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Japanese Energy Options After Fukushima
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福島原発事故後の日本のエネルギー選択肢

On April 11, the Nautilus Institute for Security and Sustainability published a report entitled The Path from Fukushima: Short and Medium-term Impacts of the Reactor Damage Caused by the Japan Earthquake and Tsunami on Japan's Electricity System (Executive Summary). The document, authored by a team headed by David von Hippel and Kae Takase, looks at an issue that has been frequently overlooked amid radiation concerns and attention to the tsunami-ravaged north – demand for electricity. Will Tokyo and surrounding regions have enough power to fuel revival? How will Japan's energy industry change in the wake of the Fukushima disaster?

The report predicts:

Under all but the most optimistic supply recovery/expansion scenarios, TEPCO and Tohoku will be unable to meet summer peak power demand in 2011 if peak demand is close to 2009/2010 levels.

It praises efforts by the Japanese population to conserve energy in the wake of the earthquake: *Curtailments have thus far been completely avoided in the Tohoku service territory as a result of conservation by citizens, coupled with reduced demand due to the earthquake and tsunami damage.* The authors are doubtful, however, that conservation will be enough when energy demand starts to peak during the summer months.

The short term prognosis highlights the need for more generation of energy by burning fossil fuels, but the authors note that this is not a sustainable solution. Either nuclear plants must be brought back online to bring energy supply back to pre-quake levels, or another solution must be found.

A **best case scenario** for TEPCO and Tohoku nuclear power is outlined as follows:

Based on what we are seeing today, (April 10th, 2011), the combination of structural damage and radioactive contamination make it unlikely that any of the Fukushima I nuclear plants will ever be restarted. Units 1 through 6 will need to be decontaminated and decommissioned, a process that will be lengthy (years, perhaps a decade or more), expensive (many billions of dollars), and also difficult to the point of requiring the importing of experts with experience in recovering from the U.S. Three Mile Island and Soviet Chernobyl incidents. It is likely that new technologies and methods will need to be developed to deal with the problems that the cleanup will pose.

In a Best Case scenario, then, about 4700 MW of nuclear generating capacity is gone, and must be replaced or otherwise compensated for by supply- or demand-side resources. Further, 2700 MW of capacity that were to be completed at Fukushima I during the next decade seem highly unlikely to be so, and the generation that would have come from those units will need to be replaced or compensated for as well. Another 6600 MW of nuclear capacity is likely to be offline for one to three years, 3300 MW at the Kashiwazaki-Kariwa plant is offline for inspection, and 4000 MW of thermal capacity seem likely to be offline through the summer.

The **worst case scenario** outlines the potential for more extensive, long-term problems:

... all of the nuclear power plants in the earthquake area [may be] found to have significant seismic or other damage, leading to prolonged (more than five years) retrofit requirements, and some thermal plants are found to have been compromised to the point where they cannot be repaired, and must be replaced (requiring several years). In addition, the results of inspections at the earthquake-affected power plants, coupled with nationwide public concern about the safety of nuclear plants, causes other nuclear plants (apart from the earthquake-affected plants) in the TEPCO/Tohoku service areas and maybe elsewhere in Japan to be taken off line on a rotating basis for damage assessment and/or earthquake retrofit.

Throughout the discussion, the authors point to "demand side resources" as a potential medium to long term solution for Japan's energy woes. These are examples of:

... energy generated or saved locally at the consumers' sites, rather than at a centralized power plant. An example would be an office building with a photovoltaic array on the roof that helps power the building. Excess energy from this array could potentially be distributed locally via a smart grid that can accept power inputs and distribute them at a local level.

The authors see the potential for Japan to leverage its existing technological strengths to become a leader in this area while simultaneously solving energy problems. Moreover, rather than restoring nuclear generation, a more cost-effective and stable solution could be found in demand side resources:

Japan may wish to examine carefully the costs of establishing a nationally integrated "smart grid" that enables intermittent renewables to be scaled up alongside a massive program of fast, super-efficient end use efficiency in all sectors. This approach may be cheaper, faster, and more resilient in the short and the long-run than relying on coastal coal and nuclear-fired power plants to make up for the immediate and long-term shortfalls in generating capacity. It also may allow Japan to accelerate the process of building a new energy infrastructure where consumer-sited devices such as small cogeneration (even household) systems generate and store electricity and heat to meet on-site demands and, through integration with the "smart grid", demand for peak power as well. These cogeneration systems exist today, and Japan is among the leaders in cogeneration technologies, particularly for the residential market. The advent of the electric car provides both an additional challenge and an opportunity. Millions of electric cars, connected to the smart grid when not in use, could store intermittent (such as wind and solar) power, and even feed it back to the grid to meet peak demand. "Hybrid" vehicles (cars and trucks with mostly electric drive systems but internal combustion engines configured to generate electricity) could be set up to act as generators to meet peak needs when not in use.

The authors make the hopeful argument that significant positives may yet emerge from the 3/11 disaster:

The need to rebuild a significant amount (estimated as high as$310 billion dollars, or over 25 trillion yen, according to recent news reports) of Japan's infrastructure provides an opportunity to construct new buildings, electricity supply grids, and factories with the most energy-efficient technologies in a manner that easily accommodates "smart grid" technologies. In so doing, the marginal costs of such improvements can be dramatically reduced, and much larger markets created for energy efficiency, distributed generation, and other demand-side management technologies, including technologies made in Japan.

The way that Japan's energy sector institutions, and the government agencies that oversee them, respond or are ultimately changed by the public's reaction to the earthquake, tsunami, and the Fukushima I accident will be crucial in determining whether Japan rapidly adopts a more aggressive posture toward energy efficiency and other demand-side and renewable resources, or whether it continues with a "business as usual" approach.

The Nautilus report is far from alone in suggesting that Japan has the potential to revolutionize its energy sector and cut dependence on nuclear power. In "What Feed-In Tariffs Could Do for Japan's Electricity Shortage", Paul Gipe argues: *If Japan adopted an aggressive renewable energy policy like that of Germany, it could, within ten years, generate more than four times the electricity lost at the Fukushima 1 nuclear power plant, cutting the country's reliance on nuclear power by one-half or more.*

Asia-Pacific Journal articles on related topics include:

Kaneko Masaru, "The Plan to Rebuild Japan: When You Can't Go Back, You Move Forward. Outline of an Environmental Sound Energy Policy"

Andrew DeWit, "The Earthquake in Japanese Energy Policy"

Andrew DeWit and Iida Tetsunari, "The 'Power Elite' and Environmental Energy Policy in Japan"