NB Science 10 Energy Unit Summary

Learning Contexts: Students build an understanding of the nature of science through inquiry activities supported by core ideas and concepts connected to Physical Sciences, and Earth and Space Sciences. They also draw from personal learning experiences, funds of knowledge, cultural worldviews, and science capital they already possess.

GCO 1.0: Student will use scientific inquiry and technological design skills to solve practical problems, communicate scientific ideas and results and make informed decision while working collaboratively.

Content	Learning Objectives (Students Should Learn)	Possible Teaching Activities
Power, Energy and Work • Concepts: Power, work, energy • Stores of energy and pathways. • Types: electrical, nuclear, and chemical. • 1st Law Thermodynamics: energy conservation.	• About the 8 different stores of energy (chemical, thermal, magnetic, electrostatic, nuclear, kinetic, gravitational potential energy, elastic potential energy) • About the 5 different pathways by which energy transfers are made (chemical, thermal, mechanical, radiation and electrical). • How to describe energy transfers in terms of stores increasing or decreasing. • About the conservation of energy.	Ensure students are familiar with the conservation of energy – energy is not created nor destroyed, just transferred from one store to another. You can use a bottle of water to demonstrate this – the water can be transferred to different places – cup, beaker, test tube – etc but it's still water. Even if it's spilled (into the environment) you've still got the same overall volume from start to finish. Students should be introduced the 8 different energy stores and pathways. To help consolidate this material, students can do an Energy Transfers lab, where students rotate around different stations set and identify the store at the start and at the end of the systems, while identifying the transfers. This activity can be found in the supporting documents. pHet simulation for energy transfers: Energy Skate Park - Conservation of Energy | Kinetic Energy | Potential Energy - PhET Interactive Simulations (colorado.edu). Les formes d'énergie | Secondaire | Alloprof L'énergie thermique | Sciences | MiniRécup - YouTube – A French resource that goes through thermal energy.

GCO 1.0: Student will use scientific inquiry and technological design skills to solve practical problems, communicate scientific ideas and results and make informed decision while working collaboratively.

Content	Learning Objectives (Students Should Learn)	Possible Teaching Activities
Electricity and Electrification • Static Electricity – electric charge, electron, uses of static electricity. • Electrification – Renewable vs. non-renewable, Clean vs. Green tech, emerging technologies, power generation: energy sector, electricity as a commodity; electricity resilience; mixed grid; calculating of energy consumption (NB Power).	• About the atom, specifically that electrons are found on the exterior of the nucleus. • About how static electricity works and different uses of static electricity.	pHet simulation for static electricity: Balloons and Static Electricity - Static Electricity | Electric Charges | Electric Force - PhET Interactive Simulations (colorado.edu). This is a good resource that visually shows students how electrons are transferred between materials. One limitation with the simulation is that when the balloon is rubbed against the sweater the negative charges are shown on one side of the side. When the balloon is brought to the wall, it shows the neutral side repelling the electrons on the wall. This could be a good model limitation to ask students. L'électricité statique | Sciences | Alloprof - YouTube – A French resource. Uses of static electricity is a research opportunity for students. Students can work in groups to create a short presentation on a use of static electricity. Examples of uses include electrostatic precipitators (this has a good tie into thermal power stations), spray painting cars, insecticides, electric eels, grounding and fuelling, lightning and photocopiers. An example of this activity can be found in the supporting documents.

GCO 2.0: Students will demonstrate an understanding of the nature of science and technology, of the relationships between science and technology, and of the social and environmental contexts of science and technology (STSE).

Content	Learning Objectives (Students Should Learn)	Possible Teaching Activities
Learning and living sustainably • Power Generation – Renewable vs. non-renewable, Clean vs. Green tech, emerging technologies, cost, benefit, and trade-offs if electrification, calculating of energy consumption (NB Power). • Earth Systems – Biosphere: Energy budget; global warming; climate change adaptation and mitigation strategies.	• About the differences between renewable and non-renewable energy. • About different energy resources and power generation in New Brunswick. • About the advantages and disadvantages between difference energy resources (pollution, cost, supply). • About the difference between clean and green energy and technologies. • About climate change adaptation and their own individual carbon footprint.	There are several energy resources in New Brunswick that can be explored – hydroelectric, nuclear, solar, wind and thermal, to name a few. NB Power partnered with The Gaia Project and created easy to understand and informative videos that explain how thermal, nuclear, hydroelectric and wind energy is generated in NB, the costs, benefits and trade-offs. The links to these videos in French and English, as well as discussion questions that students could do independently or as a whole class activity, can be found in the supporting documents. Green vs. Clean technologies could be a good opportunity for project/research-based learning. An example of this activity can be found in the supporting documents. Carbon footprint calculator: Ecological Footprint Calculator Baseload vs peak demand | Centre of Excellence for Energy (centresofexcellencenb.ca) – a great activity to look at energy consumption. Exploring Canada's energy future | Centre of Excellence for Energy (centresofexcellencenb.ca)

		There are also solar energy exploration kits (Vernier Software and Technology) available through the COE Energy. With these kits, students can investigate solar energy output. Wind turbine kits are available through the COE Energy. Students can design and build wind turbines, investigating the importance of blade design and pitch.