

# **Megawatts & Marbles**

- Curricular Connections -

# Science

Grade	Core Competencies	Big Ideas	Curricular Competencies	Activity Connections	Content
4	Thinking	Energy can be transformed.	<p><b>Questioning and predicting</b></p> <ul style="list-style-type: none"> <li>Identify questions about familiar objects and events that can be investigated scientifically</li> <li>Make predictions based on prior knowledge</li> </ul> <p><b>Planning and conducting</b></p> <ul style="list-style-type: none"> <li>Collect simple data</li> </ul> <p><b>Processing and analyzing data and information</b></p> <ul style="list-style-type: none"> <li>Use tables, simple bar graphs, or other formats to represent data and show simple patterns and trends</li> <li>Compare results with predictions, suggesting possible reasons for findings</li> </ul> <p><b>Evaluating</b></p> <ul style="list-style-type: none"> <li>Make simple inferences based on their results and prior knowledge</li> <li>Identify some simple environmental implications of their and others' actions</li> </ul> <p><b>Applying and innovating</b></p> <ul style="list-style-type: none"> <li>Cooperatively design projects</li> <li>Transfer and apply learning to new situations</li> <li>Generate and introduce new or refined ideas when problem solving</li> </ul>	<p>How power plants behave (question and predict) Demand: why this shape, predict rise or fall Collect and count marbles</p> <p>Visualize production (bar graph), compare to demand</p> <p>analyze demand: matched or not? environmental implication of coal, gas, wind, etc</p> <p>Apply learned lessons to design own system Problem: how to handle flexible demand/ production</p>	<ul style="list-style-type: none"> <li>Energy: <ul style="list-style-type: none"> <li>has various forms</li> <li>is conserved</li> </ul> </li> <li>devices that transform energy</li> </ul>
7	Thinking	The electromagnetic force produces both electricity and magnetism.	<p><b>Processing and analyzing data and information</b></p> <ul style="list-style-type: none"> <li>Seek patterns and connections in data from their own investigations and secondary sources</li> <li>Use scientific understandings to identify relationships and draw conclusions</li> </ul> <p><b>Evaluating</b></p> <ul style="list-style-type: none"> <li>Demonstrate an understanding and appreciation of evidence (qualitative and quantitative)</li> <li>Consider social, ethical, and environmental implications of the findings from their own and others' investigations</li> </ul> <p><b>Applying and innovating</b></p> <ul style="list-style-type: none"> <li>Transfer and apply learning to new situations</li> <li>Generate and introduce new or refined ideas when problem solving</li> </ul>	<p>Visualize production (bar graph), compare to demand, analyze demand shape, how can it be changed?</p> <p>demand: matched or not?Consequences? environmental implication of coal, gas, wind, etc</p> <p>Apply learned lessons to design own system Problem: how to handle flexible demand/ production</p>	<ul style="list-style-type: none"> <li>Electricity <ul style="list-style-type: none"> <li>generated in different ways with different environmental impacts</li> </ul> </li> </ul>

# Applied Design, Skills, and Technologies

Grade	Core Competencies	Big Ideas	Curricular Competencies	Activity Connections	Content
6	Thinking	Complex tasks may require multiple tools and technologies.	<b>Applied Technologies</b> <ul style="list-style-type: none"> <li>Identify the personal, social, and environmental impacts, including unintended negative consequences, of the choices they make about technology use</li> <li>Identify how the land, natural resources, and culture influence the development and use of tools and technologies</li> </ul>	Discuss consequences of electricity production and use; Alternatives? Consequences of alternatives? Show the impact of our own choices about electricity use	<b>Power Technology</b> <ul style="list-style-type: none"> <li>power is the rate at which energy is transformed</li> <li>forms of energy</li> <li>energy is conserved</li> <li>devices that transform energy</li> </ul>
7	Thinking	Complex tasks may require multiple tools and technologies.	<b>Applied Technologies</b> <ul style="list-style-type: none"> <li>Identify the personal, social, and environmental impacts, including unintended negative consequences, of the choices they make about technology use</li> <li>Identify how the land, natural resources, and culture influence the development and use of tools and technologies</li> </ul>	Discuss consequences of electricity production and use; Alternatives? Consequences of alternatives? Show the impact of our own choices about electricity use	<b>Power Technology</b> <ul style="list-style-type: none"> <li>power is the rate at which energy is transformed</li> <li>forms of energy</li> <li>energy is conserved</li> <li>devices that transform energy</li> </ul>
8	Thinking	Complex tasks may require multiple tools and technologies.	<b>Applied Technologies</b> <ul style="list-style-type: none"> <li>Identify the personal, social, and environmental impacts, including unintended negative consequences, of the choices they make about technology use</li> <li>Identify how the land, natural resources, and culture influence the development and use of tools and technologies</li> </ul>	Discuss consequences of electricity production and use; Alternatives? Consequences of alternatives? Show the impact of our own choices about electricity use	<b>Power Technology</b> <ul style="list-style-type: none"> <li>uses of power technology</li> <li>renewable and non-renewable sources of energy</li> <li>conversion and transmission of energy</li> </ul>
9	Thinking	Social, ethical, and sustainability considerations impact design.  Complex tasks require different technologies and tools at different stages.	<b>Applied Technologies</b> <ul style="list-style-type: none"> <li>Evaluate the personal, social, and environmental impacts, including unintended negative consequences, of the choices they make about technology use</li> <li>Evaluate how the land, natural resources, and culture influence the development and use of tools and technologies</li> </ul>	Discuss consequences of electricity production and use; Alternatives? Consequences of alternatives? Evaluate impact of our own choices about electricity use	<b>Power Technology</b> <ul style="list-style-type: none"> <li>energy transmission and applications</li> <li>types of fuels and methods of converting fuels to mechanical energy</li> <li>alternative energy sources</li> </ul>

## Applied Design, Skills, and Technologies - Technology Education, Power Technology

Grade	Core Competencies	Big Ideas	Curricular Competencies	Activity Connections	Content
10	N/A	Complex tasks require different technologies and tools at different stages.	<b>Applied Technologies</b> <ul style="list-style-type: none"> <li>Choose, adapt, and if necessary learn about appropriate tools and technologies to use for tasks</li> <li>Evaluate the personal, social, and environmental impacts, including unintended negative consequences, of the choices they make about technology use</li> <li>Evaluate how the land, natural resources, and culture influence the development and use of tools and technologies</li> </ul>	Technologies used to produce and transmit electricity. Alternatives? Discuss consequences of electricity production and use; Alternatives? Consequences of alternatives? Evaluate impact of our own choices about electricity use; Weighing of pros and cons of different generation technologies;	<ul style="list-style-type: none"> <li>non-fuel power systems</li> <li>transfer and conversion of energy</li> <li>energy transmission and conversion systems</li> <li>technologies that reduce energy use and waste</li> <li>historical and potential future impact of energy, power, and transportation systems on society and the environment</li> <li>alternate energy sources</li> </ul>

## Science - Science for Citizens

Grade	Core Competencies	Big Ideas	Curricular Competencies	Activity Connections	Content
11	N/A	Science helps explain how natural changes and human choices affect global systems	<b>Processing and analyzing data and information</b> <ul style="list-style-type: none"> <li>Seek and analyze patterns, trends, and connections in data, including describing relationships between variables, performing calculations, and identifying inconsistencies</li> <li>Construct, analyze, and interpret graphs, models, and/or diagrams</li> <li>Use knowledge of scientific concepts to draw conclusions that are consistent with evidence</li> <li>Analyze cause-and-effect relationships</li> </ul> <b>Applying and innovating</b> <ul style="list-style-type: none"> <li>Implement multiple strategies to solve problems in real-life, applied, and conceptual situations</li> </ul>	Demand curve; recognize and explain patterns; Put data into graphs.  Work as a team to design a new system. Deduce rules for new power plants. Discuss demand, and drivers for demand, short and long term. Discuss CO2 emissions, measures to reduce them. Influence of politics.  Discuss other strategies to reduce GHG from electricity generation (e.g. demand management, storage).	<b>Global Science</b> <ul style="list-style-type: none"> <li>energy generation and needs:               <ul style="list-style-type: none"> <li>Production</li> <li>Economics</li> <li>environmental impacts</li> </ul> </li> </ul>

