

IEEJ Outlook 2018

– Prospects and challenges until 2050 –

Energy,
Environment
and Economy

“IEEJ Outlook 2018” analyses the peak of oil demand and long-term climate change issues in addition to the projection for energy supply and demand in the world. China’s energy demand hits a peak in the mid-2040s, and the centre of gravity of energy demand shifts to South and Southeast Asia. Fossil fuels remain mainstream of energy supply although their market share declines. Climate change issues are long-lasting challenges, and it is important to pursue balanced responses over a long period, aiming to minimise the total cost rather than focusing on only emission reductions in the short to medium term such as, 2030 or 2050. The key to achieve a “2°C target” is to reduce the cost of innovative technologies through international cooperation. Oil demand will peak around 2030 if the penetration of zero-emission vehicles* (ZEVs) is greatly advanced.

Overview of the global energy market by 2050

The centre of gravity of energy demand shifts to South and Southeast Asia. Power generation and transportation drive demand increases. CO₂ declines after 2020 in the Advanced Technologies Scenario, but the level is far from halving by 2050.

- Global energy demand continues to increase despite great improvements in the energy efficiency of the economy. Approximately two-thirds of the increases in demand by 2050 come from non-OECD Asia in the “Reference Scenario.” China’s energy demand peaks by the mid-2040s, and the centre of gravity of the energy market shifts to India and ASEAN over the long term.
- Three-quarters of the increases in energy demand are concentrated in the power generation and transport sectors. Thermal power generation meets most of the rapid increases in electricity demand in developing countries and leads to increase in fossil fuel consumption along with transportation fuels for automobiles and ships. Fossil fuel dependency of the world remains about 80% even in 2050, and energy-related CO₂ emissions increase by 34% from today.
- Energy efficiency, low carbon technologies and others can reduce energy consumption by 13% (equivalent to the current consumption of the United States and Japan combined) in 2050 in the “Advanced Technologies Scenario.” In this Scenario, compared to the Reference Scenario, the maximum introduction and penetration of cutting-edge energy environmental technologies is taken into account.
- CO₂ emissions begin to decline in the mid-2020s in the Advanced Technologies Scenario but are far from the level of halving by 2050. Electricity-related measures such as non-fossil fuel power generation, thermal power generation with carbon capture and storage, demand reduction, and efficiency improvements for transmission and distribution, contribute to two thirds of the total reduction in 2050. By then, zero-emission power generation accounts for two thirds of the electricity supply. Half of the power generation capacity is solar PV and wind, but sufficient cost reduction and reinforcement of grid stabilisation measures are necessary.

* ZEV consists of plug-in hybrid vehicles, electric vehicles and fuel cell vehicles in the Outlook.

Pursue practical approaches to climate change issues

Sustainable responses are required recognising that climate change issues are ultra-long-term challenges affecting a wide range of areas. The key is cost reduction of innovative technologies through international cooperation.

- To pursue the minimisation of total cost as a sum of mitigation costs, adaptation costs and damages is important based on the perspective of sustainability. IEEJ conducted and evaluated economic and climate analysis by developing and using its in-house “integrated assessment model.”
- The temperature rise from the latter half of the 19th century is 2.6°C in 2150 in the “Minimising Cost Path,” where the total cost is approximately half of the Reference Scenario equivalent. On the other hand, the temperature rise is curbed to 1.7°C in the “Halving Emissions by 2050 Path,” but the total cost is more than twice that of the “Minimising Cost Path.”
- We developed another path aiming at the “2°C target,” described in international politics. Such “2°C Minimising Cost Path” would be subject to a rise of 2°C or less by 2150. The cost would be about 20% more than the “Minimising Cost Path” but about 50% less than the “Halving Emissions by 2050 Path.”
- The introduction of innovative technologies such as CO₂ free hydrogen is necessary to realise the “2°C Minimising Cost Path.” The target costs of many innovative technologies should be below the carbon price (\$85/tCO₂) in 2050. As such, a significant reduction in technology costs, due to steady progress in the technological development roadmap, would greatly contribute to the realisation of that Path.

Considering the possibility of peak oil demand

Given a significant progress in the penetration of ZEVs, oil demand is likely to peak around 2030. The impact will be widespread including economic impacts in the Middle East.

- Oil consumption in the Reference Scenario increases from 90 Mb/d in 2030 to 122 Mb/d in 2050. There, however, is a view that oil consumption will peak due to the demand side factors rather than resource constraints. Climate change measures and drastic transformations in automobile powertrain would reduce oil demand considerably.
- If all new cars sold in the world in 2050 are ZEVs, oil consumption would peak around 2030, and by 2050 it will be almost as much as today. Oil price will decline due to the supply-demand relaxation compared to the conventional view that world oil demand continues to increase. In that case the Middle East, which can produce oil at low cost, will increase its share of the supply and the geopolitical risks for stable supplies will increase.
- The decline in net oil exports in the Middle East reaches \$1.6 trillion, or 13% of GDP. It is important to strengthen the efforts to diversify the economic structure of the Middle East oil-producing countries. Although it is reasonable to cut public investment and subsidies to reduce budget deficits, it is difficult to deny the possibility of increasing social anxiety and worsening situation in the Middle East. Steady and stable implementation of reforms is required.
- Oil demand in 2050 is not much different from today’s level even in this “Peak Oil Demand Case.” The gap between the supply and demand and a rise in the oil price may occur if supply investment stagnates due to excessive pessimism over the future of the oil market. That can trigger further switching from oil, threatening energy security. Steady and sufficient investments are important for any of the demand scenarios.