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GLOBAL ENERGY SYSTEM BASED ON 100% RENEWABLE ENERGY – POWER SECTOR



Study by



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KEY FINDINGS

Global Energy System based on
100% Renewable Energy – Power Sector

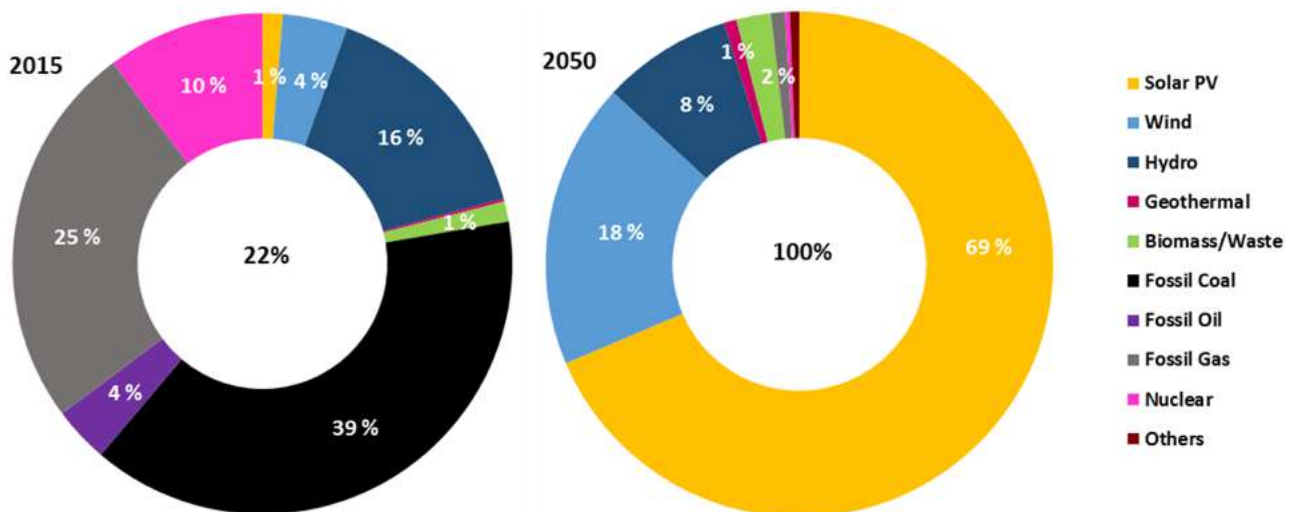
A global transition to 100% renewable electricity is feasible at every hour throughout the year and more cost effective than the existing system, which is largely based on fossil fuels and nuclear energy. Energy transition is no longer a question of technical feasibility or economic viability, but of political will.

- Existing renewable energy potential and technologies, including storage can generate sufficient and secure power to cover the entire global electricity demand by 2050¹. The world population is expected to grow from 7.3 to 9.7 billion. The global electricity demand for the power sector is set to increase from 24,310 TWh in 2015 to around 48,800 TWh by 2050.
- Total levelised cost of electricity (LCOE) on a global average for 100% renewable electricity in 2050 is 52 €/MWh (including curtailment, storage and some grid costs), compared to 70 €/MWh in 2015.

Solar PV and battery storage drive most of the 100% renewable electricity supply due to a significant decline in costs during the transition.

- Due to rapidly falling costs, solar PV and battery storage increasingly drive most of the electricity system, with solar PV reaching some 69%, wind energy 18%, hydropower 8% and bioenergy 2% of the total electricity mix in 2050 globally.
- Wind energy increases to 32% by 2030. Beyond 2030 solar PV becomes more competitive. Solar PV supply share increases from 37% in 2030 to about 69% in 2050.
- Batteries are the key supporting technology for solar PV. Storage output covers 31% of the total demand in 2050, 95% of which is covered by batteries alone. Battery storage provides mainly short-term (diurnal) storage, and renewable energy based gas provides seasonal storage.

Figure 1: Electricity generation from renewables in 2015 and 2050. In 2050, nuclear power still accounts for negligible 0.3% of the total electricity generation, due to the end of its assumed technical life, but could be phased out earlier



100% renewables bring GHG emissions in the electricity sector down to zero, drastically reduce total losses in power generation and create 36 million jobs by 2050

- Global greenhouse gas emissions significantly reduce from about 11 GtCO₂eq in 2015 to zero emissions by 2050 or earlier, as the total LCOE of the power system declines.
- The global energy transition to a 100% renewable electricity system creates 36 million jobs by 2050 in comparison to 19 million jobs in the 2015 electricity system. Operation and maintenance jobs increase from 20% of the total direct energy jobs in 2015 to 48% of the total jobs in 2050 that implies more stable employment chances and economic growth globally.
- The total losses in a 100% renewable electricity system are around 26% of the total electricity demand, compared to the current system in which about 58% of the primary energy input is lost

¹ The simulations of the global power sector in this study were made until 2050. Yet, with favorable political frameworks, the transition to 100% renewable energy can be realized earlier than 2050.