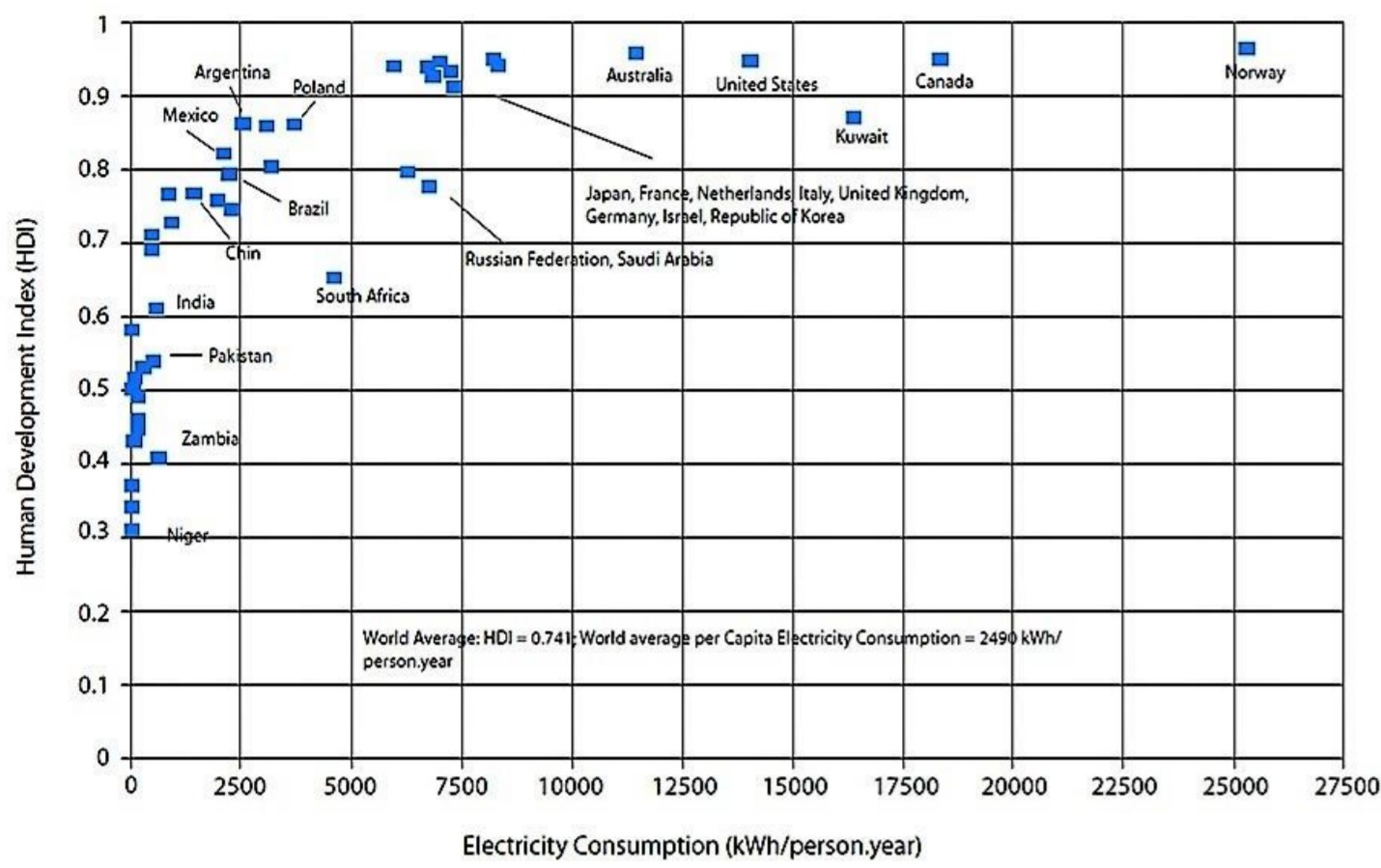
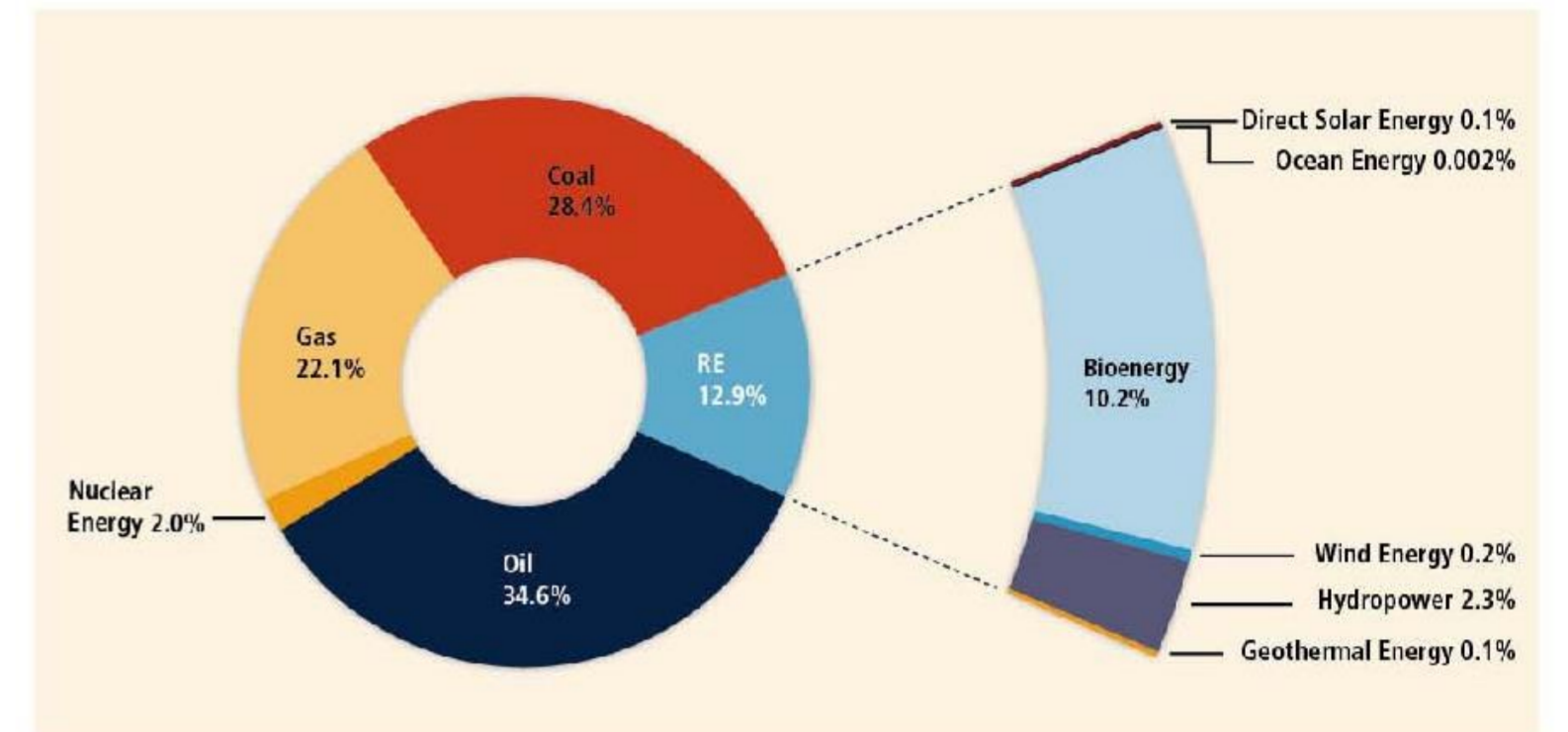




Energy security, energy equity and environmental safety and sustainability are the 3 fundamentals on which the present and future generations of the world can have a decent existence. The expanding population from the present 7 billion to estimated 10 billion by 2050 and the demands and stress that it raise underline the importance of these in the life of modern man. Dependable energy sources matching these fundamentals are the primary requirement to achieve the basic goal of human well being.

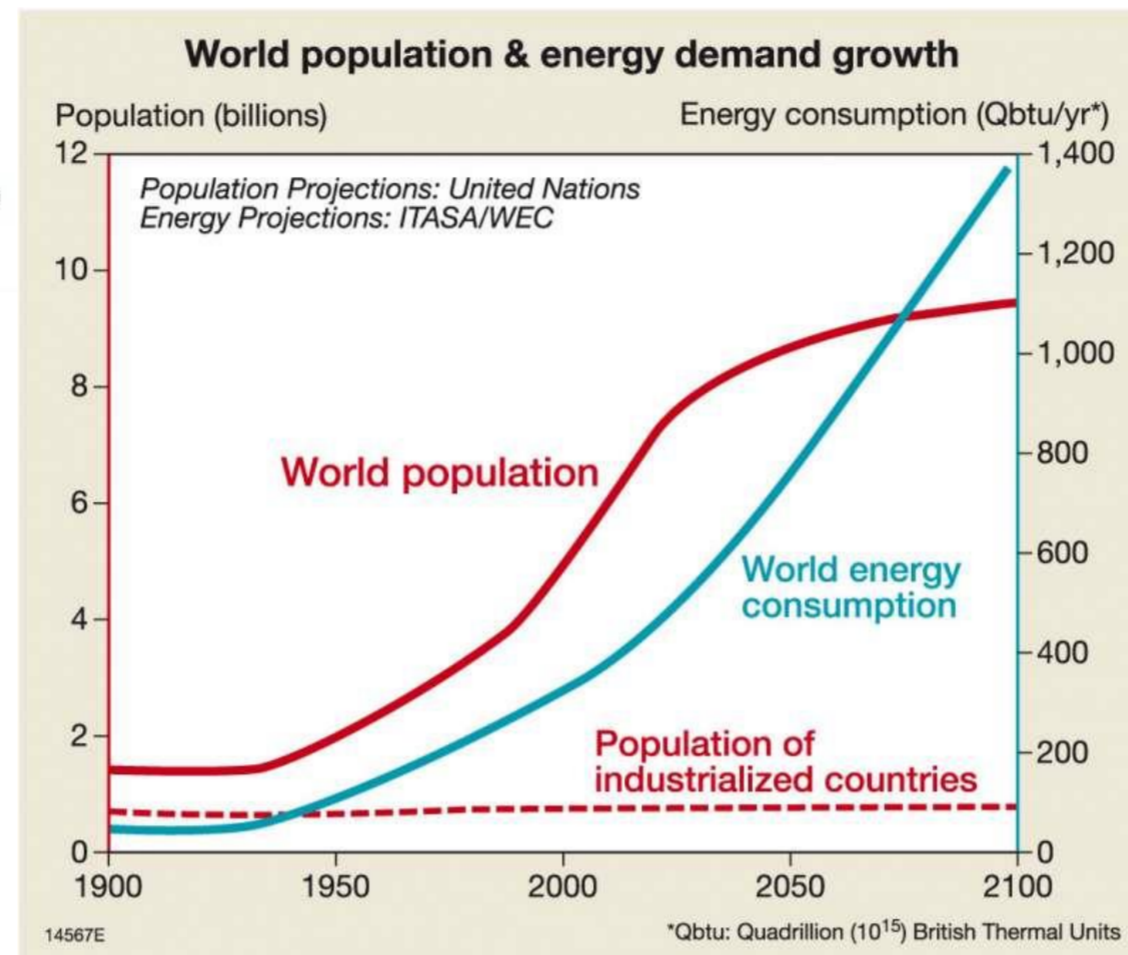


Two to three fold increase in energy consumption is expected by 2050 to meet the potential challenges posed for sustained development, environmental protection and thus overall healthy life for an estimated 10 billion people of the world.

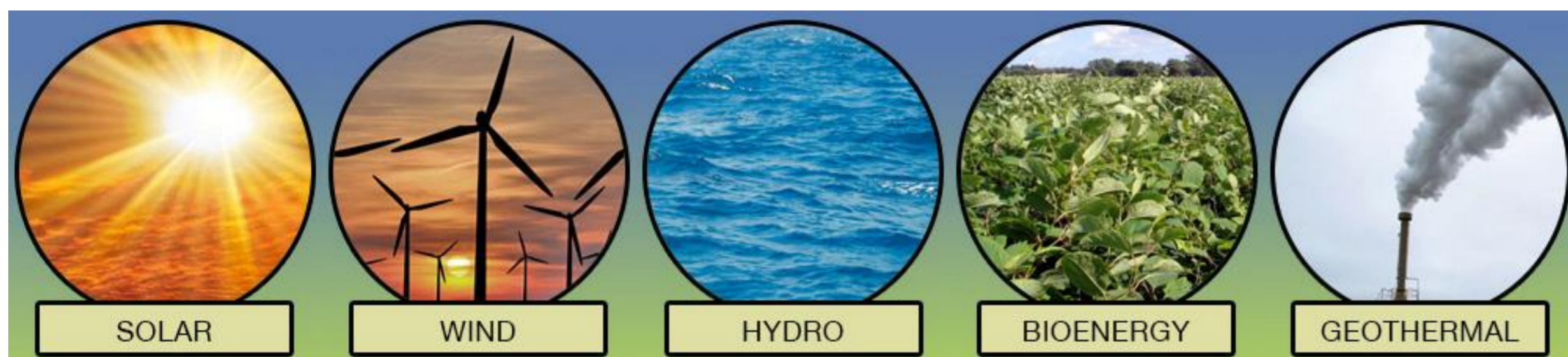
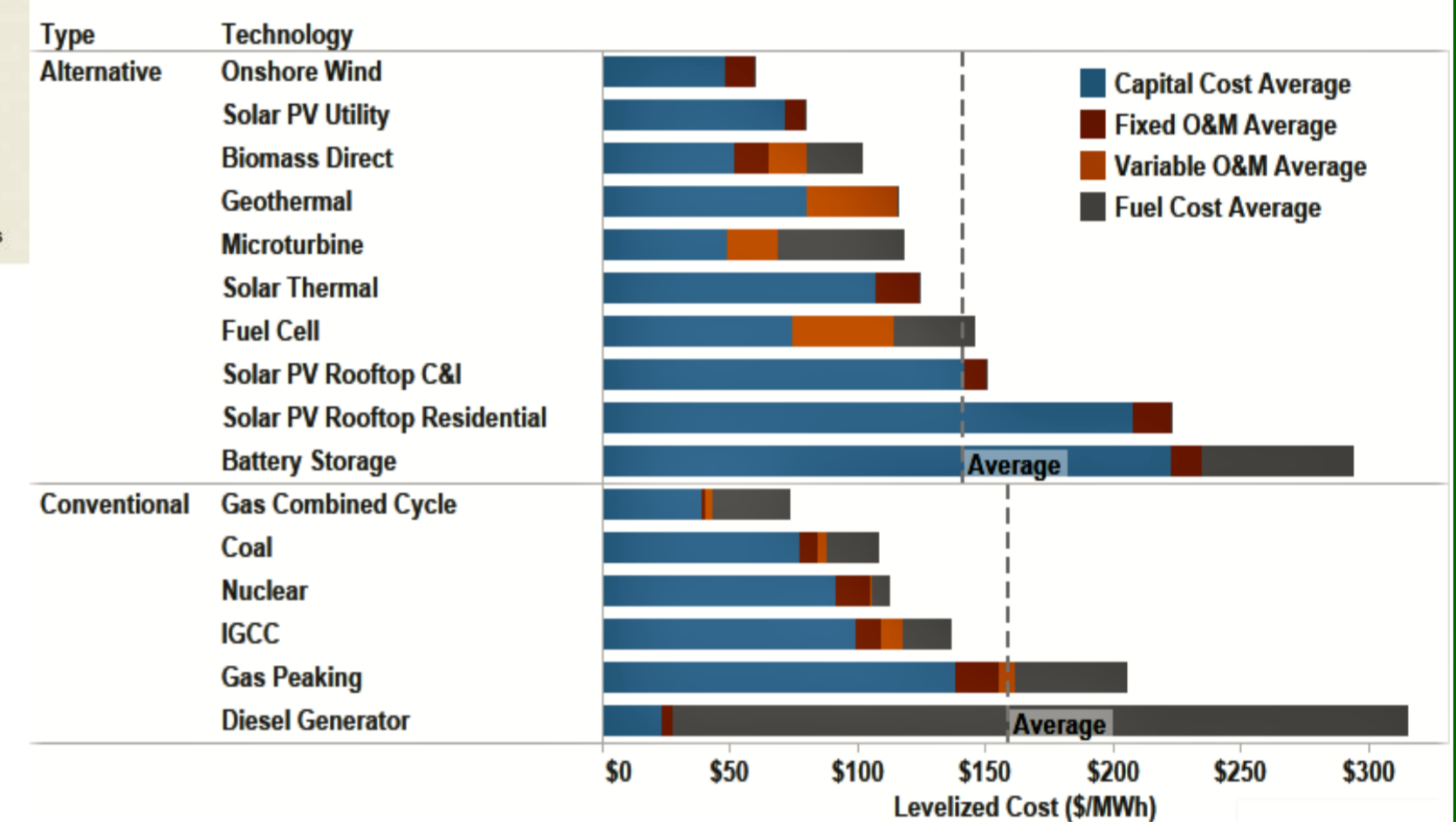


As of today **85 % of the world's energy** needs are met by fossil fuels extraction and stock of which would start declining by 2040. More importantly the environmental hazard posed by the uncontrolled use these fuel has the potential to jeopardise normal life.

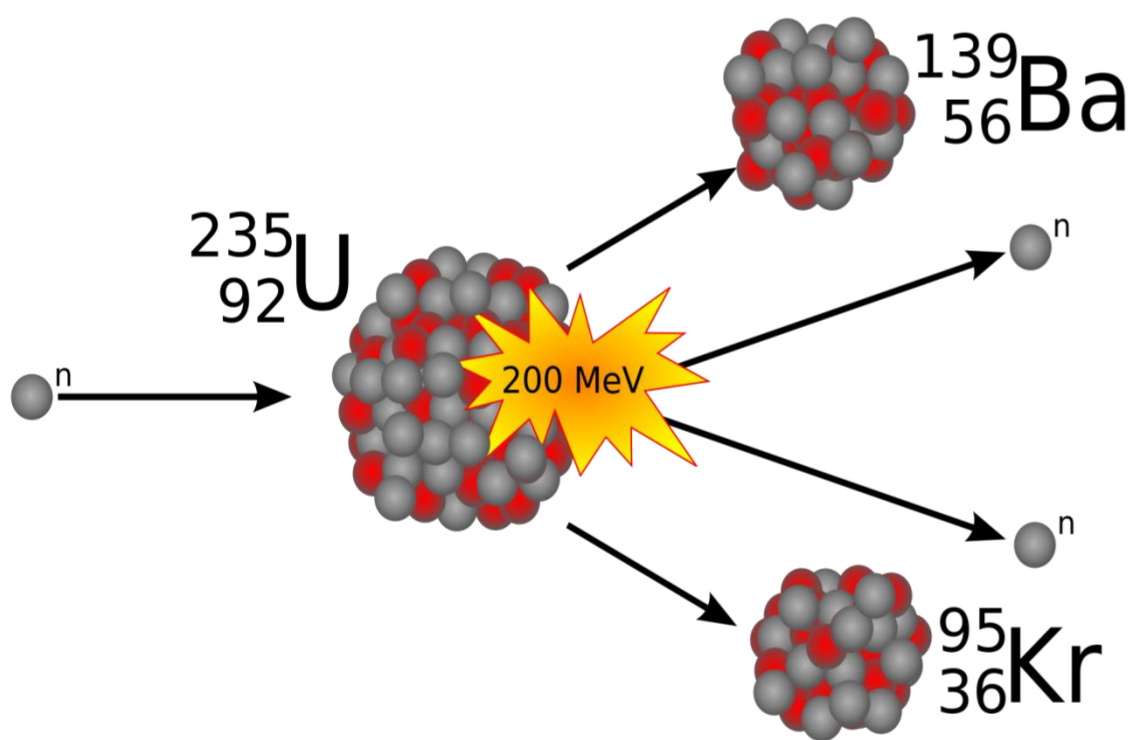
An increase in **per capita annual power consumption** by a few thousand kilowatt hour raises the **Human Developmental Index** –a direct indicator of human well being /quality of life- of country to the top. While the most developed countries have HDI saturated above 6000 kWh with a maximum value 0.949, India, a fast developing country has it 0.624 with per capita usage 1075 kWh in 2016 which is in creasing at a rate of 8% per annum from 2008 onwards.



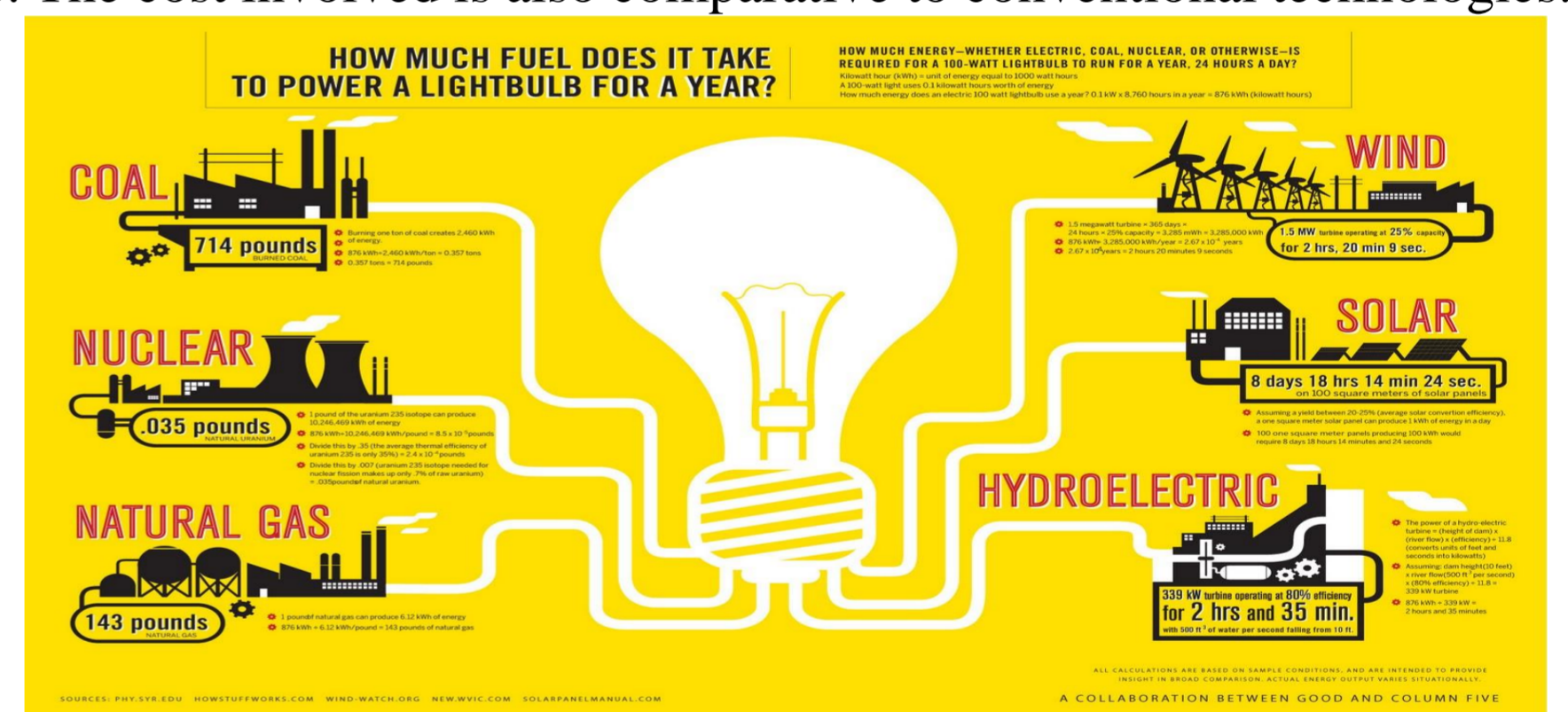
Components of levelized cost of energy



Energy from renewable sources very much depends upon environmental conditions and so very much unpredictable and rarely constant. Technology for energy storage to make it up as a non varying source of power source is still a technological challenge. The cost involved is also comparative to conventional technologies.



Contribution from the highly developed **Controlled Nuclear Fission power reactor technology** is the major hope as of today and yet concerns on safety, disposal of radio active waste and chances of nuclear weapon proliferation are drastically affecting its public acceptability world wide and the plans to build them are declining world wide.



Why Controlled Fusion so special ? Fuel to energy ratio in fusion reaction is tremendously high: 1.12 kg of deuterium and tritium is equivalent to 9000 tonnes of coal in generating 1000 MW of power and emits just 2 kg of harmless helium gas compared to 30000 tonnes of CO₂ by fossil fuels. Similarly the lithium present in a computer battery = 40 tons of coal in terms energy when used as fusion fuel. Deuterium and Lithium are available for thousands of years to meet the ever expanding need for enormous amount of energy

To meet the energy needs of a city of 1 million people one would need:

Either

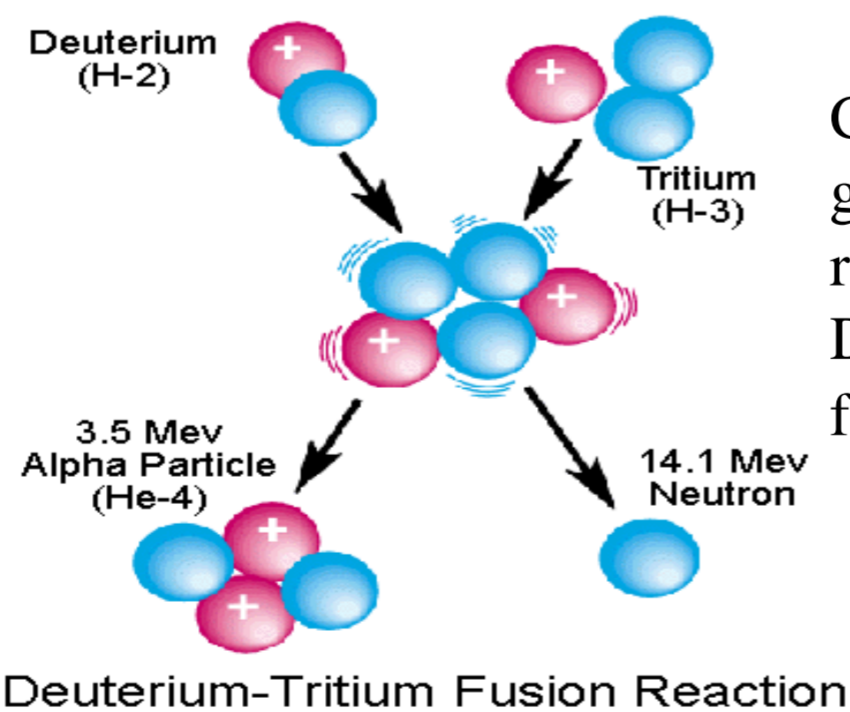
250,000 tonnes of oil

Or

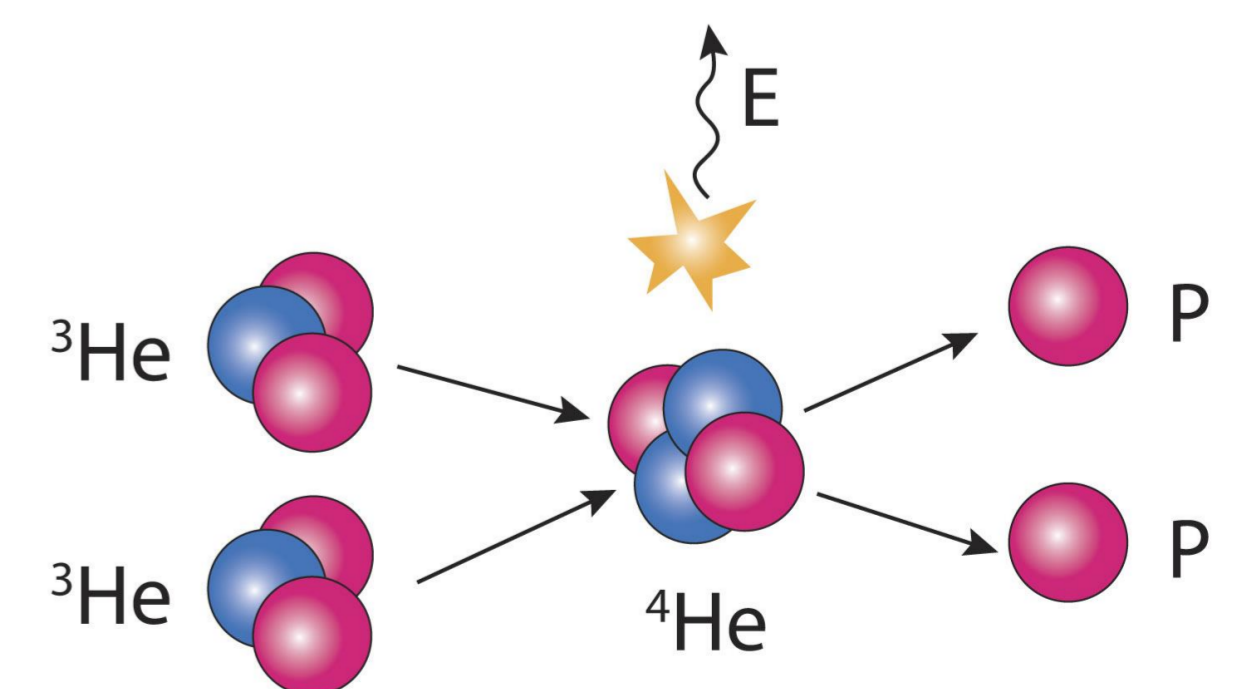
400,000 tonnes of coal

Or

60 kg of fusion fuel



The aneutronic H₃ – H₃ Nuclear fusion reaction is a highly promising futuristic field. As there is no neutron generation it does not require even radiation shielding. As the products are protons, easy containment and direct conversion to electricity become possible without even having turbines and steam. Space powers including India have solid plans to mine H₃ from moon as it virtually does not exists on earth. These efforts will become more visible by 2020 .



Around 20% of world population live without power and about 50 % live a substandard life . The IAEA predicts 1.2 billion people to remain without power and WHO reports 7 million deaths per year, one out of every 8, due to carbon fuel pollution . The much threatening “climate Change” once supposed to happen in future is already happening . All this when world energy bill is at \$5 trillion an year with the ever increasing global debt. Resources remain limited and depleting fast and even wars are possibilities. The nuclear fission rector technology which make it possible for Uranium enrichment for weapon applications in this terrorists inflicted word remains a threat in addition to the scare of accidents it generates . In such a scenario controlled nuclear fusion for power generation is mankind's biggest hope.