

# Asia / World Energy Outlook 2016

— *Consideration of 3E's+S under new energy circumstances in the world* —

## 1. Introduction

- In the *Reference Scenario* of IEEJ's *Outlook*, the world primary energy consumption increases at an annual rate of 1.2%, reaching almost 19,000 Mtoe by 2040 (increase by 38% from 2014). Oil will keep the largest share even in 2040, followed by natural gas and coal. The world will remain heavily dependent on fossil fuels for 78% of its primary energy consumption in 2040.
- China, India, and ASEAN are leading a large portion of the demand growth. ASEAN will become more dependent on coal-fired power generation due to its high growth in demand. In addition to currently being a net importer of oil and relatively resourceful in natural gas, ASEAN will begin importing natural gas within the next 10 years. For Asia, energy security will become more important in the future.
- Although crude oil is currently in oversupply, its geopolitical risk is still high. Thus, this year's *Outlook* analyses the economic implications of crude oil supply disruption, and it reveals that serious damage to the global economy would result from a supply interruption of 10 Mb/d.
- For the climate change, the *Outlook* considers an *Advanced Technologies Scenario* assuming that the penetration of energy efficient and low-carbon technologies is promoted as much as possible. In addition, the *Outlook* takes account of viewpoints to mitigate the total costs including adaptation and damage. The *Outlook* also analyses scenarios where the introduction of nuclear and hydrogen are further progressing.

## 2. Overview of the ASEAN Energy Market

ASEAN attracts attention as a new growth centre following China and India. 3E's in ASEAN would be strengthening significantly through energy market integration among ASEAN countries; however, ASEAN's issue is its lack of funds and technology for energy development. Japanese companies will benefit from a business opportunity in ASEAN through funds and technology transfers.

- ASEAN has a huge economic potential because its population is 600 million, and it borders on China and India. At the end of 2015, the ASEAN Economic Community (AEC) was established, and ASEAN is expected to further develop its economy by its expansion of free trade and market integration.
- ASEAN's energy demand is increasing rapidly through progress of industrialisation, and improvement of living standards and energy access for people in ASEAN. Contrary to the world's trend, ASEAN will depend on cheap energy source, such as coal, to meet

its tripled electricity demand. ASEAN will become a net importer of natural gas by 2030 because the demand will be beyond the production of natural gas within the region. It is urgently necessary for ASEAN to deal with its energy security and the global environment problems.

- In order to meet its rapid increase demand, ASEAN requires investment of about \$2 trillion to its energy supply infrastructure by 2040. Fund raising is a big challenge, but the situation will be a business opportunity for foreign companies. It is necessary for ASEAN to deregulate foreign investment restrictions and subsidy, and to introduce policy transparency and stability in order to attract investment from foreign companies. Also, the energy market integration between ASEAN countries, like the ASEAN Power Grid (APG), makes a significant contribution towards achieving the 3E's (Energy, Economy and Environment). ASEAN faces the issues of lack of funds and technology for developing its energy market; Japan is highly expected to cooperate with ASEAN countries to solve those issues.

### 3. Coping with the Energy Security and the Climate Change Issues

Continuous and appropriate measures are required to cope with both the energy security and the climate change issues, recognising the risks for the measures. In terms of the climate change issue, sustainable measures should be practiced given that the issue is a super long-term subject. In parallel, the development of technology that is applicable globally should be promoted.

- Although the oil prices have been kept low, the circumstances of geopolitical risks in the Middle East remain complicated and serious. If crude oil and natural gas supply are partially interrupted due to trouble, the global economy would be heavily affected by a lack of supply. Significant economic damages occur especially in Asia including Japan, Korea, and Chinese Taipei, which heavily depend on imports of oil and natural gas. For mitigating the damages, all countries and regions are required to continuously practice conventional measures such as diversification of supply source, increase of storage, and progress of energy saving and alternative energy technology. The issues are especially serious for Asia.
- The world GHG emissions will reach 45.5 GtCO<sub>2</sub> in 2030, estimated by 'Intended Nationally Determined Contributions' (INDC) to the Paris Agreement, increasing from current levels. Although the emissions will be lower than the current trend (*Reference Scenario*), it is difficult to image achieving emission reductions by half by 2050. However, the Paris Agreement is highly regarded as a step for the global effort to the reduction of the emission, at least currently.
- Based on the perspectives of the super long term and sustainability, it is meaningful to evaluate a combination that minimises the total cost, the sum of mitigation costs, adaptation costs, and damages. Such evaluations do not require the world CO<sub>2</sub> emissions to be reduced by half in 2050. Current emission levels will need to be cut by almost half after 2150, and the total cost is around \$100 billion every year, which is lower than that of the *Reference Scenario* and even much lower than that of the case that the emission reduced by half in 2050.

- However, such evaluations have significant uncertainty. The future can change significantly through progress of innovative technology, decrease of marginal costs for mitigating GHG, the climate sensitivity, etc. The most important point is to develop technology through a global network within a collaborative approach in a long-term view with continuous practice of introducing appropriate measures for climate change.
- There are various innovative technologies and hydrogen technology is one of such technologies expected to contribute to the reduction of CO<sub>2</sub> emissions. The emissions are reduced significantly in a case that oil and coal-producing countries produce hydrogen with carbon capture and storage (CCS). In the case, the application of hydrogen occurs mainly in power generation sectors and also progresses in transport sectors. Hydrogen contributes to the diversification of energy supply sources because there are many countries with high potential supply sources, not only the Middle East but also North America and Australia.

#### 4. Ascertaining the Meaning of Nuclear

Nuclear will play an important role for achieving 3E's, and ensuring safety is the most important point for nuclear.

- The development of nuclear in the future is significantly uncertain. It is not only due to countries or regions' circumstances of energy, economy, and development level of social infrastructure, but also a matter of international relations.
- If the *High Nuclear Scenario* is in effect, nuclear becomes the base power source for many emerging countries, such as Asian and Middle East countries. The scenario assumes that nuclear power generation will benefit from lower level of costs, and that nuclear technology transfer will be properly made from developed countries of nuclear technology, such as Japan, to emerging countries. In the scenario, nuclear power generation capacity in Asia becomes approximately 7 times larger than that in 2014, and improvement of CO<sub>2</sub> emissions, self-sufficiency of energy, and power costs (economy) is highly expected. Especially in Asia, the scenario assumes proper progress in further strengthening the regulatory standards for safety and developing a regulatory system along with the level of development of nuclear industry.
- On the other hand, if the *Low Nuclear Scenario* is in effect, no new nuclear power generation plant will be constructed not only in developed countries, but also in emerging countries. The world becomes less dependent on nuclear. In the scenario, primary energy self-sufficiency in Asia becomes below 65% (currently above 75%), and CO<sub>2</sub> emissions increase significantly. Consequently, the *Low Nuclear Scenario* contributes to the issues of energy security and climate change.
- Regardless of high or low development level of infrastructure and technology, risks of nuclear incidents are never zero in countries that have nuclear facilities. It is necessary to make sincere efforts for keeping in mind that there is no end for challenging the issue of safety, while nuclear can play an important role to achieve 3E's in Asia and the world.