Energy Resources:

Renewable/flow resources replenish in a short time scale e.g. HEP, Solar & Wind
USA wind turbines: 16k turbines- California (2015: provided 6.9% of regional energy)

Non renewable/finite/stock resources incl fossil fuels e.g. Natural gas, Crude oil, Coal, they're formed from the sedimentation of dead organisms on the seabed
Natural Gas: 60% UK gas from North Sea (2030: supplies will peak & diminish), Nord pipeline from Russia-> Norway for European gas

Recyclable resources are made from waste products e.g. Nuclear & Biofuels (have useable waste products)
Biogas (India): biomass fed into plant 2 ferment & CH4 used 4 generators in rural villages (2.5 mil plants already)

Secondary energy resources entail primary resources being processed e.g. coal to get electricity vs just combusting coal

Impacts of Energy Production:

Non-renewable:

Mining:

Surface mining permanently scars landscape (due to removal of vegetation),
habitat destruction via deforestation reduces biodiversity,
forest clearing increases soil erosion due to lack of trees to absorb water from the ground,
CH_4 & CO_2 emissions increase global warming rate

Drilling (onshore & offshore):

Land stripping for drill access,
Oil Spills e.g. deep water horizon 2010 leaked 4m oil barrels into Gulf of Mexico,
Extraction of natural gas from underground reserves emits CH_4

China: coal provides 70% energy (4 the emerging, rapidly industrialising nation), Gov policy encourages opencast quarries, not mines. Shengli coalfield: 37km^2 with 2b tonnes of coal. 20m tonnes coal/year = last 100 years!

Mexico: 2010: BPs oil rig exploded & sank in Gulf of Mexico (3.2m oil barrels lost), endangered Batfish, dead baby dolphins washed up on Louisiana shore, BP fined $13b under USA's Clean H_2O act!

Renewable:

Wind:

Turbines need space = deforestation,
Noise & visual pollution for locals,
Spinning blades kill birds

Solar:

Ground & surface water used to clean panels = water shortages, disrupting ecosystems,
Disturb habitats if built on ground

HEP, Brazil: 46% energy = renewable, HEP = provides 85% but dam floods 400km^2 of Amazon rainforest (loss of vegetation & changes fish migration routes)= objections!

Energy Access:

Accessibility factors:

Tech: too costly for developing nations to extract resources.

Geology: countries on plate boundaries can access geothermal, fossil fuels found in sedimentary rocks (impermeable rocks trap oil & gas in permeable rocks below) aren't abundant everywhere.

Accessibility: permafrost entails hard extraction, protected areas e.g. Antarctica cannot be exploited.

Climate: Solar requires warmer climate near equator for reliability & wind requires cooler climate near the poles.

Landscape: wind turbines are reliable on high ground/along the coast, HEP requires steep sided valleys as reservoirs & high relief for dams

Uneven global distribution:

Developed nations consume more energy/capita (have higher standards of living e.g. cars)
Emerging nations e.g. China who are undergoing rapid industrialisation are consuming more energy
Developing nations consume less energy/capita due to inability to afford

Poor **energy networks** e.g. Subsaharan Africa rely on traditional fuel sources e.g. biomass for fuel/cooking, unable to exploit energy/ improve infrastructure= widens gender inequality gap as women collect resources (no time for education & independent income jobs) & 2.5mil women & kids deaths annually due to lung cancer (from traditional stoves)

Industrialisation requires lots of energy for manufacturing (emerging nations e.g. Indian Sadat Sarovar dam) & developed nations exploit LEDCs for manufacturing, with stronger foot in tertiary sectors, developing nations are in primary industry sectors so less energy demand

UK coal industry decline:

High cost: of drilling & pumping tech
Cheap imports: from USA & Russia
Demand fall: transport switched to diesel & electric, Gas = cheaper & cleaner
Emissions: pressure group & gov policies to tackle climate change

UKs energy mix:

Fossil fuel: >1960s = North Sea pipelines access
Renewables: 10% UKs energy, wind has most potential due to climate & 11k miles of coastline
Recyclable: nuclear provides 16% >1950s e.g from Hinckley point, Somerset

Oil Supply & Demand:

Oil forecast: by 2030, demand rise to 116m barrels
Peak oil: 1/2 world's oil reserves used up
Black gold: oil= valuable commodity

Oil reserves = recoverable oil (extracted with current tech)
Oil production = extracting/refining crude oil

Oil reserve forecasts: pessimists = close 2 peak oil but enough oil for 52 more years at current usage rate
BP economist: 'demand will run out before oil will'

Middle East abundant in oil but factors that effect uneven distribution are:
Infrastructure e.g. USA & Saudi Arabia & Russia has high levels of tech so produce the most
Domestic demand e.g. Saudi Arabia uses oil to meet domestic demand
Shrinking reserves: North Sea reserves declining

2015-16: worldwide oil consumption rose by 1.4 mil barrels/day due to development

GDP/capita increases proportionally with oil consumption (developed nations have more energy intensive goods), 65% oil used to fuel vehicles
Rapid industrialisation in China & India (growing population, industry boom, rural-urban migration) = higher energy consumption in emerging economies
China: >1990s = massive exports, 2004-2014: oil consumption doubled

Oil Prices:

Conflict: Middle East 1970s saw price hike, with production decrease
China was seen as an economic 'superpower threat' to Russia, so Russia hiked oil prices to decrease industrial output, similarly to hiking oil & gas prices in conflict with Ukraine after the annexing of Crimea in 2014

Diplomatic relations: 2012-14 Iran & Saudi Arabia disagreements on oil production targets saw drop in global oil price

Recessions: 2008 Wall Street Crash saw price drop as industrial output declined due to poorer economy / during COVID in 2020 due to transport reduction

Booms: price hike as consumption & demand increases

OPEC: regulator of oil price market, 12 members (majority being BRICS states) supply 45% of global oil, Saudi Arabia = chair, 80% crude oil reserves controlled by OPEC

New energies: adoption of renewables sees oil demand drop so prices drop (California- wind provides 6.9% energy so reduced USA reliance on Middle Eastern oil import) & unconventional drilling methods e.g. hydraulic fracking = energy mix diversified so less reliance on imports (OPEC regulated) = oil price drop

Increasing Energy Supply:

Heavy reliance on fossil fuels remains so Ecologically sensitive areas e.g. Arctic Circle & Amazon being explored & unconventional drilling employed e.g. hydraulic fracking, shale & tar sands
Seismic imaging lead 2 oil discoveries in Gulf of Mexico (uses sound waves which refract upon detecting rock structures with oil & gas)
Liquefaction: (gas-> liquid)= easy transport & economically viable

ARCTIC: holds 25% of world's oil & gas
Vast wilderness & taiga forest, several countries lay claim, 4 mil inhabitants from 40 ethnic groups

Economic pros of exploitation:
Reduction in imports so less cost
Money from exports
Investment & jobs

Environmental cons of exploitation:
Land clearing (for pipelines & roads) disrupts ecosystems & less carbon sinks
Industry increases air, soil & water pollution

Shale & Tar Sands (UNCONVENTIONAL):

Shale extracted by fracking (liquid pumped into rock @ high pressure, gas released as cracks)
Cons: land clearing for drilling pad construction disrupts ecosystems
Chemicals & Shale pollute drinking water e.g. in USA people have set fire to tap water

Tar Sands & Bitumen:

Surface mines collect tar sands & transport it to processing plants (water & chemicals separate bitumen from sands)

Cons of surface mining: liquid waste in processing pollutes water supplies,
Forest clearing reduces biodiversity

USA less reliant on imports as has vast shale deposits

Sustainable energy use:

Demand reduction by conserving energy (changing consumer behaviour e.g. less driving)/ increasing efficiency (e.g. LEDs)
Makes supplies last longer & reduces carbon emissions

Sustainable solutions:

Home: insulation (less heat loss via convection), new boilers (more efficient), solar panels (low-carbon energy)

Transport: Hybrid & electric vehicles, better public transport networks, increasing engine efficiency (legislation & fuel cost rise)

Pros of fossil fuel reduction:

Reduces carbon footprint: measure of direct & indirect emissions shrinks
Diversifying energy mix: reduced reliance enhances energy security in conflict (oil is political weapon) & in shortages reducing energy deficits
Energy security enhanced: good availability when fossil fuels run out

Energy security= reliable, affordable supply of energy available

IEA 450 scenario: temp drop by 4 degrees cel goal via removal of fossil fuel subsides & carbon taxes enforced

Sustainable energy use:

Biofuels: combustion of biomass

Pros: Less pollution, reduce waste
Cons: reduces food crops & needs masses of H_2O, deforestation increase

Wind: kinetic energy generated by turbines converted to electricity

Pros: no emissions after manufacture, economically viable
Cons: unpredictable, unreliable for demand surges, costly to transport to offshore farms

Solar: converts energy from solar cells to electricity

Pros: no emissions, widely available tech, little maintenance
Cons: needs suitable climate, destroys habitat

HEP: dams trap flowing water which is fed through turbines

Pros: flow of H_2O through turbines controlled so reliable, no emissions
Cons: costly, CH_4 emissions from flooded reservoirs behind dams

Hydrogen fuel: electrolysis of water

Pros: only by-product is H_2O so no waste, widely available
Cons: flammable so dangerous storage, costly tech, need to extract hydrogen

Future of Energy:

'Business as usual': continued fossil fuel usage & no renewables
'Move to sustainability': increase renewables, reduce finite

Attitudes:

Consumers:

Want: Energy security
Cheap

But sustainable energy requires: investment = price hikes & unreliability = can't meet demand

TNCs:

Shale firms e.g. SHELL object
Profit loss if shift to renewables
High costs & little gains with increased investment needed (risk)

Government:

Want: Energy security (finite are reliable in short term but renewables for long-term)
Pressure groups & public scrutiny to shift to renewables
Renewables can halt development & hinder relatability as cannot meet National Grid base load

Climate scientists:

Want: Reduced fossil fuel reliance as IPCC forecasts 4 degrees cel temp rise by 2100 under 'business as usual scenario'

Pressure groups:

Green space want less fossil fuel usage for environmental sake,
Favour 'move to sustainability'

Energy future:

Developed nation attitude shifts:

Affluence: more government investment into public transport & renewables, New/electric cars & solar panel investment

Education: schooling & media enhance environmental understanding, Carbon footprint reduction methods learnt

Environmental concerns: Education= prompts for reduction of carbon footprint,
Research & development into renewables,
Economic development can overshadow environmental concern

Carbon & Ecological footprint calculations:

Carbon footprint = greenhouse gas emissions measure of individuals/ companies
Ecological footprint= measure of land needed 2 support person's lifestyle

Factors:

Food: meat consumption, food wastage, local sourcing
Home: size & inhabitants + efficient appliance implementation
Travel: air travel, commuting, transport type
Lifestyle: cost of clothes, electrical devices & recycling habits

London congestion zone charges 1993:

Reduces heavy traffic & pollution in central LDN, encourages public transport 2 reduce emissions BUT major fines (£300m thus far) & poorest hit hardest