

2020s

2030s

2040s

**ELECTRICITY**

Largely decarbonise electricity: renewables, flexibility, coal phase-out

Expand electricity system, decarbonise mid-merit/peak generation (e.g using hydrogen), deploy bioenergy with CCS

**HYDROGEN**

Start large-scale hydrogen production with CCS

Widespread deployment in industry, use in back-up electricity generation, heavier vehicles (e.g. HGVs, trains) and potentially heating on the coldest days

**BUILDINGS**

Efficiency, heat networks, heat pumps (new-build, off-gas, hybrids)

Widespread electrification, expand heat networks, gas grids potentially switch to hydrogen

**ROAD TRANSPORT**

Ramp up EV market, decisions on HGVs

Turn over fleets to zero-emission vehicles: cars & vans before HGVs

**INDUSTRY**

Initial CCS clusters, energy & resource efficiency

Further CCS, widespread use of hydrogen, some electrification

**LAND USE**

Afforestation, peatland restoration

**AGRICULTURE**

Healthier diets, reduced food waste, tree growing and low-carbon farming practices

**AVIATION**

Operational measures, new plane efficiency, constrained demand growth, limited sustainable biofuels

**SHIPPING**

Operational measures, new ship fuel efficiency, use of ammonia

**WASTE**

Reduce waste, increase recycling rates, landfill ban for biodegradable waste

Limit emissions from combustion of non-bio wastes (e.g Deploy measures to reduce emissions from waste water)

**F-GASES**

Move almost completely away from F-gases

**GREENHOUSE GAS REMOVALS**

Develop options & policy framework

Deployment of BECCS in various forms, demonstrate direct air capture of CO<sub>2</sub>, other removals depending on progress

**INFRASTRUCTURE**

Industrial CCS clusters, decisions on gas grid & HGV infrastructure, expand vehicle charging & electricity grids

Hydrogen supply for industry & potentially buildings, roll-out of infrastructure for hydrogen/electric HGVs, more CCS infrastructure, electricity network expansion

**CO-BENEFITS**

Health benefits due to improved air quality, healthier diets and more walking & cycling  
Clean growth and industrial opportunities