

2.1 The Future of Energy

The electricity sector

The electric system is undergoing a profound transformation. Technology and innovation are accelerating the transition towards a more efficient and environmentally-friendly industry. The trends that will mark the future are:

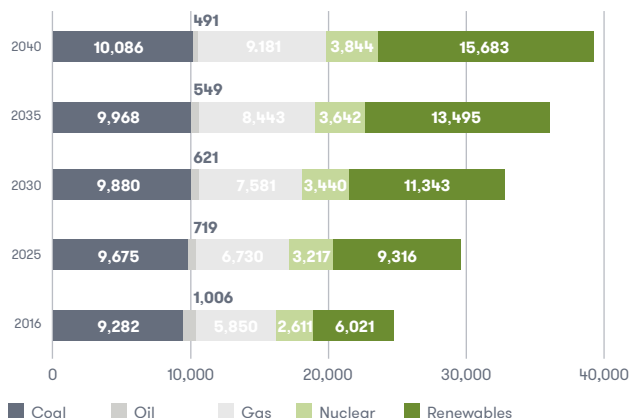
- **Decarbonisation and electrification:** 60% forecasted increase in worldwide demand through 2040⁽¹⁾, driving an increase in networks and renewable technologies.
- **Increase in connectivity of customers:** Increase in installed smart meters (more than 300 million installed by 2020⁽²⁾) and electric vehicles (to 280 million⁽³⁾).
- **Technological progress,** which drives a reduction in costs and creates new business opportunities. The cost of renewable energy has significantly decreased in recent years⁽⁴⁾, which allows for the growth of this technology.

Sources: (1) World Energy Outlook 2017 - IEA; (2) Global EV Outlook 2017 (Technology scenario) - IEA; (3) Navigant analysis; (4) Normalised cost of energy - IRENA.

Opportunities for continued growth

The energy sector presents strong opportunities for growth over the long term as a result of the process of electrification.

Electricity production by type of source (TWh)

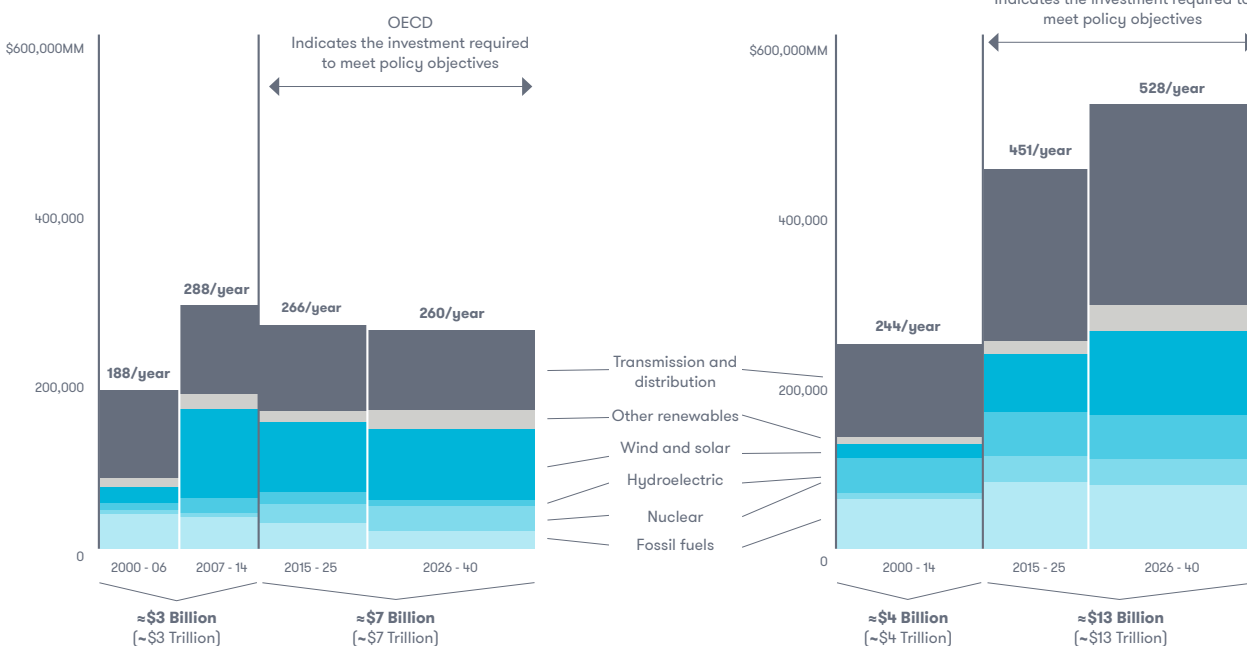


Source: World Energy Outlook 2017 - International Energy Agency (IEA).

“There is a need to electrify the economy through more renewables, more pumped storage capacity, more and smarter grids and more electric vehicles, in addition to the electricity industry having to invest some \$19 trillion over the next 25 years.”

Ignacio S. Galán, at the WORLD ECONOMIC FORUM 2018

Investment in electricity infrastructure within and outside of the OECD



Source: The Future of Electricity Report, World Economic Forum 2016.

Evolution of demand^{(1),(2)}

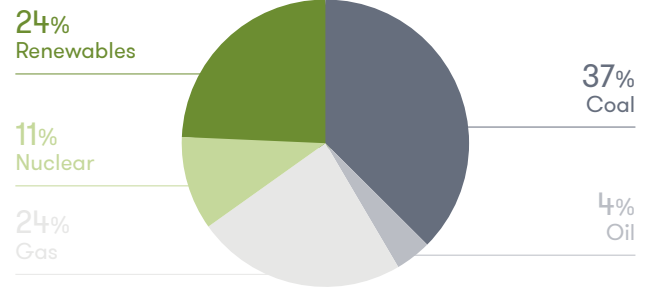
The prospects set out in the *World Energy Outlook 2017* regarding the use of energy continue to indicate an increase in energy demand over the next three decades, with a clear displacement of thermal energy by renewable energy.

The *EU Roadmap* forecasts that electricity will at least double its share in final energy demand to 36-39% by 2050, which would contribute to a reduction in carbon emissions from heating systems and the transport sector.

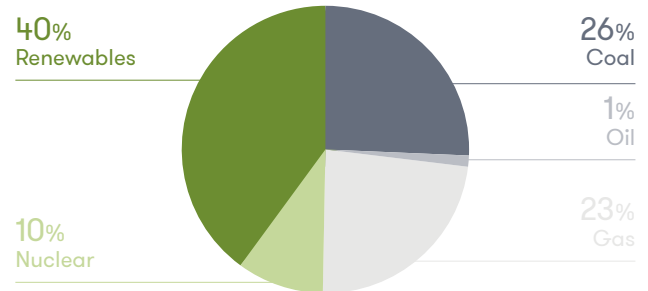
Recent years have seen a reduction in the relationship between economic growth and increasing CO₂ emissions, thanks to the growing use of renewable energy sources.

Growth in global electricity production (TWh)⁽¹⁾

2016
24,770 TWh



2040
39,290 TWh



Sources: [1] *World Energy Outlook 2017* - IEA; [2] *Energy Roadmap 2050 of the European Parliament*.

Trends in production and use of electricity

Sectoral^{(4), (5), (6)}

- The European Union has a significant challenge in meeting its commitments on climate and energy established for 2020, 2030 and 2050.
- Global growth in the supply of electricity through 2040 will be covered mainly by wind power, gas and photovoltaic energy. The proportion of fossil fuels in electricity generation will descend towards 2040, while renewables will increase to 40%.
- To the extent that generation with renewable energy sources gains weight, electrification generates more environmental benefits by avoiding the energetic consumption from fossil sources (e.g. in transport and heating). In many cases, electrification increases energy efficiency.

Technological^{(4), (5), (7)}

- The growing penetration of electric vehicles will increase the consumption of electricity and will offer a tremendous opportunity to optimise the use of the network.
- The increasing penetration of smart metering infrastructure will allow for improvement in the quality of service, the ability to manage the low-voltage grid and the collection of information.
- Urban/technological lifestyles require more electricity. The growing middle class, the increase in income, and the larger amount of electric appliances will contribute to a doubling of electricity demand through 2060.
- Electricity storage, as a still-embryonic technological possibility, can open up new vistas for the operation and management of power systems.

Consumption^{(4), (6)}

- It is expected that the global population will grow by 2,000 million people by 2040, driving world energy needs. Therefore, electricity generation will increase by 2040 due to an increase in demand in the industrial and domestic sectors.
- In the coming years, it will be necessary to reduce emissions by almost half in order to halt climate change, with the difficulty that if consumption stays on its current pace, it will have increased by approximately 45%.
- The development of new uses and applications for electricity may result in new markets and opportunities.

Sources: [4] *World Energy Outlook 2017* - IEA; [5] *Energy today in Spain, 15 key issues for the next legislature* - Club Español de la Energía; [6] *World Energy Outlook 2014* - IEA; [7] *World Energy Scenarios 2016* - World Energy Council.