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Outlook and Challenges for Nuclear Power Generation in 2016 (Summary)

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Major developments regarding nuclear energy in 2015

Attracting attention regarding nuclear energy in 2015 were the restart of the No. 1 and 2 units at Kyushu Electric Power Company's Sendai Nuclear Power Station, the decision on the FY2030 target energy mix including nuclear, and nuclear fuel cycle policy trends involving the geological disposal of high-level radioactive wastes and the Monju fast breeder reactor in Japan, as well as the Chinese nuclear industry's aggressive international expansion and U.S. nuclear power generation under the shale revolution. The following highlights the developments related to the abovementioned topics in 2016.

Outlook for domestic and overseas nuclear energy situations in 2016

<Domestic topic 1: Safety assessment of the existing nuclear power plants and the restart>

1. Electric power utilities have submitted the licensing application for the restart to the Nuclear Regulation Authority in 2013. At Kyushu Electric Power Co.'s Sendai Nuclear Power Station, the No. 1 unit restarted commercial operations in September 2015 and the No. 2 unit in November. As of December 2015, the NRA approved the safety assessment report for three other reactors -- the Nos. 3 and 4 units at the Takahama Nuclear Power Station and the No. 3 unit at the Ikata Nuclear Power Station. In addition, 20 existing reactors and one under construction (at the Oma Nuclear Power Station) were under examination.
2. Key factors affecting progress in the assessment include whether the NRA approves the design basis earthquake ground motions at nuclear plant sites. Given that the NRA at assessment meetings has clarified its policy of launching safety reviews only for nuclear reactors for which design basis earthquake ground motions have been fixed, the priority is given to reactors for which design basis earthquake ground motions have been approved. The problem of on-site fracture zones, which had been addressed at assessment meetings, has been subjected to the

NRA's licensing procedures. We hope the NRA can further rationalize, speed up and streamline its assessment in 2016 based on its past experiences.

<Domestic topic 2: Initiatives to realize nuclear energy's position in the energy mix>

3. On July 16, 2015, the Ministry of Economy, Trade and Industry decided on a long-term energy supply and demand outlook through FY 2030. Based on the so-called "three Es" policy calling for energy security, economic efficiency and environmental protection in the Strategic Energy Plan adopted by the Cabinet in 2014, the outlook gives a target electricity mix for FY 2030 consisting of renewable energy accounting for 22-24% of total power generation, nuclear energy for 20-22%, natural gas for 27%, coal for 26% and oil for 3%.
4. Nuclear power generation capacity required to achieve the share of 20-22% in FY 2030, though depending on the capacity factor, will be 30 to 35 gigawatts. If nuclear reactors' plant life is put at 40 years, only 20GW out of the present capacity will be left in FY 2030. In December 2015, fire-resistant cable measures to extend the plant life were basically approved for the No. 1 and 2 units of Kansai Electric Power Co.'s Takahama Nuclear Power Station subjected to an application for the extension, making a step forward toward the lifetime extension of the plants. We expect that the lifetime extension can be permitted beyond the 40-years limitation as far as their aging management measures are completed.

<Domestic topic 3: The back end and the fuel cycle policy reconstruction>

5. The year 2016 could be a turning point for Japan's nuclear fuel cycle policy. In November 2015, a working group on nuclear business environment development, which is reviewing the roles of the nuclear fuel cycle business entity, the government and business operators under a competitive environment, compiled an interim report calling for a government-controlled corporation to replace private company Japan Nuclear Fuel Ltd. as the entity for reprocessing spent nuclear fuels. A bill for transferring the nuclear fuel reprocessing business to a government-controlled corporation may be considered in the Diet in 2016.
6. In 2015, the government revised the process for selecting a site for geological disposal of high-level radioactive wastes. The revised concept calls for the government to propose a scientifically promising site, ask for a relevant local government's cooperation in a feasibility study and support regional consensus-building and sustainable development efforts. A working group on geological disposal technology, which considers reasons for selecting the scientifically promising site, will deepen discussions on technical factors and

discuss social acceptance and consensus-building processes.

7. In November 2015, the NRA recommended the Ministry of Education, Culture, Sports, Science and Technology, which administers the Monju fast breeder reactor, to identify within some six months an entity that can operate Monju with appropriate safety, in place of the Japan Atomic Energy Agency. It also urged the ministry to fundamentally revise how to reduce risks involving Monju if the identification of an alternative entity is difficult. Important discussions will come in 2016 on how best to deal with Monju which has a position as a key component of the nuclear fuel cycle.
8. We hope that an appropriate system will be developed to allow the nuclear back-end business for storing and reprocessing spent nuclear fuels and disposing radioactive wastes to stably continue along with relevant research and development even under the future electricity market deregulation and a competitive market environment.

International topics: China's international expansion progress and U.S. setback

9. The biggest topic regarding the nuclear industry's international expansion in 2015 was the Chinese nuclear industry's access to France and the United Kingdom. In June 2015, Chinese state-owned nuclear companies CNNC (China National Nuclear Corporation) and CGN (China General Nuclear Power Group) agreed with French nuclear company Areva and French electric utility EDF on their wide-ranging cooperation in the nuclear field. In October, the U.K. chancellor of the exchequer issued a statement welcoming CGN's investment in the U.K. Hinkley Point C nuclear reactor construction project. China is likely to increase the presence of its nuclear industry in the global market while proceeding with the domestic construction of large nuclear power plants.
10. In the United States, the largest nuclear power generating country at present, decisions were announced in 2015 to decommission two nuclear reactors. This means that the total number of US nuclear reactors will be below 100 in late 2014 for the first time in about 20 years. Behind the development are the ongoing shale revolution and slack natural gas prices (gas-fired power plants' increased competitiveness.) U.S. nuclear trends, including how to position nuclear energy in the U.S. Three Es policy, are attracting attention.
11. Also attracting attention in 2016 is progress in nuclear energy development. Except for the United Kingdom, Eastern Europe, South America and India where Japanese nuclear companies' international expansion has attracted attention. Given that Japan agreed with India to conclude a bilateral nuclear cooperation agreement

in December 2015 and that the Japanese nuclear industry is expected to compete with the Chinese and Russian industry expanding their presence in emerging markets, the Japanese nuclear industry should have a comprehensive strategy with their technical and economical competitiveness.