

Summary of

Business Risks of New Coal-fired Power Plant Projects in Japan

—The Decline in Capacity Factor and Its Effect on the Business Feasibility

1. Status of Electricity Supply and Demand Since 2011

- Electricity demand in Japan decreased by about 10% in just five years from 931.1 TWh in fiscal year (FY) 2010 to 841.5 TWh in FY 2015, mainly due to improvement in energy efficiency and the rise in electricity charges after the Great East Japan Earthquake.
- The first change observed on the supply side was the rapid deployment of renewable electricity facilities, mainly solar PVs, resulting from the enforcement of the Feed-in Tariff in July 2012. The ratio of renewable energy in total electricity generated and purchased rose by six percentage points from 8.9% to 15.0% in five years from FY 2010.
- The second change was the drastic decrease of electricity supplied by nuclear power plants. While a few plants have been restarted, the share of nuclear power plants in total electricity generated in FY 2016 was still less than 2%.
- While the capacity factor of thermal power plants rose to 62% in FY 2012 to make up for the reduced supply capability of nuclear power plants, it has turned to a declining trend since FY 2013 with improvements in energy savings and efficiency and the increase in renewable energy. The figure dropped to 53% in FY 2016.
- We analyzed thermal power plants' hours of operation based on the actual data on electricity supplied by power companies in FY 2016. Results indicate that all nine power companies whose electric power systems are connected face difficulties in maintaining the capacity factor at a high level for their coal-fired power plants, coke oven gas plants, and combined cycle gas fired power plants.

2. The Outlook for the Future Electricity Supply and Demand

- According to projections by the Japanese Government and the Organization for Cross-regional Coordination of Transmission Operators (OCCTO), no major increase is expected either in annual electricity demand or peak demand. The actual electricity demand may even fall below the figure projected by the government.
- According to the “Aggregation of Electricity Supply Plans FY2017” (hereinafter referred to as the “Supply Plan”), published by the OCCTO in March 2017, supply capability will exceed electricity demand consistently, and the reserve margin rate will exceed the optimal level of 8% up to FY 2026.
- The Supply Plan assumes that the capacity factor of coal-fired power plants will decline from 80% in FY 2015 to 69% in FY 2026.

3. The Decline in Capacity Factor of Coal-fired Power Plants and Its Effect on the Business Feasibility

- Assumptions made in the Supply Plan are based on a conservative assumption, such as assuming there will be no electricity supply from nuclear power plants without restarting decisions at this stage. This is based on the objective of the Supply Plan to ensure a stable supply of electricity. On the Other hand, to consider the business risks of new coal-fired power plant projects, it would be more appropriate to base oneself on the fact that nuclear and renewables demonstrate an

upward trend and assume that all of the new plant will be built. Hence, we made a provisional calculation of the capacity factor for FY 2026 based on the following assumptions.

- (i) All coal-fired power plants whose extension plans have been publicly announced will start operation.
 - (ii) Electricity demand will remain at the same level as that in FY 2016.
 - (iii) While nuclear power plants will restart to a certain degree, their share in the electricity mix in 2030 will remain at 10%, or about a half of the figure estimated by the government in the Long-Term Energy Supply and Demand Outlook, which is 20-22%.
 - (iv) Deployment of solar PV is assumed to be at 81.92 GW, which is a figure estimated by RTS, a leading consulting firm in Japan on solar PV, as a growth scenario based on current conditions.
- The results indicate that the capacity factor of coal-fired power plants may decline to 56% - significantly below 69%, the figure estimated in the Supply Plan.
 - If nuclear power plants will not restart at the level of the assumption above and remained to 5% of electricity supply, the capacity factor of coal-fired plants will be 62%. However, if electricity demand declines by about 5% due to energy efficiency improvement, the capacity factor of coal-fired plants may become 49%--below 50%.
 - It is considered that business plans of coal-fired power plants are based on the assumptions of a 70% capacity factor and a 40 year operational lifetime. These assumptions are not feasible and it will thus be difficult to realize the profit expected.

4. Corporate Trends and Policy Developments That Affect Future Investment in Coal-fired Power Plants

- Since the Paris Agreement entered into force, corporate activities toward de-carbonization, such as efforts toward 100% renewable energy, have been growing in Japan as well. Demand for coal-fired power plants, which are by far the largest greenhouse gas emitter among fossil fuels, will certainly decline.
- The national Long-term Low-carbon Vision, prepared in March 2017, envisions that 90% or more energy will be supplied from low carbon energy sources by 2050. Practically, the use of coal-fired power plants is not assumed. The progress of the government's efforts aiming at introducing carbon pricing, combined with various initiatives at the corporate level toward de-carbonization, will bring down the demand for coal-fired power plants.

Conclusion

- Plans of four new coal-fired power plants were cancelled in 2017 for the first time since its steady increase from the Great East Japan Earthquake. For the operators planning for the remaining 42 plants and financial institutions involved in coal businesses, it should be in their interest to make appropriate investments and financing decisions by forming a clear view of the situation of Japan and the global trend toward a de-carbonized society, which have been described in this report.