



8233

INTRODUCTION TO
SUSTAINABLE ENERGY (10)

20S/20E/20M

A Sustainable Energy Course

8233: INTRODUCTION TO SUSTAINABLE ENERGY (10) 20S/20E/20M

Course Description

This course provides a broad introduction to the field of sustainable energy. Students will explore historical and current sustainable energy use strategies in Manitoba.

Topics include the following:

- the historical role of energy in Manitoba
- current conventional energy use in Manitoba
- emerging alternative energy use in Manitoba: electricity, heat, and transportation
- safety practices and procedures

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.

- SLO 10.1.1.1: Demonstrate adherence to safety practices and procedures for facilities, processes, tools, and equipment used in the sustainable energy industry.
- SLO 10.1.1.2: Identify health and safety requirements.
- SLO 10.1.1.3: Identify personal protective equipment (PPE) and procedures.
- SLO 10.1.1.4: Identify electrical safety practices and procedures.
- SLO 10.1.1.5: Identify fire safety practices and procedures.
- SLO 10.1.1.6: Identify ergonomic considerations related to the sustainable energy industry.
- SLO 10.1.1.7: Identify hazard recognition and control practices.
- SLO 10.1.1.8: Describe the hazards of confined space entry.
- SLO 10.1.1.9: Identify safety requirements as they apply to the Workplace Hazardous Materials Information System (WHMIS).
- SLO 10.1.1.10: Describe the identification and control of specified hazards.
- SLO 10.1.1.11: Identify safe work practices related to the sustainable energy industry.

- SLO 10.1.1.12: Identify safety guidelines related to the sustainable energy industry.
- SLO 10.1.1.13: Identify safe material-handling procedures.
- SLO 10.1.1.14: Read, interpret, and communicate safety information (e.g., material safety data sheets [MSDS]) related to sustainable energy.
- SLO 10.1.1.15: Demonstrate safe practices for working from heights, including ladder safety.
- SLO 10.1.1.16: Demonstrate safe practices for working with fire, including air quality considerations.
- SLO 10.1.1.17: Demonstrate safe boating practices.

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

GLO 2.1: Demonstrate the safe and appropriate **operation and handling** of equipment, tools, materials, products, and consumable items.

- SLO 10.2.1.1: Demonstrate the safe and appropriate operation and handling of hand tools (e.g., hammer, saw, screwdriver, wrench, pliers, metal cutters, utility knife).
- SLO 10.2.1.2: Demonstrate the safe and appropriate operation and handling of power tools (e.g., drill, skill saw, table saw).

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

- SLO 10.2.2.1: Demonstrate the safe and appropriate cleaning, maintenance, and storage of hand tools (e.g., hammer, saw, screwdriver, wrench, pliers, metal cutters, utility knife).
- SLO 10.2.2.2: Demonstrate the safe and appropriate cleaning, maintenance, and storage of power tools (e.g., drill, skill saw, table saw).
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Goal 3: Demonstrate an understanding of **demand-side management (DSM)** as it applies to sustainable energy.

GLO 3.1: Demonstrate an understanding of **DSM** as it applies to sustainable energy.

SLO 10.3.1.1: Demonstrate an awareness of the benefits of reducing energy consumption.

SLO 10.3.1.2: Demonstrate an awareness of strategies for reducing energy consumption.

Goal 4: Demonstrate the knowledge and skills required to **promote and plan sustainable energy systems**.

GLO 4.1: Demonstrate the knowledge and skills required to **promote** sustainable energy systems.

SLO 10.4.1.1: Describe the advantages and disadvantages of using hydrocarbons as an energy source.

SLO 10.4.1.2: Describe sustainable energy sources and how they differ from conventional energy sources.

SLO 10.4.1.3: Demonstrate an understanding of different uses of sustainable energy (e.g., electricity, heating/cooling, transportation).

SLO 10.4.1.4: Demonstrate an understanding of solar energy distribution and the role solar energy plays in sustainable energy sources.

SLO 10.4.1.5: Calculate greenhouse gas emissions for various energy sources.

SLO 10.4.1.6: Conduct a home energy audit.

SLO 10.4.1.7: Demonstrate an understanding of various economic incentives related to sustainable energy.

SLO 10.4.1.8: Describe various sites in Manitoba that use sustainable energy or that conduct research and undertake development in the area of sustainable energy.

GLO 4.2: Demonstrate the knowledge and skills required to **plan** sustainable energy systems.

SLO 10.4.2.1: Evaluate various sustainable energy options (e.g., using RETScreen software).

Goal 5: Demonstrate the knowledge and skills required to **install or convert sustainable energy systems**.

GLO 5.1: Demonstrate the knowledge and skills required to **perform the installation or conversion** of sustainable energy systems.

No applicable SLOs.

Goal 6: Demonstrate the knowledge and skills required to **maintain sustainable energy systems**.

GLO 6.1: Demonstrate the knowledge and skills required to **perform preventive maintenance** of sustainable energy systems.

No applicable SLOs.

GLO 6.2: Demonstrate the knowledge and skills required to **diagnose malfunctions** in sustainable energy systems.

No applicable SLOs.

GLO 6.3: Demonstrate the knowledge and skills required to **repair** sustainable energy systems.

No applicable SLOs.

Goal 7: Describe and apply transferable **cross-curricular knowledge and skills** as they relate to sustainable energy.

GLO 7.1: Demonstrate **information and communication technology** skills required in the sustainable energy industry.

SLO 10.7.1.1: Demonstrate the use of information and communication technology to research topics in sustainable energy.

SLO 10.7.1.2: Explore problems and issues that demonstrate the interdependence of science, technology, society, and the environment.

GLO 7.2: **Read, interpret, and communicate information** related to the sustainable energy industry.

No applicable SLOs.

GLO 7.3: Demonstrate knowledge of **mathematical** concepts and skills related to the sustainable energy industry.

SLO 10.7.3.1: Solve problems involving fractions.

SLO 10.7.3.2: Solve problems involving decimals.

SLO 10.7.3.3: Solve problems involving percentages and ratios.

SLO 10.7.3.4: Solve problems involving metric and imperial measurements.

SLO 10.7.3.5: Solve problems involving geometric formulas.

GLO 7.4: Demonstrate knowledge of **science** as it relates to the sustainable energy industry.

SLO 10.7.4.1: Differentiate between the various forms of energy.

SLO 10.7.4.2: Differentiate between power and energy.

SLO 10.7.4.3: Identify the origins and major sources of hydrocarbons.

SLO 10.7.4.4: Convert between the various energy units (e.g., British thermal units [BTUs], joules).

GLO 7.5: Demonstrate knowledge of **physical education/health education** as it relates to the sustainable energy industry.

SLO 10.7.5.1: Identify first aid and cardiopulmonary resuscitation (CPR) procedures.

Goal 8: Demonstrate an understanding of the **ethical and legal standards** that pertain to the sustainable energy industry.

GLO 8.1: Demonstrate an awareness of the **ethical and legal expectations** of the sustainable energy industry.

SLO 10.8.1.1: Demonstrate an understanding of the importance of accurate performance reporting of sustainable energy technologies.

SLO 10.8.1.2: Demonstrate an understanding of when sustainable energy projects legally require impact assessments.

Goal 9: Practise **employability skills** required in the sustainable energy industry.

GLO 9.1: Demonstrate **employability skills**.

- SLO 10.9.1.1: Demonstrate problem-solving skills.
- SLO 10.9.1.2: Demonstrate critical thinking skills.
- SLO 10.9.1.3: Demonstrate regular attendance and punctuality.
- SLO 10.9.1.4: Demonstrate accountability by taking responsibility for own actions.
- SLO 10.9.1.5: Demonstrate adaptability, initiative, and effort.
- SLO 10.9.1.6: Demonstrate the ability to accept feedback and to follow direction.
- SLO 10.9.1.7: Demonstrate teamwork skills.
- SLO 10.9.1.8: Demonstrate the ability to stay on task and to make effective use of time in class and shop environments.
- SLO 10.9.1.9: Demonstrate the ability to communicate respectfully and effectively with co-workers and customers.

Goal 10: Demonstrate an awareness of **sustainability** as it pertains to the sustainable energy industry.

GLO 10.1: 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.

- SLO 10.10.1.1: Discuss the impact of sustainable energy systems on human health and well-being.

GLO 10.2: Describe the sustainable energy industry's **sustainability practices and their impact on the environment**.

- SLO 10.10.2.1: Describe how the use of sustainable energy can be sustainable from an environmental perspective.
- SLO 10.10.2.2: Describe how sustainable energy use produces less greenhouse gas than conventional energy use.

GLO 10.3: Describe the **relationship between the economy and sustainability practices** within the sustainable energy industry.

- SLO 10.10.3.1: Describe how the use of sustainable energy can be sustainable from an economic perspective.
 - SLO 10.10.3.2: Describe current economic factors that are promoting sustainable energy.
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Goal 11: Demonstrate an understanding of **career options** in sustainable energy.

GLO 11.1: Describe **apprenticeship, post-secondary education, and employment opportunities** related to sustainable energy.

SLO 10.11.1.1: Demonstrate an understanding of the various sustainable energy training opportunities available locally, nationally, and internationally.

SLO 10.11.1.2: Demonstrate an understanding of employment opportunities available within the sustainable energy sector.

Goal 12: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends**.

GLO 12.1: Demonstrate an understanding of the **evolution** of sustainable energy, including its **technological progression** and **emerging trends**.

SLO 10.12.1.1: Discuss how the cost of sustainable energy technologies per unit decreases and performance increases over time.

SLO 10.12.1.2: Discuss how sustainable energy systems will become economically more attractive as fossil fuels become scarcer.

SLO 10.12.1.3: Demonstrate an understanding of the technological progression of and emerging trends in sustainable energy within Manitoba.

SLO 10.12.1.4: Demonstrate an understanding of the history of human energy use and related changes to the environment.
