

Non-Renewable Energy Resource

_____ be replaced once used

Renewable Energy Resource

_____ as it is used

Biofuels (Ethanol, Biodiesel, Methane)

Fossil Fuels (Coal, Oil, Gas)

How they work:

- Burned to heat water → steam → turbines → electricity.
- Oil is refined for fuel in vehicles.

Renewable?

✗ No – takes _____ of years to form.

Main Uses:

- _____ (oil)
- _____ (coal/gas)
- _____ (gas).

Advantages:

- _____ and consistent
- High energy _____ per kg
- Existing _____

Disadvantages:

- _____-renewable – will run out
- Burning produces _____ → global warming
- Sulfur dioxide → _____ (especially from coal)

Environmental Impact:

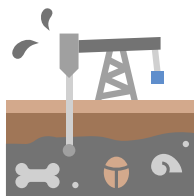
- Major contributor to _____ change
- Air _____ and habitat _____ from mining

Reliability:

✓ Very reliable, easy to _____ and _____.

Cost:

Low running cost but _____ due to scarcity and emissions regulations.



How it works:

- Made from _____/waste.
- Burned to generate electricity or used in engines.

Renewable?

✓ Yes – _____ or is constantly produced.

Main Uses:

- _____
- _____
- _____

Advantages:

- Theoretically renewable and carbon-_____
- Can use existing _____ systems
- Reduces _____ waste

Disadvantages:

- Land use – may compete with _____ crops
- Not truly carbon-neutral if fossil fuels used in _____

Environmental Impact:

- Less CO₂ than fossil fuels but can affect land use and _____

Reliability:

✓ Steady supply, but limited by _____ growth.

Cost:

Moderate; varies by source.



Resource	Capital Cost	Overall Cost
Gas	_____	Low
Coal (with carbon capture storage)	High	_____
Nuclear	_____	Medium
Wind	Very High	_____
Solar	_____	High
Hydroelectric	Medium	_____

P1.3 National and Global Energy Resources

Use	Example Resources
_____	Oil, biofuel, electric (indirect)
_____	Fossil fuels, nuclear, wind, solar
_____	Gas, geothermal, solar heating panels

Nuclear

How it works:

- Nuclear fission in reactor cores releases heat → coolant → steam → turbines.

Renewable?

✗ No – _____ is finite.

Main Uses:

- _____ generation

Advantages:

- No CO₂ or _____ gases produced
- Very high energy _____ per kg of fuel

Environmental Impact:

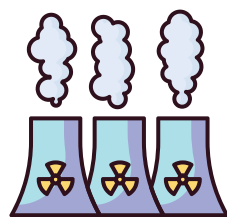
- Low emissions but high-_____ if accidents occur

Reliability:

✓ Provides base load – very consistent.

Cost:

High to _____ and _____; relatively low to run.



Disadvantages:

- _____ waste (long-term storage needed)
- High _____ cost and long decommissioning time
- _____ concern over safety (Chernobyl)

Wind

How it works:

- Wind turns turbine blades → generator produces electricity.

Renewable?

✓ Yes – wind is unlimited.

Main Uses:

- _____ generation

Advantages:

- No fuel cost or _____
- Quick to build

Environmental Impact:

- No pollution, but can harm _____ and spoil _____

Reliability:

✗ _____ – depends on wind speed.

Cost:

High _____ cost; low _____ cost



Reliability	Resources
_____ reliable	Nuclear, fossil fuels
_____ reliable	Wind, solar (weather dependent)
Base load	Nuclear, coal
Quick start	Gas, pumped storage

Base load:
Continuous demand met by nuclear & coal

Renewables: Used when conditions are suitable (e.g., windy or sunny)

Variable demand: Met using gas-fired & pumped storage power stations

Stored energy: Pumped storage used to meet peak demand quickly

Resource Type	Renewable?
Fossil Fuels	—
Nuclear Fuel	—
Biofuel	—
Wind	—
Hydroelectricity	—
Geothermal	—
Tidal	—
Solar	—
Wave	—

Tidal

How it works:

- Water trapped at high tide → released through turbines to generate electricity.

Renewable?

- ✓ Yes – driven by _____'s gravity.

Main Uses:

- _____ generation

Advantages:

- _____ and reliable
- No emissions

Disadvantages:

- _____ to build (barrages)
- May affect estuarine ecosystems and migration _____

Environmental Impact:

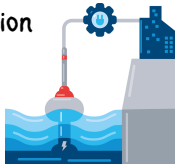
- Disruption to aquatic life and _____

Reliability:

- ✓ Highly _____ (based on tide cycles).

Cost:

Very high _____ cost.



How it works:

- Wave motion drives a generator that produces electricity.

Renewable?

- ✓ Yes – constant ocean waves.

Main Uses:

- _____ generation

Advantages:

- No emissions
- Ideal for _____ nations

Environmental Impact:

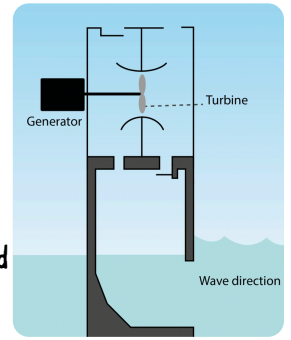
- Visual impact, possible disruption to sea life

Reliability:

- ✗ _____ with weather/ocean conditions.

Cost:

High due to _____ challenges.



Geothermal

How it works:

- Heat from radioactive decay in Earth heats water → steam → turbines.

Renewable?

- ✓ Yes – natural underground heat.

Main Uses:

- _____ generation

Advantages:

- Clean and _____
- Useful in _____ areas

Disadvantages:

- Location-_____
- Expensive to drill

Environmental Impact:

- _____, but may release underground gases

Reliability:

- ✓ Very reliable _____ available.

Cost:

High setup, low running cost.



P1.3 National and Global Energy Resources

Hydroelectric

How it works:

- Water stored in reservoir flows downhill → turns turbines → electricity.

Renewable?

- ✓ Yes – powered by rain cycle.

Main Uses:

- _____ generation

Advantages:

- Fast response to d _____
- Reliable and efficient

Disadvantages:

- Requires large _____ – can flood habitats
- Affected by _____

Environmental Impact:

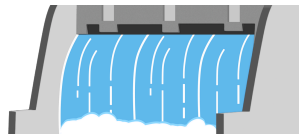
- Significant during c _____ (deforestation, flooding), affecting local communities and natural river flow
- Large reservoirs flood land → loss of wildlife and _____

Reliability:

- ✓ Reliable in _____ areas.

Cost:

High to build; low to run.



Solar

How it works:

- Cells: Sunlight → electricity.
- Heating panels: Sunlight → heats water.

Renewable?

- ✓ Yes – sunlight is unlimited.

Main Uses:

- _____ generation
- Domestic water _____

Advantages:

- No _____
- Good for remote locations

Disadvantages:

- _____ to install
- Unreliable in _____ or short-daylight areas

Environmental Impact:

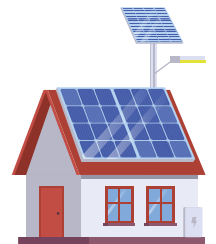
- No pollution during use, but _____ use can be significant

Reliability:

- ✗ Depends on _____.

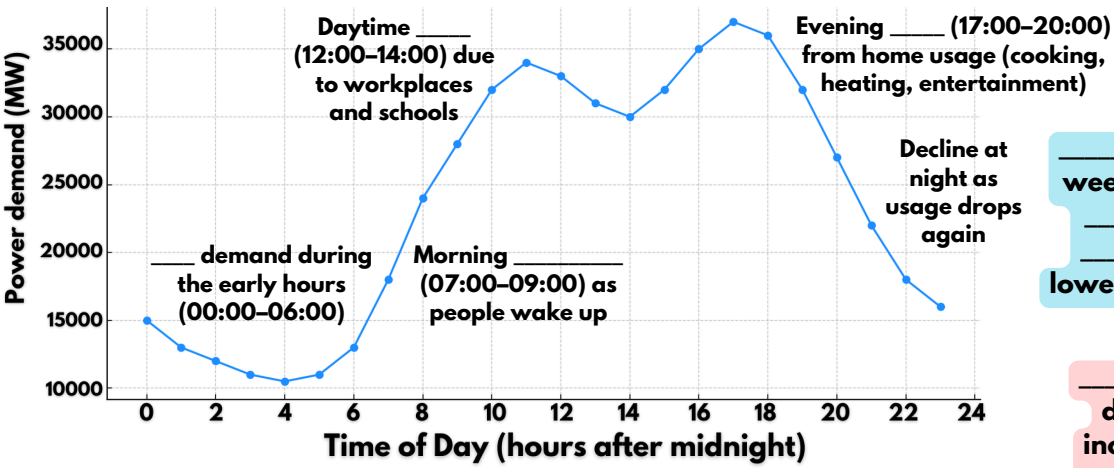
Cost:

High capital cost; very low to run.



Electricity Demands Over 24 Hours

Electricity demand varies throughout the day, week, and year.

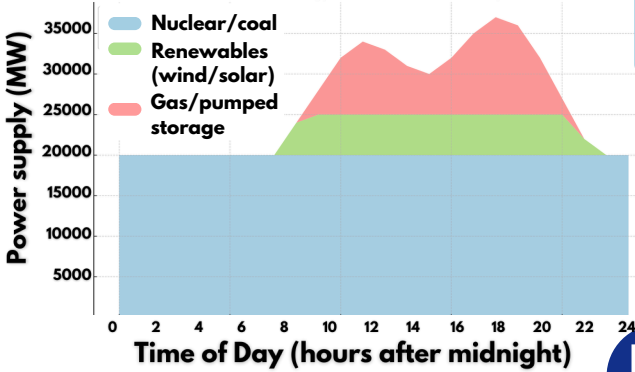


_____ variation: usually higher on weekdays due to school, work, and _____ activity, and drops on _____ when business use is lower and more people stay at home.

_____ variation: higher demand in _____ due to increased heating and fewer _____ hours, and lower demand in summer when heating is not needed and natural light lasts longer.



Example of how Different Energy Sources Meet Electricity Demand



Base Load (Nuclear/Coal): Constant supply to cover essential demand all day and night

Renewables (Wind/Solar): Contribute during suitable conditions (e.g. daytime, windy periods)

Gas/Pumped Storage: Fill in the gaps during peak times when demand spikes

P1.3 National and Global Energy Resources

Other political, social and ethical considerations include:

- _____ use still high due to **reliability & infrastructure**
- _____ alone cannot currently meet full **demand**
- **Government** _____ can increase renewable uptake
- **Global** _____ (e.g. oil shortages, war) affect energy choices
- _____ **pressure** and awareness → greener solutions

Energy resource use changes over time due to technology, public opinion, and government policy.

Time Period	Trend	Reasons
Pre-1950s	_____ dominant	_____ revolution; no alternatives
Late 20th century	Rise in _____	Seen as _____ and efficient (but expensive)
Early 2000s	_____ increase slowly	_____ pressure, EU/UK targets
2010s–Now	Faster shift to renewables	_____ change action, cost reductions
Future (predicted)	Mixed approach	Fossil fuels reduced, nuclear + renewables

Why can't science always solve environmental issues from energy uses:

Examples:

- **Carbon** _____ is scientifically possible, but too expensive for wide use.
- **Nuclear power** is efficient and low-carbon, but _____ fear and high costs **limit uptake**.
- _____ **wind farms** are clean and effective, but often face _____ **opposition**.

Science Can...	But Can't Always...
Measure CO ₂ levels, model climate change 🌍	Force _____ to reduce emissions 🚫
Identify cleaner energy sources ☀️	Overcome the _____ of switching from fossil fuels 🏗️
Show damage to habitats (e.g. tidal barrages) 🌊	Resolve _____ dilemmas about land use (biofuels vs food)
Recommend insulation & energy efficiency improvements 🏠	Make households or _____ adopt them 🏠