

What are the renewable alternatives to fossil fuels?

Below is given the energy use in EJ (exajoules, 10^{18} J) in 2023 by fuel source :
(<https://www.energyinst.org/statistical-review/resources-and-data-downloads>)

Oil	Natural Gas	Coal	Nuclear energy	Hydro electric	Renew-ables	Total
196,43	144,37	164,03	24,57	39,651	50,58	619,63

We want to try and estimate by order-of-magnitude what is needed to replace fossil fuels by renewables, using some very crude assumptions :

Oil is used for mobility

Gas is used for heating

Coal is used for electricity

Hydro and nuclear will remain constant

Approach :

1. Apply meaningful conversion efficiencies for each of the 3 fossil resources + uses
2. Choose which of the 3 fossil resources you'll replace by which renewable resource among the following :
 - Solar PV
 - Wind
 - Wood
 - Biowastes for biogas
 - Biocrops for liquid biofuels
3. Find the conversion efficiencies and m^2 requirements of the renewable technologies to propose estimates
4. Discuss the findings