論説 Commentary

21st century energy paradigm shifts

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Japan's third transition period

The accident at the Fukushima Daiichi Nuclear Power Plant brought on by the Great East Japan Earthquake on March 11, 2011, was now not only itself one of the world's worst nuclear accidents, but also exposed the hollowness of Japan's nuclear energy policies and safety inspections. In that sense, this accident will likely go down in history as marking Japan's third transition phase, after the Meiji Restoration and the close of the Pacific War.

Although the proximal cause of this nuclear earthquake disaster was natural, considering that the risk had been pointed out since before the disaster it cannot be called an "inconceivable" or "natural disaster," but clearly rather a "human disaster." All citizens of Japan witness the miserable lack of competence as parties concerned at the Tokyo Electric Power Company (TEPCO) and in the Japanese government. Looking at the string of behind-the-curve actions, such as the blundering initial response and the use of SPEEDI, which should have been used for early evacuation, one comes to question whether Japan is really even qualified to handle nuclear power technology.

Paradigm shifts around nuclear power

Nuclear power has taken a central position in Japan's energy policy as "stable, inexpensive, and clean" energy source. This is typical of the "20th century paradigm" that shares the rigid "old structure" of cozy relationships among politicians, bureaucrats, and business executives surrounding nuclear power.

The Fukushima nuclear power plant accident is what dispersed the thick black cloud of these old fixed notions. Looking at reality, we see that nuclear power cannot escape from the two essential risks of huge accidents and mostly semi-permanent nuclear waste. As such, although nuclear power was anticipated to be an energy source "so cheap that we won't even need power meters," it is now recognized as "the energy source with the greatest investment risk" and in which, at least in North America and Europe, financial institutions refuse to invest.

Moreover, the rolling blackouts in the wake of the Great East Japan Earthquake and the subsequent instability of power supply clearly demonstrated that, far from being a "stable" energy source, nuclear power has the "instability" of a gigantic centralized power source. Finally, calling nuclear power "clean" is nothing more than a sick joke after seeing the reality of radioactive material scattered all over the world by the accident and numerous citizens needlessly exposed to radiation.

A new reality for nuclear power

People have the vague idea that "30% of Japan's energy comes from nuclear power." This is an old fixed notion from before the nuclear earthquake disaster. The disaster cut Japan's nuclear power generation to less than 20% of its energy supply. This will continue to rapidly decrease due to the aging of the facilities, and since new nuclear plants are almost totally out of the question going forward, the new reality is that nuclear will fall to around 10% of Japan's power generation by 2020.

In view of this "new reality" for nuclear power, what could replace it as an alternative energy source?

For short-term power supply, we are forced to rely on coal and heavy oil. However, their surging prices could deal a blow to our standard of living and the economy. In 2008, Japan imported ¥23 trillion worth of fossil fuels, which rapidly decreased the trade surplus to ¥2 trillion. In addition, these power sources present problems in dealing with the issue of global warming, which is the largest environmental risk faced by humankind.

Paradigm shifts viewed from the history of energy in Japan

Japan's energy policy has changed orientation substantially about every 20 years since the end of World War II.

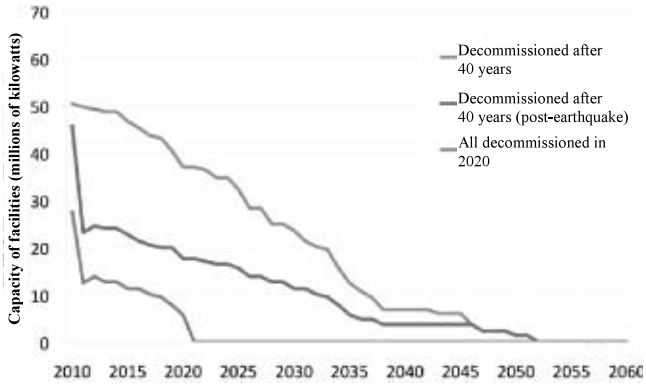

Fig. 1 The Course of Japan's Nuclear Power Plants (Before and After the Earthquake)
*Estimate by the Institute for Sustainable Energy Policies
Note: This graph assumes that after the earthquake, Fukushima Daiichi, Fukushima Daini, Onagawa, Higashidori, Tokai, and Hamaoka will all be shut down, and that Kashiwazaki-Kariwa and Shimane will be shut down in phases.

The first transition phase was the shift from coal to petroleum in the 1950s and 60s. Although this enabled Japan's rapid growth, it sowed the seeds for the second transition phase: the oil shock and environmental crisis of the 1970s. As the oil shock spurred the acceleration of nuclear power generation, the environmental crisis—especially air pollution—sped up the move to natural gas. However, when we look at this environmental crisis globally, we see that it invigorated the environmental protection movement and led to a divided controversy on the nuclear power debate, thereby giving rise to tense relations with countries and power

companies advancing nuclear power in response to the oil shock, as well as leading more than a few countries to move away from nuclear power due to the Three Mile Island accident (United States) in 1979. In contrast, since Japan had promoted nuclear power as a priority, the politicians and bureaucrats completely ignored the environmental movement, and even suppressed and expelled it, which sowed the seeds for the excessive orientation toward nuclear power that followed.

The third transition phase was the global warming measures and loosening of regulations in the 1990s. However, besides the fact that measures to curb global warming were used as an excuse to promote nuclear power, no environmental tax nor any other global warming policies with teeth were ever implemented, and the power market deregulation that started as part of the debate on the loosening of regulations was left unfinished.

Now, then, is the time for the fourth transition phase. It is surely time to take a realistic second look at nuclear energy policy, dramatically expand the use of natural power sources, and radically overhaul the electric power market, with a path for doing away with our reliance on nuclear power.

Paradigm shifts toward geographically distributed energy generation

This "fourth transition phase" includes major paradigm shifts regarding energy and the ideal form of society—shifts like the following:

- Large-scale centralized technologies → Small-scale distributed technologies
- Hierarchies → Networks
- Top-down from the center → Bottom-up from localities
- Creation of products and money → Knowledge creation

In line with this flow, the three pillars of alternative energy to replace nuclear and oil/coal should be as follows.

The first pillar is "energy-saving power plants," which refers to saving power and cutting consumption in a way that does not affect usability. There is major potential here through a policy method called "demand-side management" (DSM) and the incorporation of smart grids in the future.

The second pillar is "gas cogeneration." By using natural gas, which is cleaner than oil and coal and has a stable international market, and making the switch to distributed cogeneration that can use heat, we can raise the thermal efficiency of society overall.

The third pillar is to dramatically increase the use of natural energy sources. If we imitate Germany, which is expanding its portion of power generated from natural sources from 17% (2010) to 40% (2020), we can expand our use of natural energy to 30% in the next ten years. As with personal computers and LCD televisions, the performance of natural energy increases as it becomes more pervasive, while its costs fall.

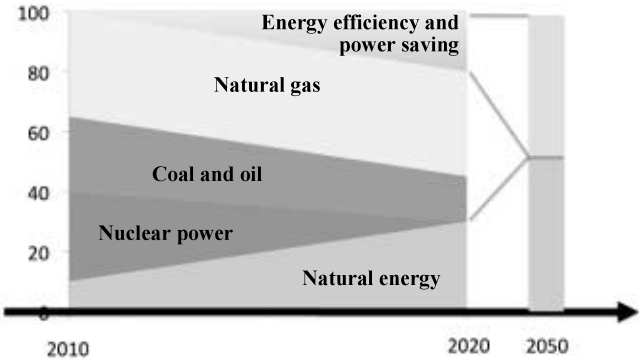

Fig. 2 Aiming to curb global warming and stop using fossil fuels, while completely eliminating nuclear power

The "fourth revolution" of the 21st century

Natural energy is achieving rapid growth worthy of being called the "fourth revolution" in the history of humankind, after the agricultural, industrial, and IT revolutions. Last year, global natural energy production was worth more than ¥20 trillion. Since power generation facilities can be constructed in a short time, the effects are fast, and they can bring energy, jobs, and economic growth to regions. Energy-saving power plants and natural energy can both create all kinds of employment opportunities and economic growth for local communities, while at the same time circulating energy costs within the region that had formerly been flowing out of the area.

This kind of completely new green economy is expected to expand tenfold to exceed ¥200 trillion ten years from now. Regardless of this, it has been only Japan that has turned its back to this trend up to now and proceeded down the fruitless road of nuclear power. In order to leave an inheritance rather than a burden on the next generation from the sorrowful calamity of nuclear earthquake disaster, isn't now the time to launch the 21st century environmentally friendly energy revolution?

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