

ZERO CARBON ENERGY IN 2050

In 2050, the global energy system does not emit any carbon dioxide and is on its path to become 'carbon-negative'. This ensures stabilization of carbon concentrations in the atmosphere close to 350 ppm CO_{2eq} and limits the increase in the global mean temperature to under 2°C.

The Planet in 2050 is populated by 9 billion people but uses roughly ½ of today's energy. Moreover, there is virtually no 'energy poverty'. The majority of the 'bottom billion' (which by 2050 becomes 'three billions') has access to modern clean forms of energy ensuring the level of human development comparable to that of the industrialized world in the late 20th century. Through innovative appropriate technologies this is attained at only about one kilowatt of energy per capita. At the same time, the industrialized countries and emerging economies are, on average, retaining the standard of living of today's France, Sweden or Japan. This standard, however, is maintained with significantly less energy consumption thanks to radically improved efficiencies and reasonably constrained consumption.

The energy production is carbon neutral and in some cases carbon negative. There is a world-wide ban on coal burning unless accompanied by carbon capture and storage or very rigorous offsets. Oil, as an energy source, has been largely replaced by products of biomass obtained from agricultural residues, specifically engineered perennial plants growing on marginal lands and providing diverse products, and algae grown in intensive closed-loop 'energy farms'. Most of the vehicle fleet is electric.

Electricity in general plays an important role in the energy system, it is delivered to consumers through 'super-smart grids'. At the micro-level this system is 'smart' featuring active load devices, distributed generation and high reliability. At the macro-level it is capable of transferring large amounts of electricity (generated, for example, by solar power in the deserts) across very long distances. As electricity generation comes to the center of the global energy system, the methods for generating electricity shift towards renewable sources, such as solar, wind and hydro, as well as to nuclear power which provides some 10-20% of global electricity power especially in locations where no other options are viable. Nuclear power production is part of global technology chains, global standards and global regulations – in both the North and the South.

NOT IN THIS VISION

- Massive inequalities in access to energy services, billions of people without access to electricity or clean cooking fuels
- Indoor and outdoor air pollution from dirty fuels and associated 5% of the global burden of disease;
- Crumbling and unreliable energy infrastructure jeopardizing normal functioning of societies;
- Gunboat diplomacy, energy blackmail, geopolitical tensions, and 'oil wars';
- 'Resource curse' crushing political and economic hopes of energy-exporting nations.