

### **Key Points of “IEEJ Outlook 2018”**

Ken Koyama, PhD  
Chief Economist, Managing Director  
The Institute of Energy Economics, Japan

On October 12, the Institute of Energy Economics, Japan, released its latest long-term global energy outlook titled “IEEJ Outlook 2018” (hereinafter referred to as the “Outlook”). The IEEJ releases a long-term global energy outlook annually. The latest Outlook extends the end of the projection period from 2040 to 2050, projecting global energy supply and demand, and markets for the next 30 plus years and analyzing challenges regarding the so-called 3E’s+S -- energy security, environmental problems, economic efficiency and safety. It sets and analyzes two basic scenarios under major assumptions including the average annual global economic growth through 2050 at 2.7%, global population at 9.7 billion in 2050, and the crude oil price at \$125 per barrel in 2050.

The first is the Reference Scenario in which the present trends of energy supply and demand, policies and technologies will remain unchanged. This represents a future business-as-usual picture projecting the present into the future. The second is the Advanced Technologies Scenario in which advanced energy and environmental technologies will diffuse to the maximum extent, with energy security and environmental policies enhanced fundamentally. This scenario represents a bottom-up analysis of global energy supply and demand changes through the diffusion of advanced technologies, based on our exchange of opinions with experts and industry people and our collection of information about various individual technologies. The Outlook builds on the two scenarios to outline the long-term global energy situation and provide special analyses on two issues – climate change and oil demand’s peaking-out through the diffusion of advanced automobile technologies. The following summarizes these points.

In the Reference Scenario, global energy demand will steadily increase from 13.6 billion tons of oil equivalent (Btoe) in 2015 to 19.8 Btoe. Non-OECD Asian countries, including China, India and ASEAN countries, will account for two-thirds of the growth. While China’s energy demand will peak out in the 2040s, India and ASEAN will continue robust energy demand growth over a long term. Accordingly, global energy demand growth will shift to Asia, particularly South and Southeast Asia. Driving energy demand growth will be electricity and transportation fuel demand. In the scenario, fossil fuels’ share of the global energy mix will slightly fall from 81% in 2015 to 79%, indicating that fossil fuels will still account for a dominant share.

In the Advanced Technologies Scenario, global energy demand in 2050 will fall by 13% from the Reference Scenario to 17.2 Btoe thanks to substantial progress in energy conservation. Fossil fuel demand will decline substantially from the Reference Scenario, while renewable energy, nuclear and other non-fossil energy demand will expand considerably. Particularly, coal demand will remarkably decrease, lowering coal’s position now as the second biggest energy source after oil to the fourth one after oil, natural gas and renewable energy in 2050. While the energy mix will considerably change thanks to technological advancement, fossil fuels’ share of overall energy

demand in 2050 will stand at 68%, indicating that fossil fuels will remain important despite the maximum diffusion of advanced technologies. Energy-related CO<sub>2</sub> emissions will continue to increase in the Reference Scenario but will peak out around 2030 and decrease slightly in the Advanced Technology Scenario. Even in the latter scenario, however, the world will fall far short of achieving an ambitious target of halving energy-related CO<sub>2</sub> emissions by 2050.

The special analysis on climate change is based on our exclusive model under the stance that while GHG emission cuts or mitigation are important, minimizing the total of mitigation, adaptation (reducing damage from global warming) and damage costs is also significant, given long-term effects and uncertainties of climate change.

The total costs on the “Minimum Cost Path” will be halved from the Reference Scenario. In this case, however, the temperature increase from the second half of the 19th century to 2050 will come to 2.6°C. On a path to halve GHG emissions in 2050, the temperature increase will be limited to 1.7°C but the total costs will double from the “Minimum Cost Path” due to substantial growth in mitigation costs. Given the significance of the 2°C target, we also analyzed a “2°C Minimum Cost Path” to minimize the total costs while limiting the temperature rise to 2°C or less over a longer term through 2150. On the path, the total costs will increase by 20% from the simple “Minimum Cost Path” (for a temperature rise of 2.6°C) while halving from the path to halve GHG emissions in 2050. The introduction and diffusion of innovative technologies including CO<sub>2</sub>-free hydrogen and the reduction of their costs will be indispensable for the “2°C Minimum Cost Path”.

The special analysis on the peaking-out of oil demand quantitatively estimates the faster-than-expected diffusion of advanced transportation technologies and its impacts on oil demand, on the international oil market and crude oil prices and on oil producing and other major economies. The background of the special analysis is the recent development such as the recent European, Chinese and Indian policies for banning or restricting sales of internal-combustion engine vehicles, automakers’ initiatives to develop and diffuse electric, fuel cell and advanced electric vehicles, their cost cuts and other factors. In the Reference Scenario, global oil demand will continue to steadily increase. Even in the Advanced Technologies Scenario, global oil demand will increase very slowly without peaking.

If global new vehicle sales are limited to zero-emission vehicles (electric, fuel cell and plug-in hybrid vehicles), however, global oil demand will peak out around 2030 and fall back to the present level in 2050. A mainstream view has so far been that global oil demand will continue to slowly increase. Long-term crude oil projections are usually based on the mainstream view. The peaking-out of oil demand, therefore, could greatly affect future supply and demand balances as well as market perceptions on crude oil prices, leading crude oil prices to slacken over a long term.

If oil demand (sales and exports) peaks out and leads to an oil price slump, oil producing economies will be greatly affected. Net oil exports from Middle Eastern oil producing countries can decrease by \$1.6 trillion or 13% of GDP from the Reference Scenario. Given such possibility, it is important for Middle Eastern oil producing countries to diversify and advance their economies in consideration of long-term economic challenges. Even if oil demand peaks out, however, oil demand in 2050 will still be kept at the present level. Given the natural depletion of existing oil fields, however, massive investment will be required to meet the present demand level to stabilize crude oil markets and prices. Failure to meet the investment requirement could destabilize the international

energy market. Future oil demand will exert various, complex impacts on the global oil industry, the energy supply and demand structure and the global economy and so will have to be analyzed from various angles in the future.

Contact: [report@tky.ieej.or.jp](mailto:report@tky.ieej.or.jp)

The back issues are available at the following URL

[http://eneken.ieej.or.jp/en/special\\_bulletin.html](http://eneken.ieej.or.jp/en/special_bulletin.html)