

# Energy Resources Overview

Essential Questions	Core Lesson
How do we use energy in Michigan? How and why has our energy consumption changed? How does Michigan’s energy use compare to the energy use of the United States?	<b>1. Energy Use in Michigan Then and Now</b> —Students learn how energy consumption has changed over the past 100 years, why it has changed, and the impact it has had. Students brainstorm and categorize uses of energy, take part in an optional consumption simulation, interpret graphs about energy use, take surveys, and engage in small group and classroom discussions about energy comparisons.
What is the difference between renewable and non-renewable energy resources? Which energy resources does Michigan use? Where does Michigan get its energy resources and how are they transported?	<b>2. Michigan’s Energy Resource Mix</b> —Students use pictures, graphs, and a map to identify the kinds of energy we use in Michigan, differentiate between renewable and non-renewable energy resources, and identify the sources of Michigan’s energy resources.
How are energy resources transformed into the electricity we use in our homes, schools and businesses? Which energy resources are used to generate electricity in Michigan, the United States and the world?	<b>3. Generating Michigan’s Electricity</b> —Students build a model turbine to observe how different energy resources can be used to turn a turbine, inquire how the interaction between a wire and a magnet generates electricity, and investigate the different mix of energy resources used to generate electricity in Michigan, the United States, and the world.
What are the economic, social, and environmental advantages and disadvantages of using coal, petroleum, natural gas, and uranium (nuclear fission) to produce electricity? What are the environmental impacts of my family’s electricity use?	<b>4. Non-renewable Energy Choices and Impacts</b> —The advantages and disadvantages of different kinds of non-renewable energy sources are the focus of this lesson. Students match different kinds of energy resources with their advantages and disadvantages, and then discuss whether these advantages and disadvantages are economic, ecological, or social. As an extension students identify the environmental impacts of their family’s electricity usage using EPA’s <i>Power Profiler</i> web site.
What are the characteristics of our renewable energy resources? Which renewable energy resources have the greatest potential in Michigan? What are the economic, social, and environmental advantages and disadvantages of wind, solar, hydroelectric, biomass, and geothermal energy resources? How do the advantages and disadvantages of non-renewable and renewable resources compare?	<b>5. Renewable Energy and Michigan</b> —The focus of this lesson is learning about the advantages and disadvantages of different kinds of renewable energy resources and their potential use in Michigan. Students read about different renewable resources, watch a teacher demonstration, and match different kinds of energy sources with the advantages and disadvantages of each. Students then compare the advantages and disadvantages of renewable and non-renewable resources and use the comparisons to write a letter to their state legislators.
What are the benefits of energy conservation and energy efficiency? What data and tools can you use to help you make better decisions about your energy and resource use and your personal actions?	<b>6. Energy Conservation and Efficiency: Leaks and Lights</b> —Energy conservation and energy efficiency are the focus of this lesson. Students learn how basic energy conservation and energy efficiency choices can save their family money, reduce energy consumption, and prevent energy-related pollution. Students learn how to identify and fix air leaks, compare incandescent and compact fluorescent light bulbs, and list ways they can conserve energy and increase energy efficiency in their daily lives.
What are the economic, social, and environmental consequences of your product choices? What tools and data can consumers use to help make better decisions about energy and resource use and personal actions?	<b>7. Using a Product’s Life Cycle</b> —The lesson introduces the concept of a product life cycle and how it can be used as tool for the consumer to make more environmentally friendly product choices. The lesson uses the life cycle of a CD or DVD as an example to investigate the life cycle of an everyday product and examine options for reusing, recycling, or disposing of the item after its useful life. Students are introduced to pollution prevention strategies (the three Rs), how consumers can use them, and how the strategies can be incorporated at different stages of a product’s life cycle to make a product more economically and environmentally sustainable.
What is my ecological footprint? What choices can I make or actions can I take that will reduce my energy and resource consumption and impact on the environment?	<b>8. Leaving Smaller Footprints</b> —This lesson develops the concept of an ecological footprint. Students use data and tools to assess the impacts of their energy and resource consumption. They examine their results and assess their impacts on the environment. Students discuss and compare their impacts and try to identify actions to reduce their footprints.
<b>Enhancements/Extensions</b>	

1- Students research energy sources used to complete everyday tasks during different time periods in Michigan history.

- *Meter Monitor* activity on the Get Smart About Energy CD-ROM
- *The Lighting Audit* activity on the Get Smart About Energy CD-ROM
- *What's a Watt* activity on the Get Smart About Energy CD-ROM
- *Analyze 2001 Household Energy Consumption Data* on the MEECS Energy Resources CD-ROM

2- *Natural Gas* PowerPoint presentation on the MEECS Energy Resources CD-ROM

- *Home Energy Use*—MTU Tech Alive Web Module

3- Students compare the energy portfolios and energy consumption of different nations to Michigan and the United States using sources from the References and Additional Resources sections.

- Students examine global electricity using NASA's "Night Lights" poster.

4- *Oil, Gas and Coal in Your Lifetime*—MTU Tech Alive Web Module

- Students explore EPA's *Global Warming Kids Page*.
- Students take online virtual tours of a coal mine, coal-fired power plant, and a nuclear power plant
- Students use the EPA's *eGrid* database to find the emissions profile, generation resource mix, and plant characteristic data for their utility's nearest power plant
- Students conduct online research to answer: Should directional drilling for oil and natural gas be allowed in the Great Lakes?
- Students learn about the history of oil using the "Oil Age Poster"

5- Students design an experiment to test if they can complete an everyday task using renewable energy source.

- Students take online tours of hydroelectric and geothermal plants
- *My Decisions Impact Michigan, the United States and the World*—MTU Tech Alive Web Module
- Students research how Michigan homes and businesses are using renewable energy using the resources provided
- Students use Michigan *Biomass Curriculum Project* activities on the MEECS Energy Resources CD-ROM to learn about biomass
- Students watch the "Great Lakes, Great Wind" DVD to learn more about wind power.

6- Project Learning Tree's *In the Driver's Seat* activity on the MEECS Energy Resources CD-ROM

- Students take the *Energy Savers Virtual Home Tour* on the Energy Savers CD-ROM.
- Students take the online *Lighting Quiz: Change a Light and Change the World*.
- *Energy Power Plants: Using Bicycles for Transportation* lesson on the Get Smart About Energy CD-ROM
- Students make smart energy choices and play fun energy games at the US DOE *Energy Hog* web site.
- Students read about *Michigan Renewable Energy and Efficiency Success Stories* at the Urban Options web site

7- Students plan an eco-friendly lunch.

- *Life Cycle Analysis of Paper and Plastic Bags*—MTU Tech Alive Web Module
- *Where Does Our Garbage Go?*—MTU Tech Alive Web Module
- Students play EPA's online *Recycle City* game
- *A Collection of Solid Waste* Resources CD-ROM
- *Life Cycle of a Sport Shoe* activity on the MEECS Energy Resources CD-ROM

8- Students calculate the average ecological footprint of the class and compare it to the size of their home's property

- Green Teacher's *Measuring Your School's Ecological Footprint*
- *Sustainability*—MTU Tech Alive Web Module
- Students play the Union of Concerned Scientists online *Great Green Web Game*
- Students read the *Sustainability Fact Sheets* provided with this unit
- Students develop an environmental stewardship program

- Develop an awareness of and sensitivity to the natural world (SCI.II.1.MS.5).
- Describe ways in which humans alter the environment (SCI.III.5.MS.6).
- Develop an awareness of and sensitivity to the natural world (SCI.II.1.HS.6).
- Explain how humans modify the environment and describe some of the possible consequences of those modifications (SS.II.2.MS.4).
- Describe how social and scientific changes in regions may have global consequences (SS.II.5.MS.1).
- Interpret social science information about the natural environment and cultures of countries from a variety of primary and secondary sources (SS.V.1.MS.3).
- Explain how processes like population growth, economic development, urbanization, resource use, international trade, global communication, and environmental impact are affecting different world regions (SS.II.4.HS.3).

- Develop an awareness of and sensitivity to the natural world (SCI.II.1.MS.5).
- Develop an awareness of and sensitivity to the natural world (SCI.II.1.HS.6).
- Describe how and why people, goods and services, and information move within world regions and between regions (SS.II.3.MS.3).
- Compare various methods for the production and distribution of goods and services (SS.IV.2.MS.2).
- Explain how processes like population growth, economic development, urbanization, resource use, international trade, global communication, and environmental impact are affecting different world regions (SS.II.4.HS.3).

- Describe common energy transformations in everyday situations (SCI.IV.2.MS.4).
- Describe how electric currents can be produced by interacting wires and magnets and explain applications of this principle (SCI.IV.1.HS.5).
- Explain changes in matter and energy involving heat transfer (SCI.IV.2.HS.5).
- Compare various methods for the production and distribution of goods and services (SS.IV.2.MS.2).

- Describe ways in which humans alter the environment (SCI.III.5.MS.6).
- Describe how human activities affect the quality of water in the hydrosphere (SCI.V.2.HS.2).
- Explain the impacts of human activities on the atmosphere and explain ways that individuals and society can reduce pollution (SCI.V.3.HS.4).
- Explain how humans modify the environment and describe some of the possible consequences of those modifications (SS.II.2.MS.4).

- Describe the advantages and risks of new technologies (SCI.II.1.MS.4).
- Describe ways in which humans alter the environment (SCI.III.5.MS.6).
- Explain the social and economic advantages and risks of new technology (SCI.II.1.HS.5).
- Explain the impact of human activities on the atmosphere and explain ways that individuals and society can reduce pollution (SCI.V.3.HS.4).
- Explain how humans modify the environment and describe some of the possible consequences of those modifications (SS.II.2.MS.4).
- Explain how the rule of law protects individual rights and serves the common good (SS.III.1.MS.3).
- Compare various methods for the production and distribution of goods and services (SS.IV.2.MS.2).

- Describe the advantages and risks of new technologies (SCI.II.1.MS.4).
- Explain the social and economic advantages and risks of new technology (SCI.II.1.HS.5).
- Explain changes in matter and energy involving heat transfer (SCI.IV.2.HS.5).
- Use economic reasoning when comparing price, quality, and features of goods and services (SS.IV.1.MS.1).

- Evaluate alternative long range plans for resources use and by-product disposal in terms of environmental and economic impact (SCI.V.1.HS.4).
- Explain the impact of human activities on the atmosphere and explain ways that individuals and society can reduce pollution (SCI.V.3.HS.4).
- Use economic reasoning when comparing the price, quality, and features of goods and services (SS.IV.1.MS.1).
- Compare various methods for the production and distribution of goods and services (SS.IV.2.MS.2).

- Describe ways in which humans alter the environment (SCI.III.5.MS.6).
- Explain how humans modify the environment and describe some of the possible consequences of those modifications (SS.II.2.MS.4).
- Describe the consequences of human/environment interactions in several different types of environments (SS.II.2.MS.5).
- Describe how social and scientific changes in regions may have global consequences (SS.II.5.MS.1).