Unit 05: Energy Resources (Weeks 25-30)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

SCI.HS-ESS3	Earth and Human Activity
SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity.
SCI.HS-ESS3-2	Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.
SCI.HS-ESS3-3	Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.
SCI.HS-ESS3-4	Evaluate or refine a technological solution that reduces impacts of human activities on climate change and other natural systems.
SCI.HS-ESS3-5	Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.C.1	Develop an innovative solution to a real world problem or issue in collaboration with peers and experts, and present ideas for feedback through social media or in an online community.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.A	The Nature of Technology: Creativity and Innovation: Technology systems impact every aspect of the world in which we live.
TECH.8.2.12.A.1	Propose an innovation to meet future demands supported by an analysis of the potential full costs, benefits, trade-offs and risks, related to the use of the innovation.
TECH.8.2.12.A.2	Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
TECH.8.2.12.B	Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.
TECH.8.2.12.B.2	Evaluate ethical considerations regarding the sustainability of environmental resources that are used for the design, creation and maintenance of a chosen product.
TECH.8.2.12.B.3	Analyze ethical and unethical practices around intellectual property rights as influenced by human wants and/or needs.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.C.3	Analyze a product or system for factors such as safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, and human factors engineering (ergonomics).

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

	Key Ideas and Details
LA.K-12.NJSLSA.R1	Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
LA.K-12.NJSLSA.R2	Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
	Integration of Knowledge and Ideas
LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
LA.RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.
LA.K-12.NJSLSA.W	Writing

LA.RI.11-12.2	Determine two or more central ideas of a text, and analyze their development and how they interact to provide a complex analysis; provide an objective summary of the text.
	Text Types and Purposes
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.K-12.NJSLSA.W2	Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.K-12.NJSLSA.W3	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
LA.RI.11-12.7	Integrate and evaluate multiple sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a question or solve a problem.
LA.W.11-12.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.W.11-12.1.B	Develop claim(s) and counterclaims avoiding common logical fallacies and using sound reasoning and thoroughly, supplying the most relevant evidence for each while pointing out the strengths and limitations of both in a manner that anticipates the audience's knowledge level, concerns, values, and possible biases.
LA.W.11-12.1.C	Use transitions (e.g., words, phrases, clauses) to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
LA.W.11-12.1.E	Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic).
LA.W.11-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.W.11-12.2.A	Introduce a topic; organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
LA.W.11-12.2.B	Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
LA.W.11-12.2.C	Use appropriate and varied transitions and syntax to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
LA.W.11-12.2.F	Provide a concluding paragraph or section that supports the argument presented (e.g., articulating implications or the significance of the topic).
LA.W.11-12.3	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
LA.W.11-12.3.E	Provide a conclusion that follows from and reflects on what is experienced, observed, or resolved over the course of the narrative.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale
Unit Rationale The purpose of this unit… **The purpose of this unit is to understand the increasing demands for energy, our dependence on fossil fuels and how we can begin to replace them with renewable energy resources as well as analyze our societies current waste crisis**

Meaning

Essential Questions

Essential Questions

- **What are the environmental and economic impacts from the use and dependency of fossil fuels?**
- **How do we plan for future energy use?**
- **What is the cause of the waste crisis and how can we implement methods to help alleviate it?**

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

Students will understand that:

- **Our current methods of energy production are producing unprecedented rates of carbon dioxide, which scientists believe is directly correlated to the increased rate of global warming**
- **Alternative methods of energy production using renewable resources will have to be developed if we are to continue our current trends of energy consumption**
- **As the human population increases, so does the amount of waste and the available land is decreasing and it is becoming more difficult to dispose of the large amounts of waste**

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

- **Most of the energy we use comes from fossil fuels**
- **Fossil fuels are the remains of ancient organisms that changed into oil, coal or natural gas**
- **Fuels are used for cooking, transportation, manufacturing, heating and cooling, and generating electricity to run machines and appliances**
- **Energy cannot be created or destroyed, but it can change from one form to another**
- **An electric generator is a machine that converts mechanical energy, or motion, into electrical energy**
- **Individuals in more developed countries use more energy than developing countries do**
- **The U.S. uses more energy per person than any other country in the world except Canada and the United Arab Emirates, due to the transportation of goods and low cost of gasoline tax**
- **Fossil fuels are not distributed evenly**
- **The burning of fossil fuels accelerates the carbon cycle by putting more carbon into the air, which scientists contribute to the increasing rate of global warming**
- **Coal forms from the remains of plants that lived in swamps hundreds of millions of years ago; layers of sediment compressed the plant remains, heat and pressure within the crust caused the coal to form**
- **Most of the world's fossil fuel reserves are made of coal, particularly Asia and North America**
- **Two major advantages of coal dare that it is relatively inexpensive and that it needs little refining after it has been mined**
- **Half of the electricity in the U.S. comes from coal-fired power plants**
- **Oil and natural gas result from the decay of tiny marine organisms that accumulated on the bottom of the ocean millions of years ago; the remains were buried by sediments and heated until they became energy rich carbon based molecules**
- **Oil that is pumped from the ground is known as crude oil, or petroleum; much of the world's energy needs are met by petroleum products**
- **Oil is found in and around major geologic features, such as folds, faults and salt domes that tend to trap**

oil as it moves in the Earth's crust; the majority is located in the Middle East

- **After oil is drilled, it is transported to a refinery to be converted into fuels and other petroleum products**
- **The overproduction of carbon dioxide and potential oil spills are disadvantages to using oil**
- **Oil formations can contain natural gas deposits; the gas can be transported in pipelines and distributed for cleaner energy production**
- **As the population and the world's energy demands both increase, fossil reserves are decreasing; As a result, we need to plan for future energy use**
- **Nuclear power plants get their power from nuclear energy, the energy within the nucleus of an atom.**
- **In nuclear power plants, atoms of the element uranium are used as fuel. The nuclei of the uranium atoms are bombarded with atomic particles called neutrons. These collisions cause the nuclei to split in a process called nuclear fission**
- **The advantages of nuclear energy are that it is a very concentrated energy source, it produces no air-polluting gases and it is an alternative to fossil fuels. The disadvantages are the high costs of construction and maintenance, the difficulty of storing the wastes and safety concerns**
- **Renewable energy is energy from sources that are constantly being formed**
- **Renewable energy sources include solar, wind, hydroelectric, biomass and geothermal**
- **Solar cells, called photovoltaic cells, convert the sun’s energy into electricity. They do not have moving parts and run on non polluting power, however they only produce a small electrical current, can be very expensive and can provide power to desolate areas.**
- **Energy from the sun warms the Earth’s surface unevenly, which creates wind. Wind power converts the movement of wind into electrical energy**
- **Plant material, manure and any other organic matter that is used as an energy source is called biomass fuel. These sources, such as wood, alcohol, methane and dung, are renewable**
- **Energy from the sun causes water to evaporate, condense in the atmosphere, and fall back to the Earth’s surface as rain. As water flows across the land, the energy in its movement can be used to generate hydroelectric energy**
- **Deposits of water in the Earth’s crust are heated by energy within the Earth, called geothermal energy**
- **Alternative energy sources for the future include hydrogen fuel cells, tidal power and ocean energy conversion**
- **Every year, the U.S. generates more than 10 billion metric tons of solid waste**
- **Many areas are running out of places to store solid waste**
- **The human population and amount of waste produced continues to increase and available land and waste storage areas continue to decrease**
- **2 types of solid waste: biodegradable and nonbiodegradable**
- **Materials are biodegradable if they can be broken down by biological processes**
- **Non Biodegradable material, like plastics are accumulating in our oceans and harming the wildlife**
- **Most of the solid waste in the U.S. is sent to landfills, the rest is incinerated or recycled**
- **The production of leachate (liquid that has passed through compacted solid waste) that collects dissolved chemicals and decomposing garbage and production of methane gas are disadvantages of landfills**
- **Society needs to find ways to reduce the amount of waste produced as well as recycling or composting the waste in order to reuse it**
- **Substances such as motor oil, paints, batteries, computers, cells phones, antifreeze, cleaners, fertilizers and pesticides are considered to be hazardous waste products and should be disposed of properly**

Skills

Skills

Student will be skilled at …

- **Explain how the different types of fossil fuels are formed and how they are used**
- **Describe how to generate electricity from fossil fuels**
- **Identify patterns of energy consumption and production in the world and in the U.S.**
- **Compare and contrast the advantages and disadvantage of each fossil fuel**
- **Explain the process of nuclear fission**
- **Compare and contrast the advantages and disadvantage of using nuclear energy**
- **Identify six forms of renewable energy and compare their advantages and disadvantages**
- **Briefly describe alternative energy technologies for the future**
- **Identify several ways that you can conserve energy in your daily life**
- **Describe the difference between biodegradable and nonbiodegradable solid waste**
- **Explain two environmental concerns from the use of landfills**
- **Analyze the current waste crisis and make predictions for results in the future**
- **Identify ways to produce less waste**

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

- **Powerpoint presentations**
- **Textbook Environmental Science (Holt)**
- **Scienceworld Magazines**
- **Articles related to topics**
- **Youtube videos**
- **Materials for labs**
- **Solar Car Materials**
- **Bus for field trip to Covanta Energy, CCMUA and Pennsauken Landfill**
- **“Islands of the Future” episode 1**
- **“Global Waste” movie**
- **Maps in Action - Nuclear Power Plants in the U.S. pg 488**
- **Society and the Environment Reading: From Crude Oil to Plastic pg 489**
- **Calculate your household energy consumption lab materials**
- **Energy Sources: Foldable**

Formative Assessment Strategies

Formative Assessment Strategies

- **Quick Thoughts**
- **Exit Slips**
- **Kahoot**
- **Bingo**
- **White Board Participation**
- **Homework**
- **Teacher Check**
- **Thumbs up/thumbs down**
- **Create a Test/Take a Test**
- **Whole class questioning and answering**
- **Graphic Organizers**
- **Foldables**
- **Renewable Energy Resource Energy Quiz**
- **Nonrenewable Energy Resource Energy Quiz**

Learning Activities/Unit of Study

Learning Activities/Unit of Study

- **Field trip to Covanta Energy, CCMUA and Pennsauken Landfill**
- **“Islands of the Future” episode 1**
- **“Global Waste” movie**
- **Maps in Action - Nuclear Power Plants in the U.S. pg. 488**
- **Society and the Environment Reading: From Crude Oil to Plastic pg. 489**
- **Calculate your household energy consumption activity pg. 486**
- **Energy Sources: Foldable**
- **Simulating Coal Formation Activity pg. 470**

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.