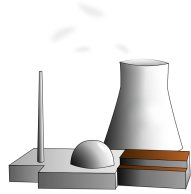


Energy Options for Decarbonisation

Nuclear



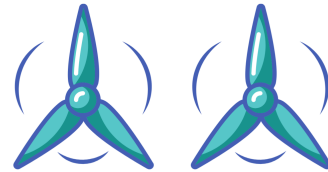
Energy density.. 20,000,000*
Safety..... 33*
Life span..... 60y
Reliability..... 92%
Carbon Footprint..... 6*
Public Support..... 43%

Hydropower



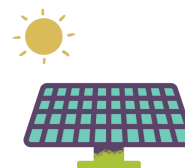
Energy density.... 0.0003*
Safety 1*
Life span..... 80y
Reliability..... 45%
Carbon footprint..... 177*
Public Support..... 74%

Wind



Energy density.... 0.0003*
Safety..... 25*
Life span..... 25y
Reliability..... 26%
Carbon Footprint..... 16*
Public Support..... 76%

Solar



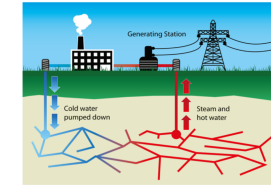
Energy density.... 0.0003*
Safety..... 50*
Life span..... 30y
Reliability..... 13%
Carbon footprint..... 65*
Public support..... 85%

Gas



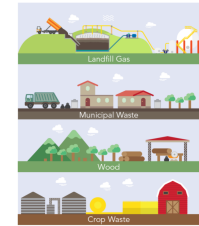
Energy density..... 1*
Safety..... 0.4*
Life span..... 30y
Reliability..... 85%
Carbon Footprint..... 455*
Public Support..... 26%

Geothermal



Energy density.... 0.0003*
Safety..... n/a
Life span..... 100y
Reliability..... 74%
Carbon footprint..... 40*
Public Support..... 74%

Biomass

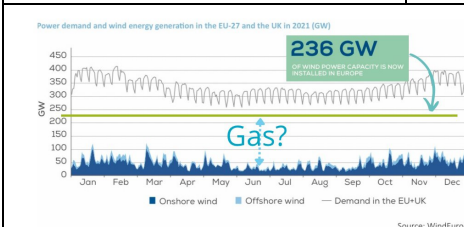


Energy density..... 1*
Safety..... 0.2*
Life span..... 30y
Reliability..... 64%
Carbon footprint..... 200+*
Public Support..... 75%

Nuclear Energy can harness the extremely high energy of the nuclear forces to generate energy with very little fuel or physical waste. Initial nuclear plants were designed for making plutonium and uranium but those currently under construction in the UK are for civilian purposes only. Nuclear energy is safe contrary to public perception. 'Spent' fuel is cooled for 20-30 years in a deep pool of water before its dry stored in casks. Waste heat is more problematic than physical waste.

Hydropower / hydroelectric power is one of the oldest and largest sources of renewable energy, which uses the flow of moving water released, generally, from behind a thick concrete dam to generate electricity. Wave and tidal power would have similar energy density values, however the majority of other data is insufficiently evaluated for a comparative presentation.

Wind-generated power derives from a fairly continuous but variable resource, and the amount of electricity produced at any given time by a turbine depends on wind speed, air density and turbine characteristics. Supply is a variable characteristic that doesn't necessarily match grid demand and requires gas back up:



Solar photovoltaics are silicon semiconductors that absorb sunlight and create an electric current. Although energy density is a difficult metric here, consider that a 300 Watt PV panel, 10% reliable in the UK, will, on average, only generate enough to power a 30 Watt lightbulb continuously (if the requisite battery storage were theoretically feasible).

Gas is a generally reliable and flexible energy source which captures electron-energy. As a fossil fuel, it releases greenhouse gases carbon dioxide, which stays in the atmosphere for hundreds of years, and methane, which stays in the atmosphere for around 12 years. However, methane has more warming potential than carbon dioxide.

Gas plants complement intermittent energy on the grid due to it's flexibility.

Geothermal energy harnesses the natural heat of rocks in the ground. Only feasible in geologically unstable areas with significant tectonic activity in the crust, geothermal plants exist in California, Italy and Iceland.

Biomass is considered 'renewable' in the UK, though it primarily derives from burning imported woodchips at Yorkshire's Drax power plant as well as energy-from-waste schemes. Burning wood releases carbon dioxide which contributes to the greenhouse effect.

* Energy density in kWh/kg derived from "Nature, Energy and Society: A Scientific Study of the Options Facing Civilisation Today" by Professor Wade Allison; Reliability (Capacity factor) and *lifecycle greenhouse gas emissions (grams of carbon dioxide equivalent per kWh), are from the UNECE Report Life Cycle Assessment of Electricity Generation Options (2022) ; * Safety is compiled from ourworldindata.org and inverts values to TWh per death; Life Span is the maximum life expectancy of a technology (approximate, depending on design, feasibility, grid system, political factors etc); Public support figures are derived from the YouGov 2024 Polls

About the authors: Marie and Ben Zabell are Imperial College graduates who created these info-cards to summarise the realities of well-known energy sources, due to a concern that, although it is clean and reliable, nuclear fission is not widely recognised in a favourable light, but is vital for decarbonisation.