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The Institute of Energy Economics, Japan (IEEJ)

Asia / World Energy Outlook 2015

— Analyses of oil pricing and climate change measures under new circumstances—

Summary

1. Introduction

- In the *Reference Scenario* of IEEJ's "*Outlook*", crude oil prices (Real 2014 US$) are assumed to decrease from $105/bbl in 2014 to $75/bbl in 2020 before rising to $100/bbl by 2030. The world primary energy consumption in the *Reference Scenario* increases at an annual rate of 1.3%, reaching almost 19,000 Mtoe by the year 2040. The emerging countries in Asia are leading the demand growth. While the use of renewables and nuclear expands, oil keeps the largest share in 2040, followed by natural gas and coal. The world will remain heavily dependent on fossil fuels for 78% of its primary energy consumption. The energy related CO_2 emissions will continue to increase accordingly and reach 42.7 Gt-CO_2 by 2040.
- Having experienced an acute drop since the end of 2014, the increasing uncertainties regarding future crude oil prices will continue to influence the world's energy markets. On the other hand, with the approaching COP21 at the end of the year, there are increasing interests in the future of the global climate change measures and their impacts on the energy supply-demand structure.
- This year's "Outlook" analyses a *Reference Scenario*, an *Advanced Technologies Scenario* and a *Lower Price Scenario*. In the *Advanced Technologies Scenario*, the penetration of energy saving and low-carbon technologies is promoted as much as possible. In the *Lower Price Scenario*, the same technologies as in the *Advanced Technologies Scenario* are assumed while the development of unconventional resources is further promoted. We also studied the climate change issues from the point of view of minimizing the total cost for society.

2. Meaning of Low Energy Prices

Lower prices have an overall positive effect on the global economy. It is important to note, however, that there are distinctive shades of lights and shadows.

- The dissemination of energy efficiency improvement technologies and measures, the promotion of unconventional resources development and the wider use of non-fossil fuels may further loosen the supply/demand balance for fossil fuels and result in a continued trend for lower energy prices. Crude oil prices in 2030, in the *Reference Scenario*, are expected to be about $100/bbl while in the *Lower Price Scenario* they remain at $75/bbl.
- In the *Lower Price Scenario,* it is assumed that energy savings will be pursued as stringently as in the *Advanced Technologies Scenario*. Consequently, global oil production will be limited to an increase of 7.7 Mb/d, reaching 96.5 Mb/d in 2030. As the *Lower Price Scenario* also assumes large increases in unconventional oil production, especially in North America, the increase in oil production from the Middle East will be limited to only 1.0 Mb/d while Russian production will decrease by 0.8 Mb/d.
- Lower energy prices have positive economic effects on energy importing countries. These benefits include lower domestic energy costs and an improved balance of trade for imported energies. Exporting countries, on the other hand, will be unable to avoid damages to their economies if their current industrial structures are kept unchanged. Middle East & North Africa (MENA) region and Russia may suffer from downward pressure on economic growth by 3.1% and 1.3% in 2030, respectively. It is important for these countries to convert their economic structures into more diversified and sophisticated ones. In the *Lower Price Scenario,* the global economy will benefit and grow by more than 1.9% in 2030, with concerns for countries and regions less positively affected.
- In addition to focusing on the issues of overall price levels, some attention should be devoted to the negative effects caused by price fluctuations and instability. Not only supply and demand factors but financial ones do amplify price swings. As short-term price fluctuations slow down the development of new supply capacities, there will be a risk of mismatching future demand and supply, and causing further price hikes.
- For both consuming and producing countries, neither extremely high/low prices nor acute destabilization of prices are welcome. Both sides need to strive for diversification of energy and for sophistication of their industry and economy in order to maintain a course of sustainable growth. Energy industries and companies also need to keep a portfolio of project expansions from a strategic point of view; they need to strengthen their ability to address price swings and business risks.

3. Addressing the Climate Change issues

Even with the maximum use of technologies, meeting the 450 ppm target is difficult. A balanced approach that uses the remaining time wisely is required, bearing in mind that promising technologies will become available and adaptation should also be addressed.

- In the *Reference Scenario*, world energy related CO_2 emissions will reach 45.9 Gt by 2050, an increase of 39% from current levels. The *Advanced Technologies Scenario* assumes the maximum penetration of low-carbon technologies currently available and acceptable to society. If the *scenario* also includes carbon capture and storage (CCS), the emissions would be lowered to 23.3 Gt or 29% below the 2013 levels. These conditions are insufficient to reach the goal of 50% of current levels.
- Based on the respective 'Intended Nationally Determined Contributions' (INDC) of eight major countries (equivalent to 65% of global total emission in 2010), the GHG emissions in 2030 for those countries are estimated to be closer to those of the *Reference Scenario* than those of the *Advanced Technologies Scenario*. The INDC of USA and Japan are closer to the *Advanced Technologies Scenario*, while that of EU is in between the *Reference Scenario* and the *Advanced Technologies Scenario*. China, on the other hand, is closer to the *Reference Scenario* while India is bigger than in the *Reference Scenario*. It would be advisable for countries to make efforts equivalent to those assumed in the *Advanced Technologies Scenario*. This is especially true for the emerging economies that need to strengthen their efforts effectively.
- The results of the *Reference Scenario* correspond to a level of GHG concentration in the atmosphere in 2100 in the range of 760-860 ppm (CO_2-eq.), with an average temperature rise from pre-industrial levels reaching between 2.8-4.0°C the same year. On the other hand, the *Advanced Technologies Scenario* + CCS, is comparable to GHG concentrations in 2100 of 540-600 ppm (CO_2-eq.), with an average rise in temperature between 1.7 and 2.4°C. This is lower than 2.5°C and possibly lower than 2°C by 2100. When combined with adaptation measures, this *scenario* of mitigation measures can well become an option close enough to reduce global CO_2 emission to 50% of the 2013 level by 2050 and on the path to reach close to zero by 2100.
- Setting the *Reference Scenario* as the base and promoting mitigation efforts such as CO_2 emission reduction would undeniably decrease the adaptation and damage costs while increasing the mitigation cost. In the short to medium term, the influence of the adaptation and damage costs are smaller than that of mitigation cost. Beyond 2050, however, their influences will become much bigger. Although the uncertainty of cost estimates remains enormous, there must be a point where the total cost (the sum of mitigation, adaptation,

and damage costs) is minimized. That point must exist somewhere between the *Reference Scenario* and a scenario of "50% reduction of emissions by 2050". As there is a trade-off among the three costs, it is impossible to reduce all three at the same time. It would be realistic, however, to expect a balance among the three, while minimizing the total cost.

- Facing the threat from climate change, ambitious GHG reduction will continue to be required far into the future. And yet, for now, it would be more practical to aim at GHG concentrations in the 500-550 ppm (CO_2-eq.) range, closer to the results of the *Advanced Technologies Scenario.* In the meantime, technologies should be developed so that energy savings and low-carbon technologies will become available at lower costs. In the mid to long-term, innovative technologies such as Carbon Capture and Usage (CCU), especially artificial photosynthesis, next generation nuclear, space photovoltaic, fuel cell and other innovative technologies development need to be promoted. All technologies should be developed through a global network within a collaborative approach.

Contact: report@tky.ieej.or.jp