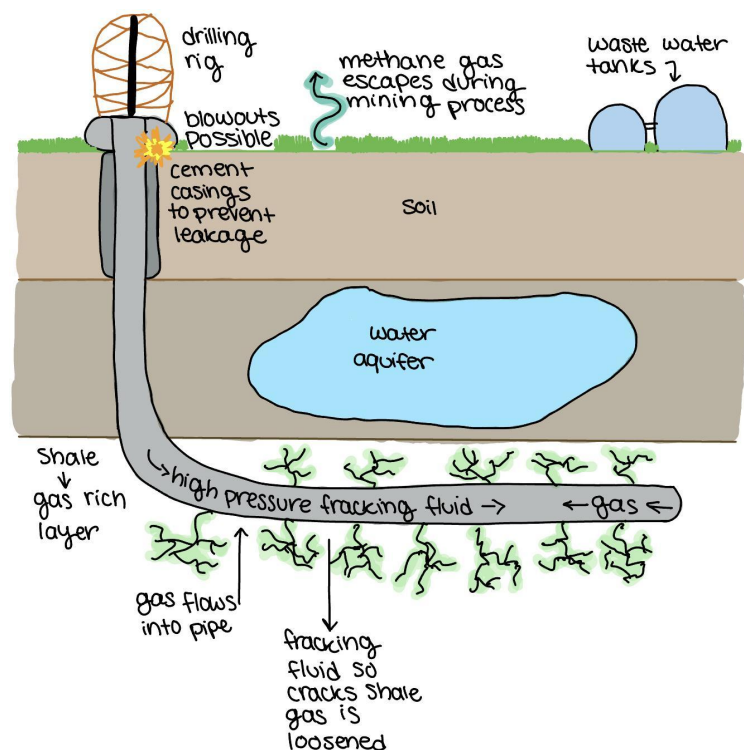


Unit 6 – Energy Resources and Consumption

Exam weighting: 10–15%



Psalm 73: 1-5 (The Message)

No doubt about it! God is good—good to good people, good to the good-hearted. But I nearly missed it, missed seeing his goodness.

I was looking the other way, looking up to the people at the top, envying the wicked who have it made, who have nothing to worry about, not a care in the whole wide world.

Psalm 112: 9-10 (NLT)

They share freely and give generously to those in need. Their good deeds will be remembered forever. They will have influence and honor. The wicked will see this and be infuriated. They will grind their teeth in anger; they will slink away, their hopes thwarted.

Mastered	Learning objectives and essential knowledge
Topic 6.1: Renewable and Nonrenewable Resources	
	I can identify differences between nonrenewable and renewable energy sources.
	Nonrenewable energy sources are those that exist in a fixed amount and involve energy transformation that cannot be easily replaced.
	Renewable energy sources are those that can be replenished naturally, at or near the rate of consumption, and reused.
Topic 6.2: Global Energy Consumption	
	I can describe trends in energy consumption.
	The use of energy resources is not evenly distributed between developed and developing countries.
	The most widely used sources of energy globally are fossil fuels.
	As developing countries become more developed, their reliance on fossil fuels for energy increases.
	As the world becomes more industrialized, the demand for energy increases.
	Availability, price, and governmental regulations influence which energy sources people use and how they use them.
Topic 6.3: Fuel Types and Uses	
	I can identify types of fuels and their uses.
	Wood is commonly used as fuel in the forms of firewood and charcoal. It is often used in developing countries because it is easily accessible.
	Peat is partially decomposed organic material that can be burned for fuel.
	Three types of coal used for fuel are lignite, bituminous, and anthracite. Heat, pressure, and depth of burial contribute to the development of various coal types and their qualities.
	Natural gas, the cleanest of the fossil fuels, is mostly methane.

	Crude oil can be recovered from tar sands, which are a combination of clay, sand, water, and bitumen.
	Fossil fuels can be made into specific fuel types for specialized uses (e.g., in motor vehicles).
	Cogeneration occurs when a fuel source is used to generate both useful heat and electricity.
Topic 6.4: Distribution of Natural Energy Resources	
	I can identify where natural energy resources occur.
	The global distribution of natural energy resources, such as ores, coal, crude oil, and gas, is not uniform and depends on regions' geologic history.
Topic 6.5: Fossil Fuels	
	I can describe the use and methods of fossil fuels in power generation.
	The combustion of fossil fuels is a chemical reaction between the fuel and oxygen that yields carbon dioxide and water and releases energy.
	Energy from fossil fuels is produced by burning those fuels to generate heat, which then turns water into steam. That steam turns a turbine, which spins a generator, producing electricity.
	Humans use a variety of methods to extract fossil fuels from the earth for energy generation.
	I can describe the effects of fossil fuels on the environment.
	Hydrologic fracturing (fracking) can cause groundwater contamination and the release of volatile organic compounds.
Topic 6.6: Nuclear Power	
	I can describe the use of nuclear energy in power generation.
	Nuclear power is generated through fission, where atoms of Uranium-235, which are stored in fuel rods, are split into smaller parts after being struck by a neutron. Nuclear fission releases a large amount of heat, which is used to generate steam, which powers a turbine and generates electricity.
	Radioactivity occurs when the nucleus of a radioactive isotope loses energy by emitting radiation.
	Uranium-235 remains radioactive for a long time, which leads to the problems associated with the disposal of nuclear waste.
	Nuclear power generation is a nonrenewable energy source. Nuclear power is considered a cleaner energy source because it does not produce air pollutants, but it does release thermal pollution and hazardous solid waste.
	I can describe the effects of the use of nuclear energy on the environment.
	Three Mile Island, Chernobyl, and Fukushima are three cases where accidents or natural disasters led to the release of radiation. These releases have had short- and long-term impacts on the environment.
	A radioactive element's half-life can be used to calculate a variety of things, including the rate of decay.
Topic 6.7: Energy from Biomass	
	I can describe the effects of the use of biomass in power generation on the environment.
	Burning of biomass produces heat for energy at a relatively low cost, but it also produces carbon dioxide, carbon monoxide, nitrogen oxides, particulates, and volatile organic compounds. The overharvesting of trees for fuel also causes deforestation.
	Ethanol can be used as a substitute for gasoline. Burning ethanol does not introduce additional carbon into the atmosphere via combustion, but the energy return on energy investment for ethanol is low.
Topic 6.8: Solar Energy	
	I can describe the use of solar energy in power generation.
	Photovoltaic solar cells capture light energy from the sun and transform it directly into electrical energy. Their use is limited by the availability of sunlight.
	Active solar energy systems use solar energy to heat a liquid through mechanical and electric equipment to collect and store the energy captured from the sun.

	Passive solar energy systems absorb heat directly from the sun without the use of mechanical and electric equipment, and energy cannot be collected or stored.
	I can describe the effects of the use of solar energy in power generation on the environment.
	Solar energy systems have low environmental impact and produce clean energy, but they can be expensive. Large solar energy farms may negatively impact desert ecosystems.
Topic 6.9: Hydroelectric Power	
	I can describe the use of hydroelectricity in power generation.
	Hydroelectric power can be generated in several ways. Dams built across rivers collect water in reservoirs. The moving water can be used to spin a turbine. The turbine spins a generator, producing electricity. Turbines can also be placed in small rivers, where the flowing water spins the turbine, which spins a generator and forms electricity.
	Tidal energy uses the energy produced by tidal flows to turn a turbine.
	I can describe the effects of the use of hydroelectricity in power generation on the environment.
	Hydroelectric power does not generate air pollution or waste, but construction of the power plants can be expensive, and there may be a loss of or change in habitats following the construction of dams.
Topic 6.10: Geothermal Energy	
	I can describe the use of geothermal energy in power generation.
	Geothermal energy is obtained by using the heat stored in the Earth's interior to heat up water, which is brought back to the surface as steam. The steam spins a turbine, which spins a generator, producing electricity.
	I can describe the effects of the use of geothermal energy in power generation on the environment.
	The cost of accessing geothermal energy can be prohibitively expensive, as it is not easily accessible in many parts of the world. In addition, it can cause the release of hydrogen sulfide.
Topic 6.11: Hydrogen Fuel Cell	
	I can describe the use of hydrogen fuel cells in power generation.
	Hydrogen fuel cells are an alternate to nonrenewable fuel sources. They use hydrogen as fuel, combining the hydrogen fuel and oxygen in the air to form water and release energy (electricity) in the process. Water is the product (emission) of a fuel cell.
	I can describe the effects of the use of hydrogen fuel cells in power generation on the environment.
	Hydrogen fuel cells have low environmental impact and produce no carbon dioxide when the hydrogen is produced from water. However, the technology is expensive and energy is still needed to create the hydrogen gas used in the fuel cell.
Topic 6.12: Wind Energy	
	I can describe the use of wind energy in power generation.
	Wind turbines use the kinetic energy of moving air to spin a turbine, which spins a generator, producing electricity.
	I can describe the effects of the use of wind energy in power generation on the environment.
	Wind energy is a renewable, clean source of energy. However, birds and bats may be killed if they fly into the spinning turbine blades.
Topic 6.13: Energy Conservation	
	I can describe methods for conserving energy.
	Some of the methods for conserving energy around a home include adjusting the thermostat to reduce the use of heat and air conditioning, conserving water, use of energy-efficient appliances, and conservation landscaping.
	Methods for conserving energy on a large scale include improving fuel economy for vehicles, using BEVs (battery electric vehicles) and hybrid vehicles, using public transportation, and implementing green building design features.

Enduring Understandings

Humans use energy from a variety of sources, resulting in positive and negative consequences. (ENG-3)

Science Practices**Concept Explanation**

Explain environmental concepts and processes.

Describe environmental concepts and processes.

Explain environmental concepts, processes, or models in applied contexts.

Visual Representations

Explain relationships between different characteristics of environmental concepts, processes, or models represented visually:

- In theoretical context
- In applied contexts

Mathematical Routines

Calculate an accurate numeric answer with appropriate units..

Data Analysis

Explain patterns and trends in data to draw conclusions.

Environmental Solutions

Describe environmental problems.

Describe potential responses or approaches to environmental problems.

Justify a proposed solution by explaining potential advantages.