SI Environmental Science - Full Discipline Demo

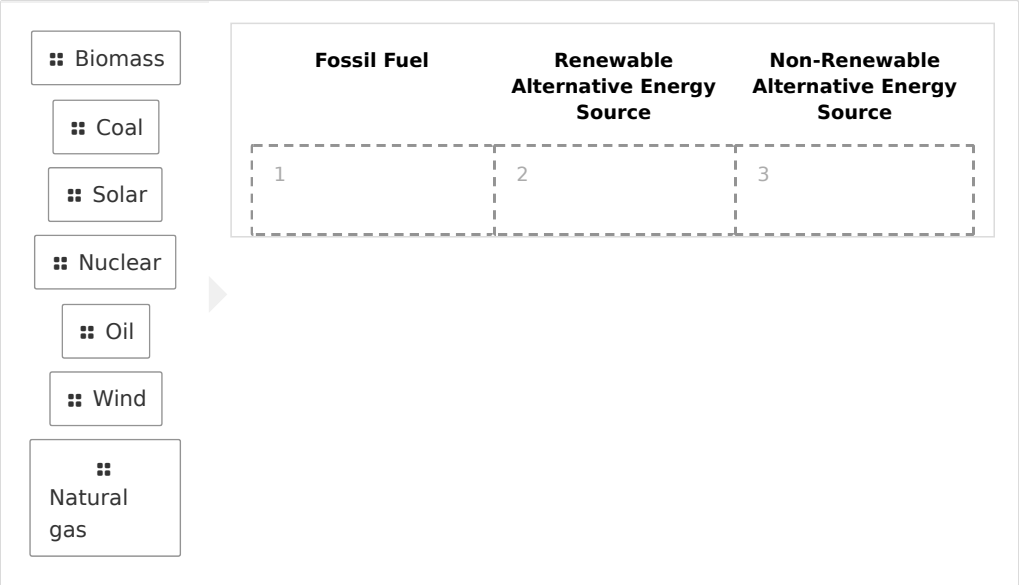
Alternative Energies

Final Report - Answer Guide

Institution	Science Interactive University
Session	SI Environmental Science - Full Discipline Demo
Course	SI Environmental Science - Full Discipline Demo
Instructor	Sales SI Demo

Test Your Knowledge

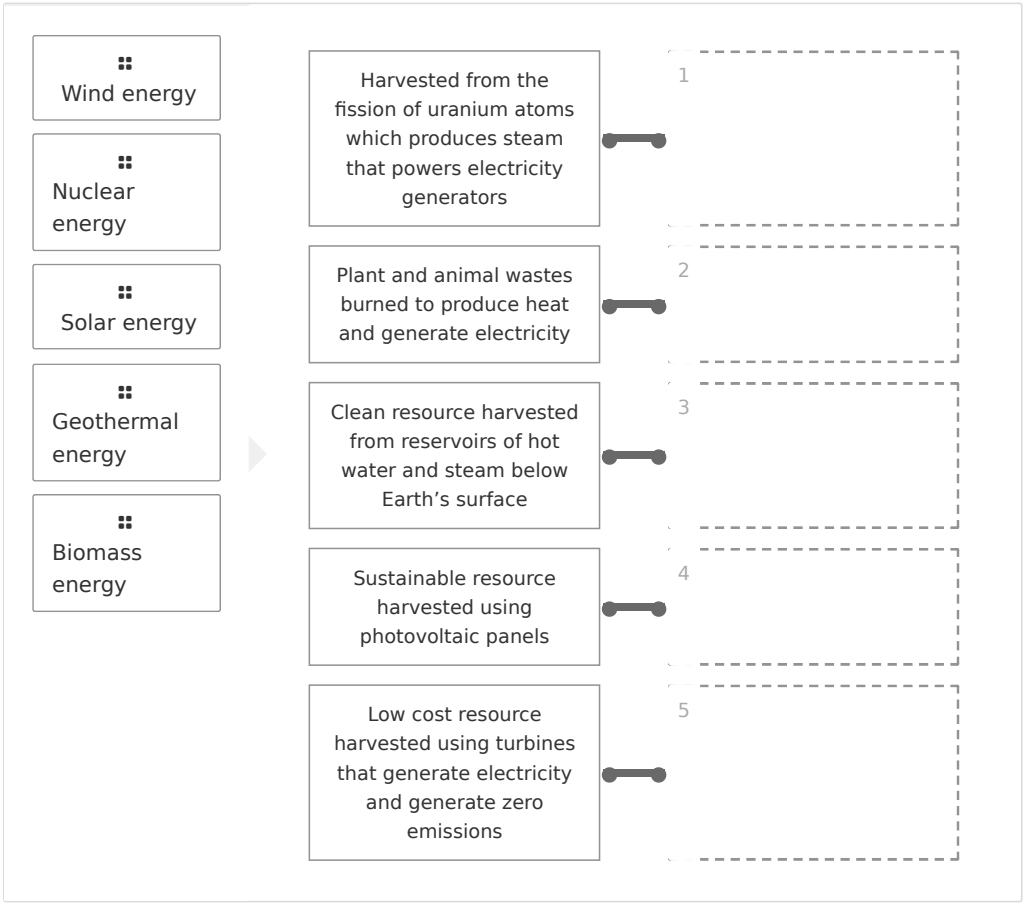
Classify each source as a fossil fuel, renewable alternative energy source, or non-renewable alternative energy source.



Correct answers:

1	Coal	Oil	Natural gas	2	Biomass	Wind	Solar
3	Nuclear						

Match each term to the best description.



Correct answers:

1 Nuclear energy 2 Biomass energy 3 Geothermal energy

4 Solar energy 5 Wind energy

Exploration

All ____ sources are naturally replenished either at the rate they are used or during a human lifespan.

- alternative energy
- renewable energy ✔
- fossil fuel
- non-renewable energy

In 2020, _____ represented 9% of U.S. total energy consumption and 52% of alternative energy used in 28 states.

- biomass fuel
- hydropower
- nuclear electric power ✔
- solar power

_____ generators are most commonly located within dams or other restriction structures.

- Hydropower ✔
- Solar
- Wind
- Geothermal

Exercise 1

What was the most common fuel consumed in 2019 for each of the states analyzed in the procedures? Is the fuel considered a renewable or non-renewable resource? How does the fuel use impact the environment? Reference Data Table 1 in your explanation.

Natural gas was the most commonly consumed fuel in both Colorado and California in 2019 as recorded in Data Table 1. Natural gas is a fossil fuel and non-renewable resource. The burning of natural gas releases carbon dioxide, a greenhouse gas, into the atmosphere which is associated with rising global temperatures.

What was the most-produced alternative energy source for Colorado and California in 2019? Reference Data Table 2 in your explanation. Is the fuel a renewable resource? What challenges are associated with the production and use of the energy source?

Biofuel was the leading alternative energy produced in Colorado in 2019 and nuclear electric energy was the leading alternative energy produced in California that year as recorded in Data Table 2.

Biomass energy is considered a renewable resource, but nuclear energy is considered non-renewable.

The challenges associated with producing biofuels include risk of deforestation and space required to both grow and store the fuel. Burning biofuel releases pollutants that can harm humans and the environment.

The challenges associated with producing nuclear energy include the proper storage of radioactive fuel wastes, availability of sufficient water for temperature control,
and the costs of running generator facilities.

Are Colorado and California net producers or net consumers of alternative energy? Reference Data Table 2 in your explanation. What benefits would each state achieve by increasing the consumption of wind energy? What challenges would increased wind energy harvesting and production present to the states?

Colorado and California are net consumers of alternative energy, consuming more alternative energy than they produce as recorded in Data Table 2.

Increased wind energy consumption in Colorado and California would reduce the amount of greenhouse gasses and toxins emitted by each of the states because wind energy consumption produces zero emissions.

Each state would be challenged by site selection of harvesting locations when increasing wind energy production because of the intermittent nature of wind as
a resource, the distance between harvesting sites
and population centers, potential hazards to
wildlife, audible low frequency noise, and view
obstruction.

Data Table 1: Energy Consumption Estimates, 2019
(SAMPLE ANSWER BELOW)

Source	Colorado consumption (Trillion Btu)	Fuel type	California consumption (Trillion Btu)
Natural gas	559.8	Fossil Fuel	2271.2
Coal	273.3	Fossil Fuel	30.9
Motor gasoline excl. ethanol	268.0	Fossil Fuel	1688.1
Distillate fuel oil	127.8	Fossil Fuel	566.7
Other renewables	114.2	Alternative	627.3
Jet fuel	82.3	Fossil Fuel	602.2
Biomass	47.5	Alternative	308.0
HGL	19.7	Fossil Fuel	61.5
Other petroleum	35.8	Fossil Fuel	323.8

Hydroelectric power	16.1	Alternative	341.5
HGL	19.7	Fossil Fuel	61.5
Nuclear Electric Power	0.0	Alternative	168.8
Residual fuel	0.0	Fossil Fuel	184.4
Total alternative consumption	177.8		1445.6

Data Table 2: Energy Production Estimates, 2019
(SAMPLE ANSWER BELOW)

Source	Colorado production (Trillion Btu)	Fuel Type	California production (Trillion Btu)
Natural gas-marketed	2385.5	Fossil Fuel	220.8
Crude oil	1081.0	Fossil Fuel	920.1
Coal	270.5	Fossil Fuel	0.0
Other renewable energy	0.0	Alternative	0.0
Biofuels	18.4	Alternative	25.9
Nuclear electric power	0.0	Alternative	168.8
Total energy production	3755.4		1335.6
Total alternative production	18.4		194.7
Percent alternative production	0.5		14.6
Net alternative consumption	159.4		1250.9

Competency Review

____ is an example of an alternative energy source.

- Hydropower
- Wind energy
- Geothermal energy
- All of the above ✔

Nuclear energy is classified as an alternative, non-renewable energy source.

- True ✔
- False

Challenges to _____ energy include intermittent availability, potential hazards to wildlife, and view obstructions.

- hydropower
- wind ✔
- geothermal
- nuclear

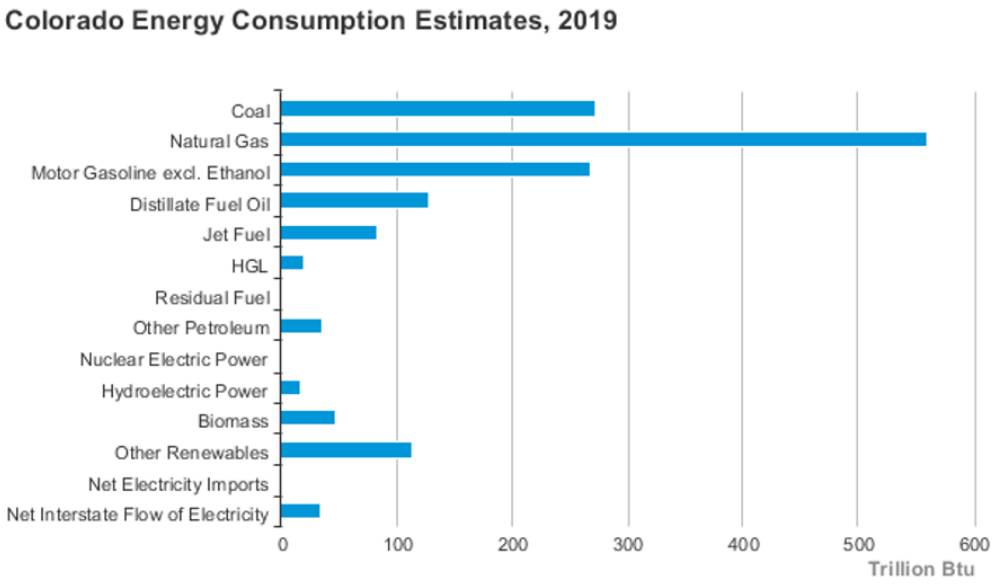
_____ is a renewable, zero-emission energy source.

- Solar energy ✔
- Coal
- Natural gas
- Biomass fuel

The harvesting of _____ energy is dependent upon steam and heat reservoirs below Earth's surface.

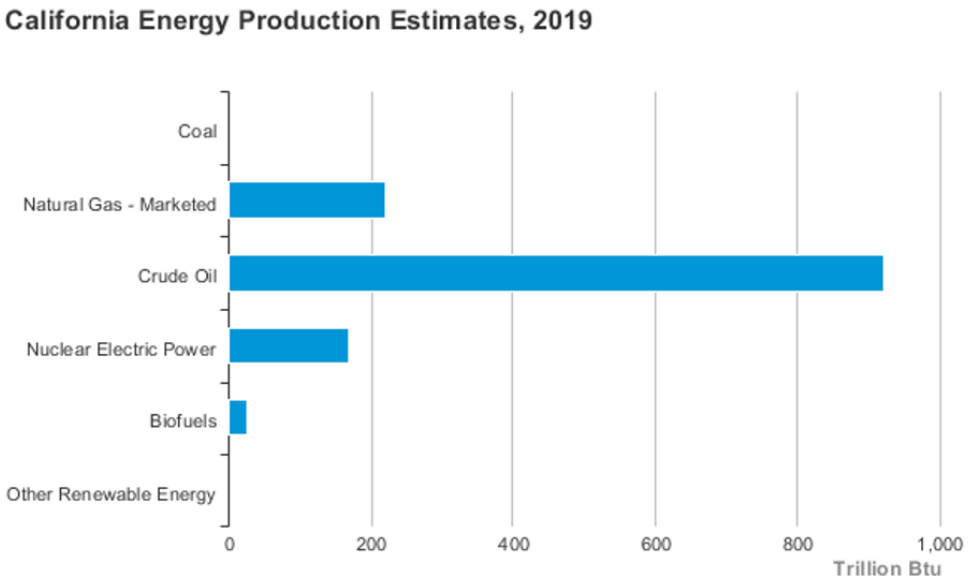
- hydropower
- nuclear
- solar
- geothermal ✔

The primary non-renewable energy source consumed in Colorado in 2019 was ____.



- nuclear electric power
- biomass
- natural gas ✔
- coal

____ was the most produced alternative energy in California in 2019.



- Natural gas
- Crude oil
- Nuclear electric ✔
- Biofuel

The biomass fuels produced and used in Colorado pose no threats to the natural environment.

- True
- False ✔

Extension Questions

The local electric utility provider is planning to add a renewable, zero-emissions, alternative energy source to their network.

Apply your knowledge of the properties of alternative energy resources to recommend the best zero-emissions resource for your area. Explain why the recommended resource is ideal for your area and include your location in your answer.

(SAMPLE ANSWER BELOW)

Answers should include one of the following: solar, wind, hydropower, or geothermal energy. The answer should address the potential challenges of the student's local area which must be included in their explanation. Solar energy should be selected for students that live in sunny locations without seasonal variability in sunlight intensity. Wind energy should be selected for locations that have dependable sustained winds. Hydropower should be selected for areas with access to large

flowing rivers. Geothermal energy should be selected for areas near underground reservoirs of steam and hot water.