Ask how fast nature replaces it

Renewability describes the source of usable energy and its replacement on a human time scale. It is not a label for price, convenience, pollution or how much energy one power plant produces.

1. THE CORE COMPARISON

Renewable

Naturally replenished at or near the rate of consumption. Continued natural flows or regrowth can support repeated use. A biological resource still needs management so harvesting does not outrun replacement.

Nonrenewable

Available in finite stocks that are not readily replaced after use. Formation or replacement is too slow to keep pace with human consumption, so using the resource depletes the accessible supply.

2. RECOGNIZE THE MAIN ENERGY SOURCES

Renewable flows	Solar radiation, wind, flowing water for hydropower, and geothermal heat from within Earth.
Renewable biomass	Wood and other recently living organic material. Biological growth can replace the material used for energy.
Nonrenewable stocks	Coal, petroleum and natural gas are fossil fuels. Uranium is a nonrenewable nuclear fuel, not a fossil fuel.

3. EXPLAIN THE CLASSIFICATION, NOT JUST THE NAME

Coal and wood can both be burned, but that similarity does not make them equally renewable. A forest can regrow on a human time scale; coal deposits formed from ancient organic matter over geological time. Likewise, uranium is nonrenewable because its fuel supply is finite, not because it is burned like coal. Always connect your classification to natural replenishment or depletion.

Definitions and replacement rate: College Board, ENG-3.A.1 and ENG-3.A.2.
Source categories, fossil fuels and uranium: US EIA, Sources of Energy.
Renewable-source examples: US EIA, Renewable Energy Types and Usage.

Scope: College Board AP Environmental Science CED, Topic 6.1, p. 120.

Compare use with replenishment

For a resource that can regrow, the important question is whether replacement keeps pace with removal. Renewable potential does not guarantee that a particular pattern of use is sustainable.

1. BIOMASS LINKS ENERGY USE TO REGROWTH

Plants grow
Store chemical energy

→

Biomass is harvested
Material leaves the stock

→

Regrowth replaces it
Replacement takes time

If wood is removed faster than new biomass accumulates, the standing stock declines. Planting seedlings does not immediately replace the mass or ecological functions of the harvested trees. If replacement keeps pace with removal, the stock can be maintained under those conditions; habitat, soil and other impacts still need separate assessment.

2. EXTENSION: A SIMPLE STOCK-BALANCE EXAMPLE

Illustrative values, not a harvesting recommendation: a woodland gains 100 tonnes of dry biomass in one year and 140 tonnes are removed. Ignoring all other gains and losses:

Annual stock change = 100 - 140 = -40 tonnes

The negative change means depletion. Continued use at this rate cannot maintain the stock.

3. RENEWABLE DOES NOT MEAN ALWAYS AVAILABLE

Sunlight varies with day, season and weather; wind speed also varies. These sources remain renewable because their natural energy flows continue, even when output at a particular place is low. Resource classification is different from the challenge of supplying electricity at the exact time it is needed. A cloudy day does not turn solar energy into a nonrenewable source.

Consumption versus replenishment: College Board, ENG-3.A.2; calculation is illustrative.
Regrowth and biomass impacts: US EIA, Biomass and the Environment.
Availability versus renewability: US EIA, Sources of Energy.

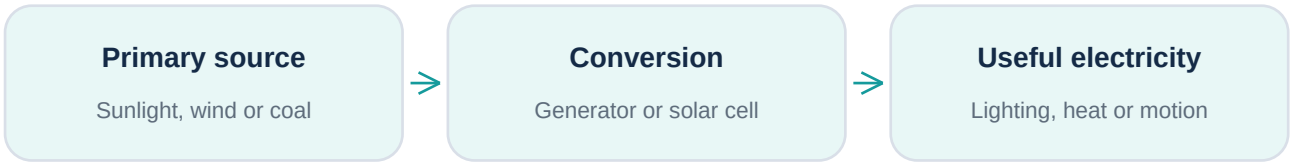
Scope: College Board AP Environmental Science CED, Topic 6.1, p. 120.

Keep three questions separate

Extension: classify the source, trace how useful energy reaches the user, and then assess environmental effects. These are related questions, but they are not interchangeable.

1. ELECTRICITY IS AN ENERGY CARRIER

Electricity is produced by converting primary energy sources. The same appliance can be supplied by a coal plant, a wind turbine or a nuclear plant. Calling electricity renewable is shorthand for saying that renewable sources generated it; the electrical energy itself does not identify its origin.



A rechargeable battery stores energy supplied to it. Recharging alone does not tell you whether the original energy source was renewable.

2. RENEWABILITY IS NOT AN EMISSIONS TEST

Nuclear example	Uranium is nonrenewable, although nuclear reactors do not emit carbon dioxide during operation. Mining, construction and radioactive waste still have impacts.
Biomass example	Biomass can regrow, yet burning it releases carbon dioxide and air pollutants. The overall carbon balance depends on regrowth and other production impacts.
The general rule	Renewable does not mean impact-free. Low operating emissions do not establish renewability. Examine the source and its whole production system separately.

3. ENERGY IS TRANSFORMED, NOT CREATED

In energy use, energy changes form; some becomes dispersed heat that is less useful for doing work. Renewable resources provide replenished inputs, not an ability to recycle the same useful energy endlessly. Distinguish the continued supply of a source from conservation of energy as a physical law.

Primary sources and electricity: US EIA, Electricity Explained.
Operating emissions and other impacts: US EIA, Nuclear Power and the Environment.
Energy conservation and transformations: US EIA, Laws of Energy.

Scope: College Board AP Environmental Science CED, Topic 6.1, p. 120.