

## **Long-term Energy Outlook and Discontinuity**

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From November 2 through 6, I had an opportunity to discuss the international energy situation with energy industry officials and experts in London. On November 6, I attended a seminar at the London office of the Japan External Trade Organization, where I made a presentation based on the IEEJ Outlook 2019, the latest long-term energy outlook by the Institute of Energy Economics, Japan, took comments from experts and held a question-and-answer session. In the following, I would like to summarize some points that impressed me through the London discussions.

The IEEJ annually publishes the IEEJ Outlook. Representative long-term energy outlooks in the world include the World Energy Outlook by the International Energy Agency, the World Oil Outlook by the Organization of the Petroleum Exporting Countries and the International Energy Outlook by the U.S. Energy Information Administration. In addition, long-term outlooks published by such international oil majors as ExxonMobil and BP and Shell's global energy scenario are also known for depicting future energy pictures.

These outlooks use artifice to select viewpoints for analyzing future conditions, develop scenarios and provide unique, interesting and significant analyses. Discussions on the IEEJ Outlook indicated that any quantitative analysis using models, while being significant for and excellent in providing specific numbers or data to depict the future direction of the international energy market, has difficulties in overcoming the following constraint.

This kind of model-based future projection is influenced easily by past tendencies or trends and tends to depict smooth, stable and continuous changes in the future. This is the same case with not only the IEEJ outlook but also any other long-term outlook.

However, the abovementioned constraint represents the problem of how to treat discontinuities that have emerged in the actual market. The actual international energy market history demonstrates that discontinuities or discontinuous changes occasionally moved the energy world while continuous, stable changes reformed energy market supply and demand fundamentals and structure moderately. Given the definition of discontinuity, it is difficult to incorporate discontinuities into any long-term outlook. On the other hand, a discontinuity that can dramatically change the energy market direction has potential to emerge, forcing forecasters to face a kind of dilemma.

The word "discontinuity" may be replaced with the frequently used words "disruptive

change” or “game changer.” The latest game changer is the U.S. shale revolution. U.S. shale resources, which had traditionally been known as abundant, have been suddenly made available for economically feasible development and production thanks to advanced technologies such as horizontal drilling and hydraulic fracturing, well-developed pipeline networks and the presence of many entrepreneurship-supported ventures, leading to the shale revolution in which shale gas and oil production have expanded rapidly and substantially. Although the United States had been expected in the beginning of the 2000s to become one of the world’s largest liquefied natural gas importers, the shale revolution has led the United States to be expected to become one of the world’s leading LNG exporters, symbolizing a discontinuous change.

Once such a discontinuity emerges, it can be reflected in any long-term outlook with efforts to analyze relevant current conditions and measure the speed of such change. As a matter of course, some participants in the London discussions remarkably pointed out that any long-term outlook tends to initially underestimate even a huge discontinuity beginning to alter the energy world. Even if such discontinuity is underestimated, adjustments may be made with the passage of time. The problem is that any potential discontinuity or game changer cannot be reflected initially in any long-term outlook.

Any long-term outlook through 2040, 2050 or beyond entails high uncertainties about all fields including international politics, geopolitics, global economic conditions, environmental problems, energy technologies and lifestyles. No one can deny that discontinuities that could dramatically change the future picture of energy in the world could emerge within such long term. Anyone developing a long-term outlook must acknowledge this point.

Even so, it is still worthwhile to analyze long-term global energy outlooks. Even if how the world is filled with uncertainties and how difficult it is to anticipate a distant future picture of energy are understood, long-term energy outlooks will continue to be developed and published. This is because energy-related investment and infrastructure development basically cover long terms, forcing business decision makers to consider conditions over the next 10, 20 or more years. Given that the best available analyses about the future are indispensable for making decisions, decision makers have no choice but to use long-term energy outlooks while understanding their limitations.

It is difficult to anticipate when the next huge discontinuity would emerge in the market. If the energy market direction is dramatically changed, the existing long-term energy outlooks may lose their relevancy, requiring new outlooks to reflect such dramatic change. This kind of response to any discontinuity may be fatal for long-term outlooks. Even if it is difficult to anticipate any discontinuity accurately, long-term outlook developers must think “unthinkable thoughts” while paying attention to any potential discontinuity. Then, they must become more sensitive to signs or precursors of changes, respond appropriately and timely to them and reflect them in long-term outlooks flexibly.

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