ENERGY & NATURAL RESOURCES

CONTENT STANDARDS



ELEMENTARY AND MIDDLE (GRADES K-8)

GUIDANCE

Energy surrounds us and is fundamental to how we live. The competencies outlined below provide a foundation for students in kindergarten through eighth grade as they explore energy production, applications, and careers in the energy sector. These competencies aim to assist educators in developing programs, courses, and lessons focused on energy and natural resources. Educators should collaborate with local advisory committees to identify what is most relevant and suitable for their students. The adoption and use of these competencies is voluntary.

The Energy and Natural Resources Career Cluster, established by Advance CTE, includes subclusters to help organize key topics. The competencies are arranged by subcluster and grade band (K-2, 3-5, and 6-8).

Thank you to the partners who contributed content expertise and guidance and to Breakthrough Energy for supporting the creation of these Energy & Natural Resources Content Standards.

SUBCLUSTERS

Energy Foundations

Energy is all around us. Yet, we often take it for granted, not thinking about energy until something we depend on doesn't work. Gaming consoles, cell phones, lights, computers, cooking appliances, and heating and cooling systems are just a few things we routinely touch that are powered and fueled by energy. There has been an incredible evolution in energy over the last several decades, and even newer and more modern advancements are occurring at lightning speed. This section provides a baseline for the study of key energy topics.

Clean Energy

Careers focused on energy generation and infrastructure development from clean energy sources such as low-carbon fuels, natural gas, nuclear, biofuels, hydrogen processes, and other alternative sources to address climate change impacts. Professionals in this field develop and implement technologies that harness natural elements, including solar, nuclear, wind, and hydropower while advancing efforts in electrification and energy storage solutions. This Sub-Cluster includes recycling batteries and waste, carbon capture, and other energy and mineral reuse and reclamation.

Transmission, Distribution, & Storage

Careers focused on supporting the integrated and interconnected networks that contain transmission facilities and power lines, distribution facilities and power lines, and distributed energy resources. These systems are designed to work cooperatively to provide consistent, reliable, and affordable power to customers in cities, rural areas, and everywhere in between.

SUBCLUSTERS

Utilities

Careers involving the transmission and maintenance of utility systems for clean and alternative energy, electricity, water, waste remediation, and telecom/broadband; distribution and infrastructure development; and storage. Professionals in this field ensure reliable connectivity to energy sources, energy efficiency, and other essential services. Opportunities exist in public utilities, as well as commercial and industrial companies, with a focus on operations, maintenance, and security of systems to guarantee uninterrupted access to vital resources.

Conservation & Land Management

Careers rooted in environmental and natural sciences, focusing on protecting and managing natural resources and landscapes. Professionals in this field operate local, state, and national parks; safeguard forests and waterways; maintain national lands and rangelands; and manage wildlife and marine life. This field merges ecological conservation with recreational spaces, aiming to preserve nature while enhancing community well-being and environmental stewardship through public accessibility.

Ecological Research & Development

Careers emphasizing the scientific study of and research in ecological, geological, electrical, chemical, nuclear, biological, environmental engineering, and other sciences as they relate to energy production, sustainability, and the management of natural resources. Professionals in this field employ scientific methods to understand ecosystems, biodiversity, and the impacts of energy systems on the environment.

SUBCLUSTERS

Environmental Protection

Careers centered on regulating and managing the impacts of both natural processes and human activities, such as resource production and consumption. This Sub-Cluster involves developing and enforcing policies to protect all ecosystems, including space, air, land, and water, from natural disasters, pollution, and degradation. This field focuses on conserving natural habitats and biodiversity and applying scientific and engineering principles to solve environmental problems and improve climate resilience.

Resource Extraction

Careers focused on the efficient extraction of natural materials including fossil fuels, minerals, natural gas, and geothermal resources that are essential for fuel production in energy and manufacturing. This Sub-Cluster includes careers in exploration, drilling, mining, fracking, mineral processing, geoscience, quarrying, and petroleum engineering.

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COMPETENCIES (GRADES K-8)

Subclusters	Grade Bands	Beginning	Intermediate	Advanced
Energy Foundations	K-2	List the different forms of energy (e.g., light, heat, motion, sound, and growth).	Explain the difference between renewable and nonrenewable energy sources.	Discuss where we see the energy in everyday life.
	3-5	Describe the different sources of energy.	Categorize energy sources according to their forms.	Analyze how people use various energy sources.
	6-8	Identify careers in the energy sector.	Present emerging technologies in the energy sector.	Debate the best new energy technology to implement in your community.
Clean Energy	K-2	Define clean energy.	Explain why some energy sources are called clean.	Compare and contrast two clean energy sources.
	3-5	Define the greenhouse effect.	Compare energy sources based on their level of greenhouse gas emissions.	Illustrate how the greenhouse effect works.
	6-8	Describe how power is generated.	Graph the level of emissions from different power generation sources.	Graph the level of emissions from different power generation sources.

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COMPETENCIES (GRADES K-8)

Subclusters	Grade Bands	Beginning	Intermediate	Advanced
Transmission, Distribution, & Storage	K-2	Define electricity as the flow of electrons through wires.	Identify how electricity is used in your home.	Demonstrate how to be safe around electricity in and around your home.
	3-5	Identify transmission, distribution, and storage systems in your community.	Label a picture to show how electricity is transported.	Draw the path electricity takes from a power plant to your home.
	6-8	Summarize the process by which various energy sources provide power to customers.	Explain the function of transmission, distribution, and storage systems.	Construct a model to represent electric power generation through distribution to customers.
Utilities	K-2	Define energy conservation.	Describe different ways to conserve energy.	Compare conservation and efficiency measures.
	3-5	Identify utility systems in your community.	Explain the role of various utility systems.	Analyze how your utility consumption changes based on environmental conditions where you live.
	6-8	Explain factors that influence the production, delivery, and consumption costs of utilities.	Compare the availability of various utilities.	Create a plan, including practical steps, to reduce utility consumption in your community.

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COMPETENCIES (GRADES K-8)

Subclusters	Grade Bands	Beginning	Intermediate	Advanced
Conservation & Land Management	K-2	Identify different natural resources.	Describe renewable and non-renewable natural resources.	Present efficiency and conservation practices for natural resources.
	3-5	Define some of the habitats in your community.	Analyze the key aspects that make various habitats healthy.	Diagram a healthy habitat.
	6-8	List strategies used to protect land and wildlife nationally.	Examine strategies used at the state level to protect land and wildlife.	Create a plan to protect land and wildlife in your community.
Ecological Research & Development	K-2	Describe how scientists study ecological systems.	Record observations of a natural system.	Develop questions about an environment based on data.
	3-5	Define the scientific method.	Generate a hypothesis based on background information.	Evaluate a hypothesis based on data.
	6-8	Identify several indicators of healthy ecological systems.	Interpret scientific data to determine the health of ecological systems.	Propose an action plan to improve ecosystem health in your community.

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COMPETENCIES (GRADES K-8)

Subclusters	Grade Bands	Beginning	Intermediate	Advanced
Environmental Protection	K-2	Identify different sources of pollution.	Describe ways to reduce pollution.	Participate in a pollution reduction activity in your community.
	3-5	Summarize major environmental protection regulations that impact your community.	Analyze the key aspects that make various habitats healthy.	Diagram a healthy habitat.
	6-8	List strategies used to protect land and wildlife nationally.	Examine strategies used at the state level to protect land and wildlife.	Create a plan to protect land and wildlife in your community.
Resource Extraction	K-2	Describe how scientists study ecological systems.	Record observations of a natural system.	Develop questions about an environment based on data.
	3-5	Define the scientific method.	Generate a hypothesis based on background information.	Evaluate a hypothesis based on data.
	6-8	Identify several indicators of healthy ecological systems.	Interpret scientific data to determine the health of ecological systems.	Propose an action plan to improve ecosystem health in your community.