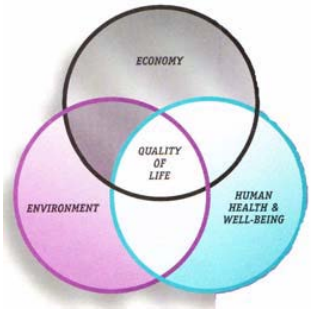

Technology Education Senior Years Technology Program

Grades 9 to 12 Sustainable Energy Manitoba Technical Vocational Curriculum Framework of Outcomes 2014

Student Learning Outcomes Related to Sustainable Development

(Note that the Sustainable Energy program is comprised of nine courses. The courses are structured using goals, General Learning Outcomes, and Specific Learning Outcomes.)

Grade 9

8232 **Exploration of Sustainable Energy (9)** 15S / 15E / 15M 10S / 10E / 10M

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

GLO 1.1: Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

9.1.1.1 Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.

9.1.1.9 Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 6.1: Demonstrate **information and communication technology** skills required in the sustainable energy industry.

9.6.1.1 Demonstrate the use of information and communication technology to research topics in sustainable energy.

Goal 11: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

GLO 11.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

9.11.1.2 Discuss how sustainable energy systems will become economically more attractive as fossil fuels become scarcer.

Grade 10

8233 **Introduction to Sustainable Energy (10)** 20S / 20E / 20M

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

GLO 1.1: Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

10.1.1.1 Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.

10.1.1.9 Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).

10.1.1.16 Demonstrate safe practices for working with fire, including air quality considerations.

Goal 3: Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems.**

GLO 3.1: Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

10.3.1.1 Describe the advantages and disadvantages of using hydrocarbons as an energy source.

10.3.1.2 Describe sustainable energy sources and how they differ from conventional energy sources.

10.3.1.4 Demonstrate an understanding of solar energy distribution and the role solar energy plays in sustainable energy sources.

10.3.1.6 Conduct a home energy audit.

10.3.1.7 Demonstrate an understanding of various economic incentives related to sustainable energy.

10.3.1.8 Describe various sites in Manitoba that use sustainable energy or that conduct research and undertake development in the area of sustainable energy.

GLO 3.2: Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

10.3.2.1 Evaluate various sustainable energy options (e.g., using RETScreen software).

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 6.1: Demonstrate **information and communication technology** skills required in the sustainable energy industry.

10.6.1.1 Demonstrate the use of information and communication technology to research topics in sustainable energy.

10.6.1.2 Explore problems and issues that demonstrate interdependence among science, technology, society, and the environment.

Goal 7: Demonstrate an understanding of the **ethical and legal standards** that pertain to the sustainable energy industry.

GLO 7.1: Demonstrate an awareness of the **ethical and legal expectations** of the sustainable energy industry.

10.7.1.2 Demonstrate an understanding of when sustainable energy projects legally require impact assessments.

Goal 9: Demonstrate an awareness of **sustainability** as it pertains to the sustainable energy industry.

GLO 9.1: Describe the impact of **sustainability** on **the health and well-being** of sustainable energy industry workers, their customers, and those who are affected by their products and services.

10.9.1.1 Discuss the impact of sustainable energy systems on human health and wellbeing.

GLO 9.2: Describe the sustainable energy industry's **sustainability practices and their impact on the environment.**

10.9.2.1 Describe how the use of sustainable energy can be sustainable from an environmental perspective.

10.9.2.2 Describe how sustainable energy use produces less greenhouse gas than conventional energy use.

GLO 9.3: Describe the **relationship between the economy and sustainability practices** within the sustainable energy industry.

10.9.3.1 Describe how the use of sustainable energy can be sustainable from an economic perspective.

10.9.3.2 Describe current economic factors that are promoting sustainable energy.

Goal 11: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

GLO 11.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

10.11.1.2 Discuss how sustainable energy systems will become economically more attractive as fossil fuels become scarcer.

10.11.1.3 Demonstrate an understanding of the technological progression of and emerging trends in sustainable energy within Manitoba.

10.11.1.4 Demonstrate an understanding of the history of human energy use and related changes to the environment.

Grade 11

8234 **Sustainable Energy: Electrical Systems (11A)** 30S / 30E / 30M

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

GLO 1.1: Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

11A.1.1.1 Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.

11A.1.1.9 Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).

Goal 3: Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems.**

GLO 3.1: Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

11A.3.1.2 Identify the advantages and disadvantages of wind and solar-generated electricity.

GLO 3.2: Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

11A.3.2.1 Conduct an economic feasibility analysis of switching from hydroelectricity to wind- or solar generated electricity.

11A.3.2.2 Conduct a wind resource assessment.

11A.3.2.3 Determine the most appropriate sites for solar PV systems.

11A.3.2.4 Determine the most appropriate sites for wind farms.

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 6.1: Demonstrate **information and communication technology** skills required in the sustainable energy industry.

11A.6.1.1 Demonstrate the use of information and communication technology to research topics in sustainable energy.

GLO 6.5: Demonstrate knowledge of **physical education/health education** as it relates to the sustainable energy industry.

11A.6.5.2 Discuss the stress (e.g., noise pollution, aesthetic concerns) experienced by neighbours of large wind turbines.

Goal 7: Demonstrate an understanding of the **ethical and legal standards** that pertain to the sustainable energy industry.

GLO 7.1: Demonstrate an awareness of the **ethical and legal expectations** of the sustainable energy industry.

11A.7.1.1 Demonstrate an understanding of the ethical responsibility of communicating with neighbours prior to the installation of solar or wind systems.

11A.7.1.2 Demonstrate an understanding of the criteria that trigger federal regulatory processes for solar and wind energy projects.

Goal 9: Demonstrate an awareness of **sustainability** as it pertains to the sustainable energy industry.

GLO 9.1: Describe the impact of **sustainability** on **the health and well-being** of sustainable energy industry workers, their customers, and those who are affected by their products and services.

11A.9.1.1 Discuss the impact of sustainable electrical systems on human health and wellbeing.

GLO 9.2: Describe the sustainable energy industry's **sustainability practices and their impact on the environment.**

11A.9.2.1 Compare and contrast the environmental impact of hydroelectric dams and sustainable electrical energy sources.

11A.9.2.2 Demonstrate an understanding of the impact of wind turbines on birds and bats.

GLO 9.3: Describe the **relationship between the economy and sustainability practices** within the sustainable energy industry.

11A.9.3.1 Describe Manitoba Hydro's economic strategy related to sustainable sources of electricity.

Goal 11: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

GLO 11.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

11A.11.1.2 Discuss how sustainable energy systems will become economically more attractive as fossil fuels become scarcer.

11A.11.1.3 Demonstrate an understanding of the latest industry trends.

11A.11.1.4 Demonstrate an understanding of the rationale for utility scale wind farms in Manitoba.

8245 **Sustainable Energy: Heating/Cooling Systems (11B)** 30S / 30E / 30M

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

GLO 1.1: Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

11B.1.1.1 Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.

11B.1.1.9 Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).

11B.1.1.16 Demonstrate safe practices for working with fire, including air quality considerations.

Goal 3: Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems.**

GLO 3.1: Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

11B.3.1.1 Demonstrate an understanding of the different heating/cooling system options (e.g., ground-source heat pump [GSHP], solar air, solar water, biomass energy systems).

11B.3.1.2 Demonstrate an understanding of the energy savings of sustainable energy systems compared to those of conventional systems.

GLO 3.2: Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

11B.3.2.2 Demonstrate an understanding of how to size sustainable energy heating/cooling systems.

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 6.1: Demonstrate **information and communication technology** skills required in the sustainable energy industry.

11B.6.1.1 Demonstrate the use of information and communication technology to research topics in sustainable energy.

Goal 9: Demonstrate an awareness of **sustainability** as it pertains to the sustainable energy industry.

GLO 9.1: Describe the impact of **sustainability** on **the health and well-being** of sustainable energy industry workers, their customers, and those who are affected by their products and services.

11B.9.1.1 Discuss the impact of sustainable heating/cooling systems on human health and well-being.

11B.9.1.2 Describe the relationship between the proper design and installation and the long-term sustainability of sustainable energy technologies.

11B.9.1.3 Describe how sustainable energy technologies address the issue of energy security.

GLO 9.2: Describe the sustainable energy industry's **sustainability practices and their impact on the environment.**

11B.9.2.1 Demonstrate the understanding that switching from conventional to sustainable heating/cooling systems will reduce greenhouse gas emissions.

GLO 9.3: Describe the **relationship between the economy and sustainability practices** within the sustainable energy industry.

11B.9.3.1 Describe Manitoba's provincial strategy for using energy as a source of economic development and wealth retention.

11B.9.3.2 Describe how biomass heating systems can add value to agricultural crops.

Goal 11: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

GLO 11.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

11B.11.1.2 Discuss how sustainable energy systems will become economically more attractive as fossil fuels become scarcer.

11B.11.1.3 Demonstrate an understanding of the latest industry trends.

8246 **Sustainable Energy: Transportation Systems (11C)** 30S / 30E / 30M

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

GLO 1.1: Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

11C.1.1.1 Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.

11C.1.1.9 Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).

Goal 3: Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems.**

GLO 3.1: Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

11C.3.1.1 Describe the environmental, economic, and energy security advantages of electric and hydrogen powered vehicles compared to those of fossil-fuel-powered vehicles.

GLO 3.2: Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

11C.3.2.2 Demonstrate an understanding of the infrastructure needed to support electric and hydrogen-powered vehicles.

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 6.1: Demonstrate **information and communication technology** skills required in the sustainable energy industry.

11C.6.1.1 Demonstrate the use of information and communication technology to research topics in sustainable energy.

Goal 11: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

GLO 11.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

11C.11.1.2 Discuss how sustainable energy systems will become economically more attractive as fossil fuels become scarcer.

11C.11.1.3 Demonstrate an understanding of the latest industry trends.

11C.11.1.4 Demonstrate an understanding of the provincial strategy for electric vehicles (e.g., Manitoba's Electric Vehicle Road Map, Manitoba Innovation, Energy and Mines).

Grade 12

8279 **Sustainable Energy: Solar Systems (12A)** 40S / 40E / 40M

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

GLO 1.1: Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

12A.1.1.1 Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.

12A.1.1.9 Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).

Goal 2: Demonstrate the safe and appropriate **operation, handling, cleaning, maintenance, and storage** of **equipment, tools, materials, products, and consumable items.**

GLO 2.2: Demonstrate the safe and appropriate **cleaning, maintenance, and storage** of equipment, tools, materials, products, and consumable items.

12A.2.2.1 Demonstrate the safe and appropriate cleaning, maintenance, and storage of equipment, tools, materials, products, and consumable items used in solar energy systems.

Goal 3: Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems.**

GLO 3.1: Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

12A.3.1.1 Describe existing strategies, both in the private and public sectors (e.g., Manitoba Innovation, Energy and Mines, Manitoba: 50 by ’30, Manitoba Sustainable Energy Association, Energy Manitoba), that promote solar energy systems in Manitoba.

GLO 3.2: Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

12A.3.2.1 Perform an energy audit for a building proposed as a site for the installation of a solar (photovoltaic [PV] or heat) energy system.

12A.3.2.2 Evaluate solar resources of a proposed solar energy installation site.

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 6.2: Read, interpret, and communicate information related to the sustainable energy industry.

12A.6.2.1 Read, interpret, and communicate information related to solar energy systems.

Goal 7: Demonstrate an understanding of the **ethical and legal standards** that pertain to the sustainable energy industry.

GLO 7.1: Demonstrate an awareness of the **ethical and legal expectations** of the sustainable energy industry.

12A.7.1.1 Demonstrate an understanding of the need to adhere to local authority requirements (e.g., permit, insurance, emission regulations) related to sustainable energy.

Goal 9: Demonstrate an awareness of **sustainability** as it pertains to the sustainable energy industry.

GLO 9.1: Describe the impact of **sustainability** on the **health and well-being** of sustainable energy industry workers, their customers, and those who are affected by their products and services.

12A.9.1.1 Discuss the benefits of solar energy systems to human health and well-being.

12A.9.1.2 Discuss how solar energy systems can negatively affect humans (e.g., aesthetic concerns).

GLO 9.2: Describe the sustainable energy industry's **sustainability practices and their impact on the environment.**

12A.9.2.1 Describe sustainability practices related to PV energy systems and their impact on the environment.

GLO 9.3: Describe the **relationship between the economy and sustainability practices** within the sustainable energy industry.

12A.9.3.1 Discuss the effect of solar energy systems on the local and national economies.

Goal 11: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

GLO 11.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

12A.11.1.1 Demonstrate an understanding of the evolution of solar energy systems, including their technological progression and emerging trends.

8292 **Sustainable Energy: Wind Systems (12B)** 40S / 40E / 40M

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

GLO 1.1: Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

12B.1.1.1 Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.

12B.1.1.9 Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).

Goal 2: Demonstrate the safe and appropriate **operation, handling, cleaning, maintenance, and storage** of **equipment, tools, materials, products, and consumable items.**

GLO 2.2: Demonstrate the safe and appropriate **cleaning, maintenance, and storage** of equipment, tools, materials, products, and consumable items.

12B.2.2.1 Demonstrate the safe and appropriate cleaning, maintenance, and storage of equipment, tools, materials, products, and consumable items used in wind energy systems.

Goal 3: Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems.**

GLO 3.1: Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

12B.3.1.1 Describe existing strategies, both in the private and public sectors (e.g., Manitoba Innovation, Energy and Mines, Manitoba Hydro, Manitoba: 50 by ’30, Manitoba Sustainable Energy Association, Energy Manitoba), that promote wind energy systems in Manitoba.

GLO 3.2: Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

12B.3.2.1 Perform an energy audit for a building proposed as a site for the installation of a small wind energy system.

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 6.2: Read, interpret, and communicate information related to the sustainable energy industry.

12B.6.2.1 Read, interpret, and communicate information related to wind energy systems.

Goal 7: Demonstrate an understanding of the **ethical and legal standards** that pertain to the sustainable energy industry.

GLO 7.1: Demonstrate an awareness of the **ethical and legal expectations** of the sustainable energy industry.

12B.7.1.1 Demonstrate an understanding of the need to adhere to local authority requirements (e.g., permit, insurance, emission regulations) related to sustainable energy.

Goal 9: Demonstrate an awareness of **sustainability** as it pertains to the sustainable energy industry.

GLO 9.1: Describe the impact of **sustainability** on the **health and well-being** of sustainable energy industry workers, their customers, and those who are affected by their products and services.

12B.9.1.1 Discuss the benefits of wind energy systems to human health and well-being.

12B.9.1.2 Discuss how wind energy systems can negatively affect humans (e.g., wind turbine syndrome).

GLO 9.2: Describe the sustainable energy industry's **sustainability practices and their impact on the environment.**

12B.9.2.1 Describe sustainability practices related to wind energy systems and their impact on the environment.

GLO 9.3: Describe the **relationship between the economy and sustainability practices** within the sustainable energy industry.

12B.9.3.1 Discuss the effect of wind energy systems on the local and national economies.

Goal 11: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

GLO 11.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

12B.11.1.1 Demonstrate an understanding of the evolution of wind energy systems, including their technological progression and emerging trends.

8293 **Sustainable Energy: Biomass Systems (12C)** 40S / 40E / 40M

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

GLO 1.1: Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

12C.1.1.1 Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.

12C.1.1.9 Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).

Goal 2: Demonstrate the safe and appropriate **operation, handling, cleaning, maintenance, and storage** of **equipment, tools, materials, products, and consumable items.**

GLO 2.2: Demonstrate the safe and appropriate **cleaning, maintenance, and storage** of equipment, tools, materials, products, and consumable items.

12C.2.2.1 Demonstrate the safe and appropriate cleaning, maintenance, and storage of equipment, tools, materials, products, and consumable items used in biomass energy systems.

Goal 3: Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems.**

GLO 3.1: Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

12C.3.1.1 Describe existing strategies, both in the private and public sectors (e.g., Manitoba innovation, Energy and Mines, Manitoba Hydro, Manitoba: 50 by ’30, Manitoba Sustainable Energy Association, Energy Manitoba), that promote biomass energy systems in Manitoba.

GLO 3.2: Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

12C.3.2.1 Perform an energy audit for a building proposed as a site for the installation of a biomass energy (heating or electrical) system.

12C.3.2.8 Discuss logistics (e.g., removal, storage) related to ash content in feedstock.

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 6.2: Read, interpret, and communicate information related to the sustainable energy industry.

12C.6.2.1 Read, interpret, and communicate information related to biomass energy systems.

Goal 7: Demonstrate an understanding of the **ethical and legal standards** that pertain to the sustainable energy industry.

GLO 7.1: Demonstrate an awareness of the **ethical and legal expectations** of the sustainable energy industry.

12AC7.1.1 Demonstrate an understanding of the need to adhere to local authority requirements (e.g., permit, insurance, emission regulations) related to sustainable energy.

Goal 9: Demonstrate an awareness of **sustainability** as it pertains to the sustainable energy industry.

GLO 9.1: Describe the impact of **sustainability** on the **health and well-being** of sustainable energy industry workers, their customers, and those who are affected by their products and services.

12C.9.1.1 Discuss the benefits of biomass energy systems to human health and well-being.

12C.9.1.2 Discuss how biomass energy systems can negatively affect humans (e.g., emissions).

GLO 9.2: Describe the sustainable energy industry's **sustainability practices and their impact on the environment.**

12C.9.2.1 Describe sustainability practices related to biomass energy systems and their impact on the environment.

GLO 9.3: Describe the **relationship between the economy and sustainability practices** within the sustainable energy industry.

12C.9.3.1 Discuss the effect of biomass energy systems on the local and national economies.

Goal 11: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

GLO 11.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

12C.11.1.1 Demonstrate an understanding of the evolution of biomass energy systems, including their technological progression and emerging trends.

8294 **Sustainable Energy: Applied Systems (12D)** 40S / 40E / 40M

Goal 1: Describe and apply appropriate **health and safety practices** as they relate to the sustainable energy industry.

GLO 1.1: Demonstrate adherence to **safety practices and procedures** for **facilities, processes, tools, and equipment** used in the sustainable energy industry.

12D.1.1.1 Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.

12D.1.1.9 Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).

Goal 2: Demonstrate the safe and appropriate **operation, handling, cleaning, maintenance, and storage** of **equipment, tools, materials, products, and consumable items.**

GLO 2.2: Demonstrate the safe and appropriate **cleaning, maintenance, and storage** of equipment, tools, materials, products, and consumable items.

12D.2.2.1 Demonstrate the safe and appropriate cleaning, maintenance, and storage of equipment, tools, materials, products, and consumable items used in applied sustainable energy systems.

Goal 3: Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems.**

GLO 3.1: Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

12D.3.1.1 Design and implement a promotion campaign for a sustainable energy system.

GLO 3.2: Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

12D.3.2.1 Perform a feasibility study to determine the economic and environmental implications of a sustainable energy system.

12D.3.2.2 Plan a sustainable energy system based on the results of a feasibility study.

12D.3.2.3 Present a feasibility study of and plan for a sustainable energy system.

Goal 6: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 6.2: Read, interpret, and communicate information related to the sustainable energy industry.

12D.6.2.1 Read, interpret, and communicate information related to sustainable energy systems.

Goal 7: Demonstrate an understanding of the **ethical and legal standards** that pertain to the sustainable energy industry.

GLO 7.1: Demonstrate an awareness of the **ethical and legal expectations** of the sustainable energy industry.

12D.7.1.1 Demonstrate an understanding of the need to adhere to local authority requirements (e.g., permit, insurance, emission regulations) related to sustainable energy.

12D.7.1.3 Investigate and conform to local authority requirements (e.g., permit, insurance, emission regulations) related to sustainable energy.

Goal 9: Demonstrate an awareness of **sustainability** as it pertains to the sustainable energy industry.

GLO 9.1: Describe the impact of **sustainability** on the **health and well-being** of sustainable energy industry workers, their customers, and those who are affected by their products and services.

12D.9.1.1 Research the benefits of sustainable energy systems to human health and well-being, and incorporate the findings into a feasibility study.

12D.9.1.2 Research the long-term health hazards related to sustainable energy systems, and incorporate the findings into a feasibility study.

GLO 9.2: Describe the sustainable energy industry's **sustainability practices and their impact on the environment.**

12D.9.2.1 Research the environmental impact of sustainable energy systems, and incorporate the findings into a feasibility study.

GLO 9.3: Describe the **relationship between the economy and sustainability practices** within the sustainable energy industry.

12D.9.3.1 Research the effect of sustainable energy systems on the local and national economies, and incorporate the findings into a feasibility study.

Goal 11: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

GLO 11.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends.**

12D.11.1.1 Research the evolution of sustainable energy systems, including their technological progression and emerging trends.