



JAPAN'S POWER SUPPLY CRISIS: AN ASSESSMENT

By Tomoko Hosoe

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The power supply shortage resulting from the massive earthquake/tsunami that struck Japan's Tohoku region on March 11, along with the threat of nuclear disaster that followed, has created widespread chaos in the country. The threat to public health is the top concern, of course, but the electricity situation has also disrupted everything from rail transportation to manufacturing activities, including the auto industry. In that regard, the big questions are: what is the extent of the power supply crisis, how long might it last, and what will its impact be on Japan's long-term energy picture?

As an immediate result of the disaster, about 9.7 gigawatts (GW) of nuclear power capacity went offline in the region, along with about 9 GW of additional thermal power capacity. The utilities affected are Tokyo Electric Power Co. (TEPCO), Tohoku Electric Power Co. and Japan Atomic Power Co. TEPCO in particular is Japan's largest electric utility, and it supplies electricity to the Kanto region, which includes the Tokyo metropolitan area.

Due to the overall loss of generating capacity, TEPCO started a program of rolling blackouts on March 14, and it is currently unable to assess how long this program might have to last. TEPCO's immediate electricity supply capacity is now assessed at 34 GW, roughly 30 percent below normal peak demand for this time of year. The biggest concern is that TEPCO would not have enough capacity to meet the peak summer demand in July and August, unless the situation improves rapidly.

TEPCO has had to shut two of its three nuclear power plants completely. It seems reasonable to assume that its severely damaged Fukushima Daiichi plant (4.7 GW) and nearby Fukushima Daini plant (4.4 GW) will not be operational for the foreseeable future, if not permanently. TEPCO's largest nuclear facility, the 8.2-GW Kashiwazaki-Kariwa plant, was not affected by the emergency.

The company is only able to buy electricity from other utilities in limited amounts, since Japan's power grid operates on two different frequencies. Eastern Japan—including Tokyo and Tohoku—runs on 50-hertz power, while western Japan—including Kansai and Chubu—is on 60-hertz. When power is sent to Tokyo from the west, it has to pass through frequency conversion facilities, and total capacity for this is estimated at just 900 megawatts (MW).

TEPCO is both ramping up power generation at its functioning plants and starting up oil-fired backup plants to make up for the loss of base-load electricity supply from the nuclear shutdowns. As a result, demand for oil and natural gas for power generation will certainly increase. Under emergency situations, the protocol is for utilities to procure low-sulfur fuel oil from local refineries immediately, while buying crude oil from the market—such as Indonesian Minas and Duri—as soon as it can be delivered.

As for liquefied natural gas (LNG), local gas utilities are likely to have an excess supply, since demand is certain to fall due to an immediate decline in industrial activities. They could probably share some of this with TEPCO, assuming infrastructure and LNG receiving facilities operate normally. In the longer term, spot cargoes and swap deals between utilities in Japan and Korea will have to be arranged, since Japan does not have any pipelines to import natural gas.

Despite a series of accidents and other problems in recent years, the core of resource-poor Japan's energy policy has long been nuclear power. The country currently has 55 nuclear units, totaling 49.6 GW of capacity. There is at least one unit under construction, and about 12 additional nuclear units are in the planning stage, but there is no definite timetable for their construction.

The government has set ambitious targets for increasing the share of nuclear power generation in order to mitigate climate change and diversify the energy mix away from oil, which would reduce Japan's energy reliance on the Middle East. (Over 85 percent of its total crude oil imports come from the Middle East today). But the crisis clearly calls into question the current target, which calls for nuclear power to comprise 50 percent of the nation's total power generation by FY 2030, compared to just below 30 percent today. Under such a scenario, 12-14 nuclear units would need to be built, and the utilization ratios of the operating nuclear units would need to increase to 85-90 percent, from the pre-disaster level of around 71 percent.

Even before the disaster, there was strong public opposition to the building of additional nuclear plants, despite the economic benefits to host communities in the form of employment and government subsidies. This, coupled with Japan's declining energy demand outlook due to its aging and shrinking population, had already cast a considerable shadow over the feasibility of Tokyo's long-term objectives for nuclear power. Now, with public concern understandably at a feverish pitch, both the expansion of existing nuclear plant capacities and the construction of new plants will most likely face stricter safety regulations and approval processes, if they are able to overcome public opposition at all. After the disaster, one utility has already temporarily suspended its construction

work on new nuclear units.

Japan's fuel cycle program will likely have to be reassessed as well. The pillar of Japan's nuclear power policy has been to achieve a program of processing used nuclear fuel, extracting plutonium, and using it in mixed plutonium-uranium oxide fuel (commonly called MOX). The government has emphasized that the nuclear fuel cycle is an important energy security effort, allowing limited uranium resources to be utilized effectively and reducing waste.

But it is this same MOX fuel, with its danger of increased radiation release in an emergency, that is now one of the primary concerns at the No. 3 reactor of the stricken Fukushima Daiichi plant. One Japanese governor has already called for a reassessment of plans to begin using MOX fuel at a plant in his prefecture.

Ultimately, the shape of Japan's post-crisis energy policies will likely be determined in large part by the degree of local communities' acceptance of further nuclear power generation in their vicinity. It is clear, however, that the current disruption in nuclear operations will inevitably change Japan's fuel mix significantly, and the demand for both petroleum products and natural gas will increase in both the short and long term.

Looking ahead, Japan's energy policy will be one key component in determining its economic recovery and competitiveness. However, it is likely to be an uncertain factor in the overall Asia-Pacific energy picture for some time to come.

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