

Energy Resources and Consumption

AP Environmental Science ■ Unit 6

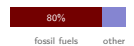
AP Environmental Science

80% fossil

Energy Resources and Consumption

What we will cover

- 1 Renewable vs nonrenewable
- 2 Fossil fuels
- 3 Nuclear power
- 4 Solar and wind
- 5 Hydro and geothermal
- 6 Biomass and conservation



1

Resource types

Energy Resources and Consumption

Resource types

Renewable vs nonrenewable

The split is a race of two rates – use vs **replenishment** 补充:

- **renewable** 可再生: refills as fast as we use it (sun, wind)
- **nonrenewable** 不可再生: forms far slower (fossil fuels)

Fossil fuels 化石燃料 still supply ~80% of world energy – cheap and energy-dense.



Renewable nonrenewable

2

Fossil fuels

Energy Resources and Consumption

Fossil fuels

Fossil fuels

Buried life, pressed for *millions* of years into coal, oil, gas.

- **extraction** 开采: mine coal, pump oil & gas
- burn → steam → turbine → electricity

Burning releases **carbon dioxide** 二氧化碳 plus **pollutants** 污染物.



Fossil fuels: energy-dense but nonrenewable

3 Nuclear

Nuclear power

Nuclear power 核能 uses **fission** 核裂变: a neutron splits a uranium nucleus, releasing huge heat.

- almost no **greenhouse gas** 温室气体
- but **radioactive waste** 放射性废物 lasts 10,000+ years

Low-carbon and steady, but waste storage and accidents are the risks.



Nuclear: steady low-carbon power, long-lived waste

4 Solar and wind

Solar and wind



Solar PV: clean but intermittent

Photovoltaic cells 光伏电池 turn light to electricity; need storage at night.

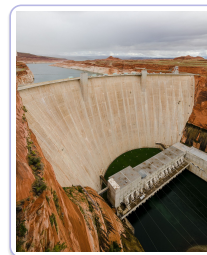


Wind: kinetic energy on coasts & ridges

No fuel once built – but both need backup for calm, dark hours.

5 Hydro and geothermal

Hydro and geothermal



Hydro: reliable, but floods valleys A **dam** 大坝 drops water through turbines.



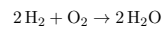
Geothermal: Earth's heat near plates

Only works where hot rock is shallow.

6 Biomass and conservation

Biomass, hydrogen, conservation

Biomass 生物质 burns stored chemical energy; ferment crops to **ethanol** 乙醇. A **hydrogen fuel cell** 氢燃料电池 makes only water:



The cleanest energy is the energy we never use – **energy conservation** 能源节约.



Conservation + renewables: efficiency first

7 Recap

Worked example – energy and cost

A 100 W bulb runs 10 hours a day. Find its yearly energy use, and the saving from a 15 W LED at \$0.12/kWh.

- Daily:
 $100\text{ W} \times 10\text{ h} = 1000\text{ Wh} = 1\text{ kWh}$.
- Yearly: $1 \times 365 = 365\text{ kWh}$; the LED uses $0.15 \times 365 = 54.75\text{ kWh}$.
- Energy saved
 $= 365 - 54.75 = 310.25\text{ kWh}$
- Cost saved
 $= 310.25 \times 0.12 = \$37.23\text{ per year}$

Watch the units: $\text{W} \times \text{h} = \text{Wh}$, then $\div 1000$ for kWh. Show *every* conversion – APES gives marks for the *setup*, not just the number.

Unit 6 – key takeaways

1 Fossil fuels

~80% of energy; nonrenewable; CO_2 + pollutants

2 Nuclear

fission: low-carbon but long-lived waste

3 Renewables

solar/wind intermittent; hydro/geothermal reliable

4 Cleaner still

hydrogen $\rightarrow$ water; conservation is cheapest

Check yourself

- 1 About what share of world energy is fossil fuels?
- 2 What process powers a nuclear plant?
- 3 Why do solar and wind need backup?
- 4 What is the only byproduct of a hydrogen fuel cell?

80%

Answers 1. about 80% 2. nuclear fission 3. they are intermittent 4. water