MDEQ CMEEI ~ Energy Resources Unit Overview ~ Grades 7-9 ~ Science & Social Studies

Essential Questions	Major Topics	Core Lesson	Enhancements	Extensions
How do we use energy in Michigan and how has our consumption changed?	Past and present energy use, consumption comparisons and impacts	*1.Energy Use in Michigan*- Identify/discuss uses of energy in Michigan. Compare energy consumption of past and present generations and the impact it has had.	**Michigan's Energy Past*- Research energy sources used to complete everyday tasks during different time periods in Michigan's history.	**An Energy Diary*-Students record their electricity usage, graph their data and explore ways to decrease consumption.
What's the difference between renewable and non-renewable energy resources? What kinds of energy does Michigan use? Where does Michigan get its energy and how is it transported?	Energy source and use, renewable and non-renewable energy	*2. Michigan's Energy Resource Mix*-Use pictures, graphs and maps to identify the kinds of energy we use in Michigan, differentiate between renewable and non-renewable energy resources, identify sources of Michigan's energy, and compare Michigan's resource mix to that of the U.S. and other countries.	**Get Smart about Energy* CD-Rom.	*Extraction, processing, transmission and distribution of energy PowerPoint.
How is electricity generated, and how does it get to our homes?	Energy transformation, generator, electricity, transformer, turbine, voltage, electricity distribution	*3. Generating Michigan's Electricity*-Build a turbine to understand how energy resources are used to generate electricity.	**Generating and transporting electricity* PowerPoint.	**Where does our energy come from?* - MTU Tech Alive Web Module
What are the economic, social and environmental advantages and disadvantages of using coal, petroleum, natural gas and nuclear to produce electricity? What are the environmental impacts of my family's electricity use?	Characteristics of non-renewable energy resources, environmental, economic and social impacts of using non-renewable energy resources, personal impacts	*4. Non-renewable Energy Choices and Impacts*- Learn about the advantages and disadvantages of different kinds of non-renewable energy sources. Look at Michigan's energy resources and use data to identify the environmental impacts of their own electricity usage using EPA's *Power Profiler*.	**My Electrical Utility*-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.	**Non-renewable Energy Virtual Tours*-Virtual tours of a coal mine, coal fired power plant and a nuclear power plant.
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?	Characteristics of renewable energy resources, availability of renewable energy in Michigan, environmental, economic and social advantages and disadvantages of renewable energy	*5. Renewable Energy and Michigan*- Compare and contrast renewable energy technologies. Read Michigan renewable energy case studies and create a chart to evaluate the suitability of renewable energy sources. Compare the advantages and disadvantages of renewable and non-renewable resources. Discuss the role of government.	**Using Renewables*-Students design an experiment to test if they can complete an everyday task using a renewable energy source.	**Renewable Energy Virtual Tours*-Tours of hydroelectric and geothermal plants. **Energy and Environment*- MTU Tech Alive Web Module
How can energy conservation and energy efficiency conserve energy resources and prevent pollution? What data and tools can you use to help you make better decisions about your energy and resource use and your personal actions?	Energy conservation, energy efficiency, incandescent and compact fluorescent bulbs, insulation, waste energy, pay back time	*6. Leaks and Lights*-Explore how basic energy conservation and energy efficiency choices saves money, reduces energy consumption, and prevents pollution of Michigan's air, water and land. Includes a home caulking air leaks activity.	**US DOE Energy Savers Virtual Home Tour*-Students learn about saving money, energy and the environment. **Dodging Leaks*-Make and install draft dodgers and switch plate insulators. **Home Energy Use*- MTU Tech Alive Web Module	**Energy Hog*-How to make smart energy choices and play fun energy games. **Lighting Quiz: Change a light and change the world*-Test and expand their lighting knowledge.
What are the economic, social, and environmental consequences of our product choices? What tools and data can help us make better decisions about energy and resource use?	Product life cycle, pollution prevention (reduce, reuse, recycle), sustainability	*7. Using a Product's Life Cycle*- Use the life cycle of a CD or DVD poster and examine options for reusing, recycling, or disposing of the item after its useful life. Identify the direct and indirect economic, social, and environmental consequences of product choices and learn how to use a product's life cycle assessment to make more environmentally friendly choices.	**A Product's Life cycle*-Students research the life cycle of a product and redesign the product to make it more sustainable. **DumpTown or Recycle City?*- Play the EPA's "DumpTown" and "Recycle City" games.	**Eco-friendly Lunch*-Make a meal with the least waste. **Life Cycle*- MTU Tech Alive Web Module **Where does our garbage go?*- MTU Tech Alive Web Module
What is my ecological footprint? What choices can I make that will reduce my energy and resource consumption and impact on the environment?	Ecological footprint, stewardship, sustainability	*8. Leaving Smaller Footprints*- Develop the concept of an ecological footprint. Use data and tools to assess the impacts of their energy and resource consumption. Discuss and compare their impacts and identify and take actions to reduce their footprints.	**Reducing our Community's Footprint*- Develop an environmental stewardship program in their school or community.	**Great Green Web Game*- How consumer choices impact the environment. **Personal Decisions*- MTU Tech Alive Web Module

Enduring Understandings for the MDEQ CMEEI Energy Resources Unit

Students will understand that:

1. (Awareness) All people use renewable and non-renewable energy and resources to meet their basic needs and to improve their material standard of living.
2. (Awareness) Michigan uses more energy and resources today than did past generations.
3. (Concern) Energy and product choices have direct and indirect economic, social, and environmental consequences that affect everyone.
4. (Knowledge) To make renewable and non-renewable energy sources available for human use, the energy resource *usually* has to be processed, transported and transformed which also requires energy.
5. (Knowledge/problem solving) Energy conservation and energy efficiency saves money; reduces energy consumption; and prevents pollution of Michigan's air, water, and land.
6. (Knowledge/connections) Pollution prevention (reduce, reuse, and recycle strategies) can help conserve energy and resources and protect Michigan's environment.
7. (Stewardship/decision making) People can use a variety of tools including data collection and analysis to make decisions about their energy and product choices, and personal actions.
8. (Sustainability/stewardship) A sustainable future depends on personal choices and actions, the development of wise policies, the use of renewable energies, the development of new technologies and the conservation of available resources.

Lesson 1: *Energy Use in Michigan*

In this lesson students learn how energy consumption has changed over the past 100 years, why it has changed and impact it has had. Students will brainstorm and categorize uses of energy, take part in a consumption simulation, interpret graphs about energy use, take surveys and engage in small group and classroom discussions about energy comparisons and the impact of consumption.

Lesson 2: *Michigan's Energy Resource Mix*

In this lesson students use pictures, graphs and maps 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. Students compare the energy mix used in Michigan to that of the U.S. and other countries.

Lesson 3: *Generating Michigan's Electricity*

In this lesson students build a turbine to understand how energy resources are used to generate electricity. The lesson develops the basic idea that using energy to turn a turbine connected to a generator creates electricity. A turbine can be turned directly by water (hydro-electric) or wind or indirectly by using coal, oil, natural gas or nuclear reactions to heat water and generate steam that turns a turbine.

Lesson 4: *Non-Renewable Energy Choices and Impacts*

The focus of the lesson is on learning about the advantages and disadvantages of different kinds of non-renewable energy sources. Students match different kinds of energy resources with the advantages and disadvantages of each, and then discuss whether they are economic, ecological, or social/political issues. As an extension students identify the environmental impacts of their family's electricity usage using EPA's *Power Profiler*.

Lesson 5: *Renewable Energy and Michigan*

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.

Lesson 6: *Energy Conservation and Efficiency: Leaks and Lights*

The focus of this lesson is energy conservation and energy efficiency. Students explore how basic energy conservation and energy efficiency choices, especially with respect to home heating and lighting saves money, reduces energy consumption, and prevents pollution of Michigan's air, water, and land. In addition to basic information about energy conservation and efficiency, the lesson also includes resources for a home air leak caulking activity.

Lesson 7: *Using a Product's Life Cycle*

The lesson introduces the concept of a product's life cycle, and how it relates to making more ecologically informed choices. The lesson uses the Life cycle of a CD or DVD poster as a student resource 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 will try to identify direct and indirect economic, social, and environmental consequences of their product choices, and learn how to use a product's life cycle assessment to make more environmentally friendly choices.

Lesson 8: *Leaving Smaller Footprints*

The focus of this lesson is on developing 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 identify and take actions to reduce their footprints.