

Considering Energy Issues 10 Years after Great East Japan Earthquake

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At 2:46 p.m. on March 11, 2011, a magnitude 9.0 earthquake, one of the largest recorded in Japan, occurred at a depth of 24 kilometers in Pacific waters off northeastern Japan. The earthquake measured the maximum 7 on the Japanese seismic intensity scale in Kurihara, Miyagi Prefecture. In numerous other municipalities, it measured upper 6. The great earthquake triggered massive tsunami waves that devastated coastal areas of the Tohoku and Kanto regions. The great earthquake killed or left missing more than 18,000 people, destroyed more than 400,000 houses and forced as many as 470,000 people to be evacuated, becoming an unprecedentedly large disaster.

A massive tsunami hit the Fukushima Daiichi Nuclear Power Station of Tokyo Electric Power Co., crippling emergency diesel generators to cause station blackout (SBO). The facility thus lost its reactor-cooling functions. Units 1, 2 and 3 in operation melted down, generating hydrogen gas. Hydrogen explosions took place at Units 1, 3 and 4, releasing massive radioactive materials. The accident, classified as Level 7 or the most serious level on the International Nuclear Event Scale, forced a large number of residents around the power station to evacuate their homes or remain unable to return home. Even at present, many of them are left unable to return home. The accident caused serious damage to the reputations of agriculture, forestry and fishery products, affecting the regional economy and livelihood.

A decade after the Great East Japan Earthquake, I would like to pray for the repose of the souls of those were killed in the disaster and offer my sincere condolences and sympathies to those who were socially, economically and mentally affected by the great earthquake and the nuclear power station accident. At the same time, I would like to pay my heartfelt respects to those who have continued utmost efforts for recovery from the unprecedented great disaster. I think that our society must renew its determination and preparedness to support recovery from the disaster. We must not forget what happened a decade ago but promote further recovery initiatives while conveying lessons from the disaster to future generations.

The Great East Japan Earthquake and the Fukushima nuclear accident forced Japan to dramatically change its energy policy. The disaster wreaked great havoc on energy infrastructure in eastern Japan. It caused heavy damage not only to the Fukushima Daiichi Nuclear Power Station but also to fossil-fired power plants, relevant port and harbor facilities and oil refineries, leading rolling blackouts to be implemented on a large scale mainly in the Kanto region. Distribution networks were cut off, affecting petroleum product supply to gas stations mainly in the disaster-hit region. City gas supply was also stalled for more than 400,000 households temporarily. The serious accident affecting nuclear power generation as a baseload electricity source forced nuclear power plants to be shut down for regular checkups. Japan then completely halted nuclear power generation. To secure stable power supply, Japan promoted power saving campaigns as much as possible and substantially expanded fossil-fired power generation. Even coal-fired power plants, designed to supply electricity as the base-load power supply source, increased generation as much as possible. Among fossil-fired

power sources, gas-fired plants scored the largest generation growth, leading Japan's liquefied natural gas imports to rapidly expand. Idled oil-fired plants were also mobilized for power generation. Crude oil prices then remained around \$100 per barrel, and LNG prices indexed to oil prices stayed high. The high fossil fuel prices and massive fossil fuel import volume forced Japan's fuel import value and power generation costs to substantially rise. As a result, Japan plunged into a trade deficit. Fossil fuel consumption expansion resulted in a sharp increase in CO₂ emissions.

Until the disaster, the Japanese government (then, a Democratic Party of Japan administration) had a target of cutting greenhouse gas emissions by 25% from 1990 by 2020. To achieve the target, the third Strategic Energy Plan formulated in June 2010 called for increasing nuclear power plants to raise their share of Japan's power generation to 50% by 2030. The great earthquake and the Fukushima nuclear accident forced the plan to be revised fundamentally. The nuclear accident and the subsequent heavy damage led nuclear energy to come under strong fire. The fourth Strategic Energy Plan formulated in 2014 stated: "We will do our utmost to achieve the reconstruction and recovery of Fukushima while reflecting on and responding to the pain felt by the people affected by the accident at TEPCO's Fukushima Daiichi Nuclear Power Station. We revise the energy strategy plan formulated before the disaster from scratch to reduce Japan's dependence on nuclear power plants as much as possible." Then, the government added safety to the so-called 3E's (energy security, economic efficiency and environment) as energy policy priorities, reflecting the Fukushima accident. Based on the plan, the government in 2015 released a target energy mix for 2030, putting nuclear energy's share of Japan's power generation at 20-22% and renewable energy's share at 22-24%.

The fifth Strategic Energy Plan formulated in 2018 called for achieving the abovementioned energy mix. Even as less than 10 years are left before 2030, however, there are a mountain of challenges to be resolved for achieving the energy mix. The number of restarted nuclear power plants is limited to nine, with various challenges left unresolved. Renewable energy has spread rapidly under the Feed-in Tariff system introduced in July 2012, but the FIT surcharge has swollen subsequently, leaving the economical promotion of renewable energy as a great challenge.

In such situation, full-fledged discussions since last year on the sixth Strategic Energy Plan have indicated new challenges. While the 3Es+S basic priorities have remained unchanged, the government has specified an extremely ambitious environmental target regarding climate change countermeasures. Prime Minister Yoshihide Suga in his policy address last October declared that Japan as well as the European Community and the United States would seek to achieve carbon neutrality in 2050. The target energy mix for 2030 includes a target of cutting GHG emissions by 26% from 2013. If Japan were to pursue carbon neutrality in 2050, it may have to reconsider the 2030 target in view of the current expansion in renewable energy power generation. To achieve carbon neutrality in 2050, Japan will have to thoroughly promote electrification, make the power sector free from GHG emissions and thoroughly decarbonize non-power sectors. CO₂-free hydrogen and fuel ammonia utilization along with other innovations in the energy field will be indispensable to this end.

Last December, a preliminary idea for energy mix for 2050 was put on the table as a reference for discussions on the new Strategic Energy Plan at the Strategic Policy Committee of the Advisory Committee for Natural Resources and Energy, indicating that renewable energy would account for 50-60% of Japan's total power generation, nuclear and fossil-fired power plants equipped with CCUS (Carbon Capture Utilization and Storage) technologies for 30-40% and CO₂-free hydrogen and ammonia for around 10%. While referring to the preliminary idea, the

committee will consider various scenarios and energy mixes, energy security and costs and policies based on the 3E's+S priorities to explore a desirable energy mix for 2050.

Even a decade after the Great East Japan Earthquake, Japan still faces various challenges regarding energy problems and policies and is struggling to overcome them. Stable energy supply has remained a top priority for Japan that is poor with energy resources. The tightening power supply-demand balance seen early this year provided us with an opportunity to reaffirm the significance of energy security and stable energy supply for Japan. Initiatives to realize carbon neutrality are now one of Japan's most important challenges. Based on experiences in the past decade after the Great East Japan Earthquake and lessons learned from the disaster, Japan must pursue a best energy mix for the effective utilization of all energy sources and potential innovations to develop a desirable future picture of energy.

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