

Towards a major role for electricity in the long term ?

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The main issue for energy in the 21st century is probably more on environmental impact of fossil combustion than on resources scarcity.

Massive cheap oil is now behind us, whereas liquid fuel demand will continue to grow, mainly for transport uses. As the remaining oil resources (deep offshore, unconventional oil) are expensive to put on production, the oil market will probably be durably close to shortage, with high average prices and short term oscillations. Gas is less scarce than oil, mainly because its industrial production is more recent, but it is more expensive to store and transport than oil. There are still huge resources of coal, but coal is less versatile than oil and gas. So, enough energy is available for the current century, but at high costs.

The real problem is climate change : if all this fossil energy is burned, the CO₂ emissions will continue to grow. To avoid that, no silver bullet, but a mix of energy efficiency on end-uses, shift to less CO₂-loaded resources (coal to gas, fossils to nuclear and renewable...), and CO₂ carbon capture and storage.

In this context, all long term energy scenarios rely on electricity as a major player :

- (i) electricity can be produced from any kind of primary energy resource: fossil, hydro, biomass, wind, solar, nuclear. The electricity transport grid allows an economically optimal combination of these resources, both at centralized (nuclear and fossil power plants, large hydro) and decentralized level (cogeneration, small hydro, biomass, wind, solar).
- (ii) carbon capture and storage is more economically realistic on centralised uses like fossil power plants, than on decentralised (small boilers...) or mobile ones (transport).
- (iii) electricity end-uses are often more efficient than their fossil competitor, both for domestic uses (heat pumps for space heating and domestic hot water) and industrial uses (heat pumps for heat losses recovery, infrared and induction heating...).

So, in the long term, the global energy context is a real opportunity for electromagnetic processing of materials, because of their good energy efficiency, and their ability to reduce material losses and facilitate material recycling.