy Future visualization tool <http://bit.ly/2iTOcg9>
 - NEB Energy Market Snapshots <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/snpsht/index-eng.html>
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WHAT TO DO?

1. Read your stakeholder profile.

STAKEHOLDER PROFILE: POLICYMAKER

You are a policymaker looking for an investment in a specific sector to stimulate economic growth, or to speed up/slow down predicted trends in your province or territory.

2. Find out more about the energy profiles of various Canadian provinces and territories by using the following resources:
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 - Exploring Canada's Energy Future visualization tool <http://bit.ly/2iTOcg9>
 - NEB Energy Market Snapshots <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/snpst/index-eng.html>
 - Energy Markets Feature Articles <https://www.neb-one.gc.ca/nrg/ntgrtd/mrkt/fttrcl/index-eng.html>
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- Why is your chosen province the most profitable for this business?
Why is Canada a good place to start this business?
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- Who will benefit from your business?
- Will anyone be against this business or suffer hardship because of it?

Team members: _____

Stakeholder Profile: _____ Due by: _____

Remit this rubric to the Dragons on pitch day

CRITERIA	LEVEL 1 Does not meet expectations	LEVEL 2 Minimally meets expectations	LEVEL 3 Fully meets expectations	LEVEL 4 Exceeds expectations
VIABILITY OF PRODUCT, SERVICE OR INVENTION (30%)				
Identifies a specific need to be addressed, a gap to be filled or a problem to be solved.				
Describes strategies that produce a positive, lasting impact on their target market.				
Clearly identifies and describes their target market.				
CREATIVITY AND INNOVATION (30%)				
Demonstrates a clear action plan.				
Demonstrates creativity and innovation in identifying strategies to meet the need, to fill the gap or to solve the problem.				
COMMUNICATION AND PURSUASIVENESS (40%)				
Effectively uses evidence from the NEB's visualization tool to support the idea.				
Effectively uses existing information relating to province or territory of choice to justify the idea.				
Presents a clear, concise, creative and informative sales pitch targeted to the Dragons.				
Effectively uses branding (company name, logo, taglines) to present a professional image.				
Creates a memorable and effective closing (call to action).				
NOTES:				

ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD: WHAT'S THEIR BACKGROUND?

OVERVIEW	This activity is designed to illustrate non-conventional jobs at the National Energy Board that represent a variety of educational trajectories. Students may be surprised by the many different types of people hired by the NEB, including artists, communication specialists, writers and engineers.
LEARNING OUTCOMES	<ul style="list-style-type: none"> • Recognize that scientific institutions require contributions from people with a variety of backgrounds and interests. • Discover various entry points into employment in the science and technology field, contributing to their job search skills development.
MATERIALS	<ul style="list-style-type: none"> • Sticky notes (3-4 per student) • Sharpie markers • One set of NEB Employee Profiles to post around the room (large print) • One set of NEB Employee Profiles per group (small print)
NEB VISUALIZATION(S)	None
WHAT TO DO?	<ol style="list-style-type: none"> 1. With the class, brainstorm what kinds of jobs might be available at the National Energy Board. Write these on individual sticky notes and post on the board. Sort them into general categories. 2. Split students into groups representing the general categories above. What education or experience would be required for that type of job? Write these on individual sticky notes and post on the board. 3. Do the profiles created represent the abilities and interests of everyone in the room? Which kinds of jobs are represented? Which are absent? 4. Post the large print profiles around the room and ask students to roam and read. Did anything surprise them? 5. Hand out one set of National Energy Board Employee Profiles per group. After looking at the profiles, do they see some of the “absent” categories from Step 3? Did anything surprise them?
HOMEWORK/ EXTENSION	<ol style="list-style-type: none"> 1. Find the Careers page of the National Energy Board (Home > About Us > Careers) 2. Are you eligible for the Federal Student Work Experience Program? Optional: give students some time to create an account with the FSWEPP or negotiate with your school's career counseling program 3. Which social media platforms might NEB jobs appear on? Twitter, LinkedIn (specified in the Careers page) 4. What does the NEB expect to see in your cover letter? Name of position, position ID number, and to list how you meet the essential qualifications listed on the Statement of Merit Criteria. 5. What does the NEB expect to see in your CV? Profile (language, skill and attitude highlights), Formal Education, Work Experience (Career Summary), Volunteer Experience, Professional Development, Awards (and recognition), Other Requested Information (e.g. citizenship,) 6. What is the difference between formal education and professional development? Formal education represents a degree-granting program such as high school and college diplomas and university degrees. Professional development represents workshops, individual courses and institutes you have attended to develop skills and abilities related to the position. PD includes personal development workshops such as teambuilding and communication skills.



**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Amadou**

TITLE: Engineer, Pipeline Integrity Management

EDUCATION: B.Sc. in Mechanical Engineering, M.Sc. in Industrial Engineering

WHAT WAS YOUR FAVORITE SUBJECT IN GRADE SCHOOL? Physics.

TRAINING AND EXPERIENCE: Training in pipeline integrity management, application assessment, compliance verification activities (e.g. field inspection, implementation assessment and audit), and incident investigation.

WHAT DO YOU WANT TO LEARN? I'd like to continuously improve my skills, stay on top of current technical trends and do more leadership development training.



WHAT IS THE MOST INTERESTING THING ABOUT YOUR JOB? Working within an interesting, dynamic, knowledgeable engineering team to continuously find solutions to challenging pipeline integrity issues across Canada.

FIRST JOB AFTER GRADUATING: I was the service workshop technical lead for a Caterpillar dealer in Mali, Africa.

WHAT WAS YOUR VERY FIRST JOB EVER? I was a machine tool operator helper (lathe machine and milling machine).

HOW DID YOU COME TO WORK AT THE NEB? Through the National Energy Board's (NEB) online job posting and application portal.



**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Amanda****TITLE:** Communications Student

EDUCATION: Bachelor of Communications with a degree in public relations.

WHAT WAS YOUR FAVORITE SUBJECT IN GRADE SCHOOL? Math and social studies.

WHAT WAS YOUR VERY FIRST JOB EVER? I worked as a clerk at Rexall Pharmacy.

FIRST JOB AFTER GRADUATING: Not sure yet. I walk the graduation stage this November.

WHAT DO YOU WANT TO LEARN? Before I leave I want to answer a media inquiry. It is a significant part of what our team does and a big responsibility because all the information released must be accurate. I take any success or challenge that comes my way as an opportunity to learn and grown.

HOW DID YOU COME TO WORK AT THE NEB? I applied through a posting on my school's bulletin. I received an email to come in for an interview and a week later I was conditionally hired! My work term was initially just four months but towards the end I asked for an extension and wound up staying an additional three months!

WHAT IS THE MOST INTERESTING THING ABOUT YOUR JOB? I have a lot of freedom to begin my own projects and collaborate with different people. This means I get to work on many diverse projects simultaneously which lets me maximize my creativity. The organization is so big that I meet new people and learn something new every day. I usually get to transform what I learn into web communications products that help others.

I also adore my team. I believe that loving your work is just as important as having a positive and supportive team.



**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Negar****TITLE:** Engineer

EDUCATION: B.Sc.–
Chemical Engineering,
M.Sc. – Oil and Gas
Engineering

**WHAT WAS YOUR FAVORITE
SUBJECT IN GRADE
SCHOOL?** Persian literature
and creative writing.

TRAINING AND

EXPERIENCE: I've taken
various technical and
non-technical courses
such as defect assessment
in pipelines, geohazard
management, pipeline
integrity management
incident investigation –
DNV, directional drilling,
drilling engineering,
formation evaluation,
geomagnetic referencing,
finance, leadership, project
management conflict
management, Tableau and
many more!

WHAT DO YOU WANT TO LEARN?
Too many things! But on top
of my list are learning about
Indigenous culture and history,
sharpening my leadership skills,
and playing a music instrument.

**WHAT IS THE MOST INTERESTING
THING ABOUT YOUR JOB?** The
people I work with across the
organization. I also like the diverse
nature of the projects that I get
to work on in the Research and
Innovation team.

FIRST JOB AFTER GRADUATING:
Process engineer.

**WHAT WAS YOUR VERY FIRST
JOB EVER?** I worked as an
engineering co-op student for
one summer in a food factory
outside Tehran, Iran.

**HOW DID YOU COME TO WORK AT THE
NEB?** Before I joined the NEB, I was a
drilling engineer working on onshore
and offshore projects. I worked globally
for 15-years after graduating. I completed
my master's degree in 2014, applied for
an engineering position that had just
opened up at the NEB, and I joined the
Pipeline Integrity team in 2015.



**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Ryan****TITLE:** Market Analyst**EDUCATION:** B.A. in Economics, M.A. in Economics**WHAT WAS YOUR FAVORITE SUBJECT IN GRADE SCHOOL?** Social studies.**WHAT DO YOU WANT TO LEARN?** Data management practices, specifically, learning about more efficient and automated ways to work with data.**FIRST JOB AFTER GRADUATING:** My current job as a market analyst with the NEB.**HOW DID YOU COME TO WORK AT THE NEB?** I started as a summer student in 2016 on the Energy Trade team and moved into my current role over time.**WHAT IS THE MOST INTERESTING THING ABOUT YOUR JOB?** Learning about the market fundamentals and understanding the big picture of where supply and demand is in North America.**WHAT WAS YOUR VERY FIRST JOB EVER?** Catering at the Calgary Stampede!

**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Rohini**

TITLE: Human Resources Assistant

EDUCATION: B.Comm. (Commerce) in Human Resources, B.A. in Psychology

WHAT WAS YOUR FAVORITE SUBJECT IN GRADE SCHOOL? Science.

WHAT DO YOU WANT TO LEARN? Labour relations, workforce planning, employee relations, organizational culture, health and safety, leadership roles, and change management. I'm sure there are more areas but for now this is all I can think of for now.

WHAT IS THE MOST INTERESTING THING ABOUT YOUR JOB? The wide variety of HR disciplines that I get to explore – like learning and development, awards and recognition, workforce planning and lots of others. There is always something to do since my role requires taking holistic perspective of the organization. I also enjoy engaging, interacting, and working with employees from all different departments.

WHAT WAS YOUR VERY FIRST JOB EVER? Teaching kindergarten in India.

HOW DID YOU COME TO WORK AT THE NEB? I started off as a co-op student in 2012 and then came back as a casual employee a few times. Later I was a contractor providing e-learning services. Now I'm working on a term with the NEB.

FIRST JOB AFTER GRADUATING: Right here at the National Energy Board.

TRAINING AND EXPERIENCE: E-learning certification since I have created E-learning courses for the NEB.



**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Wesley****TITLE:** Financial Management
Advisor**EDUCATION:** B.B.A.
(Business Administration
- Hons.) with concentration
in Accounting, Chartered
Professional Accountant
(CPA)**WHAT WAS YOUR FAVORITE
SUBJECT IN GRADE
SCHOOL?** It's a tie between
math and English.**TRAINING AND
EXPERIENCE:** Financial
Officer Recruitment and
Development (FORD)
Program administered
by Treasury Board
Secretariat.**WHAT DO YOU WANT TO LEARN?**
I am interested in learning more
about the financial regulatory
compliance side of Energy
Adjudication.**WHAT IS THE MOST INTERESTING
THING ABOUT YOUR JOB?** Being
able to network with NEB
employees of many different
educational, personal, and
professional backgrounds.**FIRST JOB AFTER GRADUATING:**
I worked for the Federal
Government in the Department
of National Defence.**WHAT WAS YOUR VERY FIRST JOB
EVER?** Delivering newspapers
for the Guelph Mercury which is
no longer in publication.**HOW DID YOU COME TO WORK AT THE
NEB?** After working at the Department
of National Defence for six years, I
applied to a posting at the National
Energy Board. I was interested in
relocating to Calgary and working at a
small government organization where
I could learn more about the oil and
gas industry.

**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Nancy**

TITLE: Indigenous Engagement Specialist

EDUCATION: B.A. in Anthropology and English

WHAT WAS YOUR FAVORITE SUBJECT IN GRADE SCHOOL? English.

TRAINING AND

EXPERIENCE: I joined the co-op education program at my university and did four co-op work terms as well as an international exchange term at the University of Adelaide in South Australia. These work terms gave me a range of experiences and helped me determine my strengths and weaknesses which helped me discover my career path.

WHAT DO YOU WANT TO LEARN? I am interested in many things! I want to learn about methods for historical-geographical research; about how women are impacted by natural resource development, sustainable community development, and how marginalized people can achieve self-determination. I would also like to learn how to be a better public speaker.

WHAT IS THE MOST INTERESTING THING ABOUT YOUR JOB? I like the cross-disciplinary aspects and the collaborative nature of the position. While it can be fast-paced or high-pressure, there is great opportunity in connecting with many different types of people.

FIRST JOB AFTER GRADUATING: Socio-economic specialist at the National Energy Board!

HOW DID YOU COME TO WORK AT THE NEB? I applied and was accepted for a co-op position with the NEB as a student. I did well enough in that role that I was able to transition to a term position after I graduated. I believe it was the combination of my education and my co-op work experiences that had developed my expertise to the point where the National Energy Board could use my skillset almost immediately.

WHAT WAS YOUR VERY FIRST JOB EVER? I worked at the concession stand at a baseball field.



ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD: WHAT'S THEIR BACKGROUND?

MEET: **Andrea**

TITLE: Market Analyst and Project Manager

EDUCATION: B.B.A. (Business Administration), M.A. in Public Administration

WHAT WAS YOUR FAVORITE SUBJECT IN GRADE SCHOOL?
Global development.

WHAT WAS YOUR VERY FIRST JOB EVER? I worked at a movie theatre.

FIRST JOB AFTER GRADUATING: Policy Analyst at Western Economic Diversification Canada in Edmonton.



WHAT DO YOU WANT TO LEARN?
I currently manage the NEB's flagship report, Energy Futures. It's a very complex and technical report. I'd like to continue to work on Energy Futures and build my competency around Canadian energy supply and demand forecasts as well as how climate policy is shaping the energy landscape. I would also like to continue to work on hearings and get that in-depth, technical knowledge of the companies and pipelines we regulate. This is where you really build your expertise in energy markets.

HOW DID YOU COME TO WORK AT THE NEB? I moved to Calgary in 2009 after graduating school and decided my goal was to work at the National Energy Board. In grad school, I became very interested in energy, particularly the oil sands, and incorporated that into some of my graduate work.

During the recession, I took a job in Edmonton with Western Economic Diversification. A couple years later, I got a job offer from the NEB!

Because of my background working for the federal government as a student for almost four years, the National Energy Board seemed like the perfect for me because it blended my federal government experience and education with my interest in energy.

WHAT IS THE MOST INTERESTING THING ABOUT YOUR JOB? The most interesting thing about my job is working in several areas and learning about various parts of the NEB's work at once. I'm a project manager, but I also do natural gas market analysis. Part of my job is also doing regulatory work and providing market analysis and expertise to Board Members during our hearing processes.

At the NEB, you have the opportunity to work on different kinds of projects all the time with people from around the organization. I stay interested in my job because my work is always changing and I'm constantly learning from my co-workers.



**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Margaret**

TITLE: Technical Leader,
Socio-Economics

EDUCATION: Bachelor of Environment Studies and Masters of Environmental Studies with specialization in First Nations Community Development

WHAT WAS YOUR FAVORITE SUBJECT IN GRADE SCHOOL? Geography.

FIRST JOB AFTER GRADUATING:

I worked at Indigenous and Northern Affairs Canada in my home town of Toronto. I was developing and running workshops on community development delivered onsite on remote Northern Ontario reserves.

WHAT DO YOU WANT TO LEARN?

There is always something to learn, whether it is building on what I already know or something completely new. There are so many opportunities at the NEB to learn new things and staff who are happy to share their expertise.



WHAT IS THE MOST INTERESTING THING ABOUT YOUR JOB? For me it's the opportunity to work with Canada's Indigenous peoples and learn about their unique cultures, history, and contemporary issues. My work at the NEB focuses on Indigenous peoples and the consideration of their rights and interests in energy development.

HOW DID YOU COME TO WORK AT THE NEB? Just before coming to the NEB I worked at Indian Oil and Gas Canada. They regulate oil and gas on First Nation reserves. It was there that I learned about the NEB.

WHAT WAS YOUR VERY FIRST JOB EVER? Lifeguard.



**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Andria**

TITLE: Environmental Specialist,
Inspection Officer

EDUCATION: B.Sc. (Hons.)
in Marine Biology and
Oceanography, M.M.M.
in Marine Management

**WHAT WAS YOUR FAVORITE
SUBJECT IN GRADE
SCHOOL?** Math.

TRAINING AND

EXPERIENCE: Inspection
Officers (IOs) like me,
get a lot of on-the-job
learning from more
experienced IOs about
pipeline construction
and mitigation
measures to protect the
environment.

WHAT DO YOU WANT TO LEARN?

No specific subject matter comes
to mind, but when there's an
opportunity to learn anything I
jump at it.



**WHAT IS THE MOST INTERESTING
THING ABOUT YOUR JOB?** I learn
something new almost daily and
I love traveling to parts of the
country that I might not otherwise
see.

FIRST JOB AFTER GRADUATING:
Outreach specialist at Discovery
Centre in Halifax. I traveled to
elementary schools around the
city and did curriculum-based,
hands-on science activities with
students.

**WHAT WAS YOUR VERY FIRST JOB
EVER?** Lifeguard.

**HOW DID YOU COME TO WORK AT THE
NEB?** I moved to Calgary from Halifax
in 2011 and saw an interesting NEB
job posting in 2012. I applied and
qualified and was in a candidate-pool
for about a year before being hired. I
was attracted by the role's work/life
balance, benefits, and the chance to
serve Canadians and see the country.



**ACTIVITY 4: CAREERS AT THE NATIONAL ENERGY BOARD:
WHAT'S THEIR BACKGROUND?****MEET: Jason****TITLE:** Graphic Designer**EDUCATION:**

International Academy
of Design

**WHAT WAS YOUR FAVORITE
SUBJECT IN GRADE SCHOOL?**

I would have to say band or
art but I didn't really like high
school that much. I just barely
graduated.

FIRST JOB AFTER

GRADUATING: Hockey News
Magazine. Literally five-
minutes after my final exam,
I was headhunted to start
work that very same after-
noon. The job was to colour
correct the faces of goalies
for their year-end magazine.
I went from making \$8 per
hour in a hardware store to
making \$25 per hour. When
I received my first paycheck,
I almost wept.

**WHAT IS THE MOST
INTERESTING THING
ABOUT YOUR JOB?**

I get to work with
awesome people!

HOW DID YOU COME TO WORK AT THE NEB?

I was working in a print shop in Edmonton
and a friend of mine who lived in Calgary
stumbled across a job application for the NEB
and encouraged me to apply. I interviewed a
few weeks later and I've been here 18-years
so far. I'll probably put in at least another
13-years according to when I can retire.

**WHAT WAS YOUR VERY FIRST
JOB EVER?** Flipping burgers at
Peggy Sue's Diner in Brandon,
Manitoba.



Appendix 1: National Energy Board Visualizations

1. EXPLORE ELECTRICITY: ELECTRICITY GENERATION (DARK BLUE - BUBBLES)

- Compare the relative amount of electricity generated by various energy sources throughout the provinces and territories for a given year.
- Switch between two views: one that compares the amount of electricity generated by each source for each region, and one that compares the amount of electricity generated by each region for each source.

VARIABLES: province, source (oil products, nuclear, biomass and biofuels, natural gas, coal, solar/wind/geothermal, hydro), scenario (technology, high CO₂ price) year (2005–2040)

2. EXPLORE DEMAND: CHANGING DEMAND SHARES (PINK)

- Compare how the energy mix evolves over time across Canada's provinces and territories. Choose a base year, and see how the shares of various end-use energy sources change in a future year.
- The charts provide the difference in the % share of demand in the future year versus the base year.

* Same information as Explore by Sector visualization but in % change

VARIABLES: province, sector (residential, commercial, industrial, transportation), scenario (technology, high CO₂ price) source (solar/wind/geothermal, coal, oil products, electricity, natural gas, biomass and biofuels), base year (% change between the selected base year and selected future year)

3. EXPLORE BY SECTOR: ENERGY DEMAND BY SECTOR (TEAL)

- Explore how energy source mixes from different sectors have evolved in recent history, and how they are projected to evolve in the Energy Futures scenarios.

* Same information as Explore Demand visualization but in energy quantities

VARIABLES: sector (total demand, residential, commercial, industrial, transportation), province, source (electricity [includes nuclear, hydro, not solar/wind/geothermal, thermal generation from natural gas, coal and oil], oil products, biomass and biofuels, natural gas, coal, solar/wind/geothermal), scenario (technology, high CO₂ price), static year (2005–2040)

4. EXPLORE BY REGION: ENERGY DEMAND AND GENERATION BY REGION (LIGHT BLUE)

- Compare historical and projected energy supply and demand data from across Canada's provinces and territories.



VARIABLES: total demand (used by all four sectors); supply (electricity generation, oil production, gas production [includes both energy used in the province and energy for export]); province; scenario (technology, high CO₂ price); static year (2005–2040)

5. SCENARIOS: DEMAND SCENARIOS

- Directly compare the scenarios. Explore the impact of key uncertainties on future energy trends, including technological development, climate policy initiatives such as carbon pricing, or higher or lower energy prices.

VARIABLES: total demand, supply (electricity generation, oil production, gas production [includes both energy used in the province and energy for export]); province, scenario (technology, high CO₂ price); static year (2005–2040)

Appendix 2: Portals to Geographical Thinking

The following excerpt from Sharpe, Bahbahani and Huynh’s *Teaching Geographical Thinking* (p. 4–6, 2016) has been used to guide the activity development for this resource.

A major step in embedding geographical thinking is to make the curriculum problematic, so that the study of geography poses challenges to think through problems rather than supplying lists of information to be remembered. Based on Peter Seixas’ Teaching historical Thinking approach, the Critical Thinking Consortium approach proposes six concepts that serve as portals to turn the factual content of geography into a subject for analysis. These six concepts are not “content”—although they have to be taught to students—they are sources of questions that invite and support students to think critically about what they are learning.

SPATIAL SIGNIFICANCE. At the heart of any geographical analysis or representation lies the question of importance. It is a core question in geographer Charles Gritzner’s definition of geography, “What is Where, Why There, and Why Care?” Answering the question of “why care?” requires consideration of the other core questions, “what is where?” and “why there?”

PATTERNS AND TRENDS. This portal raises the question: *What can we conclude about the variation and distribution of geographical characteristics over time and space?*

INTERRELATIONSHIPS. This portal raises the question: *How do human and natural factors and events connect with and influence each other?*

GEOGRAPHICAL PERSPECTIVE. The key question in understanding the geography of a place is: *What are the human and physical features and identities, as understood through various lenses, that characterize a place?*

EVIDENCE AND INTERPRETATION. This portal raises the questions: *What information can be used as evidence to support ideas about geography, and how adequately does the geographical evidence justify the interpretations offered?*

Students often approach data from a naïve perspective, assuming that they are accurate, relevant, and free of distortions. To encourage a more critical analysis of data — the source of all subsequent interpreta-



tions—we must invite students to examine their accuracy, precision and reliability. This includes analyzing three kinds of sources:

- Primary sources, which provide the raw data for geographical information and knowledge;
- Secondary sources, which are geographical reports not drawn directly from the object of study; and
- Tertiary sources, which provide overviews of information based largely on secondary sources.

ETHICAL JUDGMENT. The central question invoked by ethical judgment is: *How desirable and responsible are the practices and outcomes associated with particular geographical actions and events?* Ethical judgments encompass various lenses—including economic, environmental, cultural, political and historical—and various group and regional perspectives.

REFERENCE:

Sharpe, B., Bahbahani, K., Huynh, N.T. (2016) *Teaching Geographical Thinking*. The Critical Thinking Consortium (TC²) and The Royal Canadian Geographical Society.

Appendix 3: Data Sources

DATA SOURCES FOR ENERGY DEMAND

The primary source for historical energy demand data is Statistics Canada's Report on Energy Supply and Demand and associated CANSIM data tables. These values are disaggregated at an end-use level using NRCan's National End-use Database. The dataset is also supplemented with data from Environment and Climate Change Canada, and various provincial and territorial sources such as the Alberta Energy Regulator, BC Hydro, Alberta Electric System Operator, and Ontario's Independent Electric System Operator.

DATA SOURCES FOR ELECTRIC GENERATION

The primary source for electric generation data comes from Statistics Canada. It is supplemented by additional data from provincial governments, utilities, and system operators, as well as industry associations (such as CanWEA and CanSIA).

DATA SOURCES FOR CRUDE OIL AND NATURAL GAS PRODUCTION

Data for crude oil and natural gas production comes from a variety of sources. These include NEB analysis of Divestco well data, provincial and territorial governments, the Alberta Energy Regulator, and Canadian Association of Petroleum Producers.



Appendix 4: Glossary

See also the *Energy Information Program Glossary* for detailed definitions

ENERGY SOURCES

CRUDE OIL: contains conventional light and heavy crude oil, condensate, oil sands bitumen (mined and in situ).

OIL PRODUCTS: Includes refined petroleum products and natural gas liquids. Specifically this includes: motor gasoline, diesel, aviation fuel, light fuel oil, kerosene, heavy fuel oil, propane, butane, ethane, petroleum coke, still gas, and non-energy products such as lubricants, asphalt, and petrochemical feedstocks.

NATURAL GAS: Production refers to dry marketable gas production. Total consumption of gas includes some non-marketed producer consumption. In Canada, it is produced from conventional, tight, shale, and coal bed methane resources, as well as produced along with crude oil production (also known as solution or associated gas).

COAL: Includes coal, coke, and coke oven gas.

ELECTRICITY: End-use electric energy that is generated from a variety of sources and technologies. Includes generation primary electricity sources such as nuclear, hydro, and other renewables, and thermal generation from other fuels such as natural gas, coal, and oil.

HYDRO: Amount of electricity generated by hydro power plants.

NUCLEAR: Amount of electricity generated by nuclear power plants.

BIOMASS AND BIOFUELS: Includes solid biomass fuels such as wood pellets, as well as liquid biofuels such as ethanol and biodiesel.

SOLAR/WIND/GEOTHERMAL: For electricity generation, this includes the electric energy generated from wind, solar, and geothermal sources. At an end-use level, it includes thermal uses such as solar hot water heating and geothermal space heating.

ENERGY UNITS

PETAJoule: A measure of energy that is a quadrillion (10¹⁵) joules. According to Statistics Canada, a petajoule is the approximate amount of energy it takes to run the Montreal Metro for one year.

THOUSAND BARRELS OF OIL EQUIVALENT PER DAY (KBOE/D): A measure of energy normalized to the equivalent energy content of a barrel of light crude oil. One barrel of oil equivalent is equal to 6.811 joules, while one petajoule is equal to 0.4475 kBOE/d.

GW.H: A measure of electric energy that is a billion (10⁹) watt hours of electric energy per year. One GW.h is equal to 0.0036 petajoules and 0.0016 kBOE/d.



VOLUMETRIC UNITS

THOUSAND BARRELS PER DAY (KB/D): Number of barrels of crude oil produced per day.

THOUSAND M3 PER DAY ($10^3\text{M}^3/\text{D}$): Number of cubic metres of crude oil produced per day. One barrel of oil is equal to 0.159 cubic metres.

MILLION CUBIC FEET PER DAY (MCF/D): Number of cubic feet of natural gas produced per day.

MILLION CUBIC METRES PER DAY ($10^6\text{M}^3/\text{D}$): Number of cubic metres of natural gas produced per day. One cubic foot of natural gas is equal to 0.0283 cubic metres.

SECTORS

RESIDENTIAL: This is the energy consumed by Canadian households. It includes energy used for space and water heating, air conditioning, lighting, large appliances, and other energy-using devices like televisions and computers.

COMMERCIAL: A broad category including offices, stores, warehouses, government and institutional buildings, utilities, communications, and other service industries. It also includes energy consumed by street lighting and pipelines. Buildings use energy for space and water heating, air conditioning, lighting, appliances and other devices. Pipelines use energy to power pumps or compressors that move oil and natural gas through pipelines.

INDUSTRIAL: This sector includes manufacturing, forestry, fisheries, agriculture, construction, mining, and oil and natural gas extraction. In 2013, 81 per cent of industrial energy was consumed by a number of energy-intensive industries like iron and steel, aluminum, cement, chemicals and fertilizers, pulp and paper, petroleum refining, mining, and oil and natural gas extraction.

TRANSPORTATION: Includes passenger and freight on-road transportation, as well as air, rail, marine, and non-industrial off-road travel, such as recreational all-terrain vehicles and snowmobiles. Demand in the transportation sector includes foreign energy used on Canadian soil, airspace, and waters.

SUPPLY AND DEMAND CATEGORIES

TOTAL DEMAND: The total energy used in the four sectors of Canada's economy: residential, commercial, industrial, and transportation. Includes the use of electricity, natural gas, and petroleum products such as gasoline, coal, and renewable fuels. Also referred to as end-use or secondary demand, it does not include the energy used to generate electricity.

ELECTRICITY GENERATION: The amount of electric energy produced by transforming other forms of energy. In Canada, electricity is generated from hydro, other renewables like wind and solar, and thermal sources like natural gas and coal, and nuclear power.

OIL PRODUCTION: The amount of crude oil produced in Canada. Crude oil is produced from various areas using different technologies. This includes mined and in situ bitumen from the oil sands, conventional light and heavy oil produced in the Western Canadian Sedimentary Basin, condensate, and oil produced from off-shore platforms on the east coast.



NATURAL GAS PRODUCTION: The amount of marketable natural gas produced in Canada. Natural gas is produced from various areas using different technologies. This includes tight, shale, coal bed methane, conventional, and natural gas produced along with oil from oil wells (also called associated or solution gas).

SCENARIOS

Each edition of the various NEB Energy Futures reports uses several scenarios to explore how possible energy futures might unfold for Canadians over the long term. Energy Futures 2017 considers three scenarios that explore how future climate policy and technological development might impact Canada's energy system.

REFERENCE

The Reference Case provides a baseline outlook with a moderate view of energy prices and economic growth, and climate and energy policies announced at the time of analysis.

TECHNOLOGY

The Technology Case considers higher carbon prices than the Reference Case and greater adoption of select emerging production and consumption energy technologies.

HIGH CO₂ PRICE

The Higher Carbon Price Case explores the impact of higher carbon pricing than in the Reference Case in the longer term.

