

Short Report

~ Current Energy Situation in Japan ~

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More than six years have passed since the accident at the Fukushima Daiichi nuclear power station in 2011. It is indeed regrettable that this unprecedented accident caused by a big earthquake and an unanticipated tsunami is still giving an impact on the nuclear policies worldwide.

In the meantime, we have observed several energy trends, some of which are unique to Japan.

< 5 Ds: TEPCO's Idea >

We are currently facing the “Grand Energy Transition”, which was confirmed at the Istanbul Congress last year. One of Japanese utilities (TEPCO) has recently identified five Ds to tackle during this transition era. Five Ds are (1) Deregulation, (2) Decentralization, (3) Decarbonization, (4) Digitalization and (5) Depopulation.

The council's Trilemma Report identifies 3Ds ((2), (3) and (4)) as global evolution trends in the recent energy landscape and additional 2Ds ((1) and (5)) are indigenous to Japan.

In this paper, I would like to briefly report some topics of energy situation in Japan facing five Ds mentioned above.

1. Energy Demand---- (5) Depopulation

First, energy demand in Japan started decreasing and this trend seems to continue in the future.

In the past decade, Japan's primary energy consumption has decreased by 14.4%, with electricity demand down by 14.1%. These decreasing rates are significantly big compared with the ones in OECD countries. This never happened in the far past, and as the depopulation and aging in the future are foreseen, this decreasing trend must be continuing.

On top of that, a policy known as Top Runner Programme has seen appliances, cars, other goods and buildings subjected to energy efficiency improvement, and highly efficient goods are now deployed widely. An increase of self-consumption of a part of rooftop PV panels' generation has also contributed to suppress the electricity demand for the utilities. CO2 emission from energy use in 2016 was almost same amount of the one in 1997. Thus, we have started to enter a new era of lesser energy consumption society.

Even under this trend, there is no doubt that energy security is Japan's top priority. It is because we have no oil and gas pipelines from neighbouring countries and no natural resources with a self-sufficiency of primary energy of just 6%. Therefore, it is vital for us to depend on the foreign resources based on a well-balanced portfolio as well as to aim at forming energy efficient society.

2. Nuclear Restarting ----- (3) Decarbonization

At present, there are 20 PWR (WH design) units and 22 BWR (GE design) units in Japan. Total capacity of these 42 units is 41,482 MW.

None of BWR units which are same as Fukushima Daiichi has passed NRA's safety examination yet, but very recently, Kashiwazaki-Kariwa Unit 6 and 7 (1356 MW each) owned by TEPCO have passed NRA's safety examination with an expectation of being followed by other BWR units.

On the other hand, 12 PWR units in 6 NPSs have passed the safety examination of NRA. Among them, 5 nuclear units with total capacity of 4,410 MW are now in operation. These 5 units are Sendai unit 1 and 2 (890 MW each) owned by Kyushu EPCO, Ikara unit 3 (890 MW) owned by Shikoku EPCO and Takahama unit 3 and 4 (870 MW each) owned by Kansai EPCO. The remaining 7 units are in a preparatory stage of restarts under the best efforts to get public acceptance. However, three old units out of 7 remaining units will need more time to complete the necessary work to meet new safety standards before they can go online.

<Japan's unique system for getting local governors' consent>

What is unique in Japan is that the plant owners must get an approval from city mayors and prefectural governors surrounding the nuclear power stations before restarting. This is based on the "Safety Agreement", which is voluntarily conducted between owners and local governments, but not regally bounded.

It is also noteworthy that the public opinion in Japan shows its preference to the renewable energy rather than nuclear after Fukushima accident.

<Lost trust from the public>

Nuclear experts and nuclear technology itself have lost the public trust, and the media has been informing people of nothing but negative side of nuclear. Nuclear industry including plant owners has been reluctant to make efforts in communication about energy issues with the public. There is nobody but nuclear industry who can communicate with the public to show their efforts to keep safety of reactors. In consequence, there is a serious lack of awareness about energy among people. Electricity is mostly taken for granted, much more so than oil.

For having further restarts of nuclear reactors, public opinion should be more favorable to nuclear.

<More effort is needed for getting better understandings>

Thus, more effort is needed to seek people's better understanding of not only risks but also importance and benefits of energy, speciously nuclear energy.

3. Renewables ----- (2)Decentralization, (3)Decarbonization, (4) Digitalization

Most of the public favour renewables over nuclear. A feed-in-tariff (FIT) system introduced in 2012 caused a rapid penetration of renewables such as mega-solar PVs. As a result, in some areas the total capacity of renewables connected to the grid has become larger than the minimum demand in the daytime, making it difficult to balance supply and demand.

In addition to this, the FIT system has been viewed with some criticism because purchasing prices were set high based on the estimated cost of individual renewable energies to guarantee the investors' profit. A heavy burden is now imposed on consumers' (including households on welfare) electricity bill.

In this context, the government has amended the FIT system to be introduced in April 2017. The new system introduced a bidding system for the purchasing price from large scale PVs such as mega-solar PVs.

<Year 2019 Problem: 10-year FIT-term for rooftop PVs to start ending>

Regarding the rooftop PV panels, we will soon be facing so-called Year 2019 Problem. Ahead of the FIT system implemented in 2012, “Surplus Power Purchasing” system was introduced in 2009. Both of those systems limit the term of purchasing surplus power to 10 years from small capacity rooftop PV panels of less than 10kW. Thus, in 2019 it is estimated that about 1200 MW panels on the rooftops of 0.4 million households will end 10-year term, and the owners will be unable to sell their surplus power at the original high price such as 42 Yen/kWh (Average price for household in Tokyo: 26 Yen/kWh). It is obvious that this trend will continue from then on.

Taking this trend as a sort of new business opportunity, a part of EPCOs and/or new entrants in the market started feasibility studies or demo projects which allow prosumers (rooftop PV panel owners) to trade the surplus power to other customers in a peer to peer manner utilizing new digitalization technology such as block-chain.

FYI: TEPCO’s Tender System

Transmission capacity is usually reduced from the upstream (bulk power grid side) to the downstream (end-users side). If there is a huge RE penetration in the end-users side, it may cause reverse power flow and overloading on some transmission facilities and network upgrading is required to mitigate capacity shortage. To cope with this situation which is now a reality, TEPCO introduced a scheme of public tender to connect REs as shown below.

- Tendering opportunity is presented for RE developers in the designated area to share the cost of upgrading the relevant transmission facilities in the area.
- Minimum offering price is calculated as construction cost divided by additional transmission capacity.
- The connection priority is determined by the order of bidding price.
- The cost of upgrading project will be basically allocated among the successful bidders.
- Tendering process is cleared on a condition that the sum of the shared cost among successful bidders can cover the whole project cost.

4. Electricity System Reform ----- (1) Deregulation

April 2013, Cabinet decided the “Policy on Electricity System Reform” to realize three objectives in Japan’s market with a three-step approach.

[3 Objectives]

- (1) Securing a stable supply of electricity**
- (2) Suppressing electricity rates to the maximum extent possible**
- (3) Expanding choices for consumers and business opportunities**

[3 Steps]

<New organization for cross-regional coordination of transmission operators>

In April, 2015, the Organization for Cross-regional Coordination of Transmission Operators (OCCTO) was established.

In April 2016, electricity retail competition was expanded to the residential sector by opening a new market. As of 31, March 2017, there are 389 companies registered for the retail business. Consumers switching rate one year after the market opening has reached about 10%, mostly in urban areas such as Tokyo. It is said that the switching rate in the UK one year after the market opening was a little more than 10%, which was almost same figure as in Japan.

In 2020, the transmission/distribution sectors of big EPCOs will be unbundled by regal unbundling style.

5. LNG ----- (3) Decarbonization

One of the most surprising aspects of the Fukushima accident has been how well the nation has coped with the loss of so much electricity generating capacity, as nuclear power plants accounted for more than 30% of electricity generation before the accident.

In other words, Japan has managed to go through six summer and winter peak power demand seasons without any major power outage by unsung efforts of electric power companies, which have operated fossil fuel-fired thermal power plants and boosted their imports of coal, oil and LNG.

Japan is a world's largest LNG importer, relying on LNG for almost 100% of its natural gas supply from more than 15 countries.

The volume of LNG import peaked at 106.2 Million BOE in 2014, which was 34.9% share of global LNG demand. After the nuclear restarting, the share is down to 31.3% in 2016. Considering additional nuclear restarting to come, I am expecting LNG import to decrease in the next decade, even as imports from the US increase.

<JERA>

In April 2015, two Japanese utilities - Tokyo Electric Power Company and Chubu Electric Power Company- formed a joint venture company named JERA that enable them to “ensure the stable supply of energy on an internationally competitive basis”. JERA is involved in “the entire energy supply chain, from upstream investments and fuel procurement through power generation”.

Its establishment has been made in a step-by-step manner. To begin with, it focused on developing new upstream energy investments, integrating a process for new fuel procurement and creating processes to develop new thermal power plants and scrap obsolete ones, both in Japan and internationally.

At present, JERA is the world largest LNG buyer with annual procurement of around 40 million ton.

6. Coal ----- (3) Decarbonization

We fully understand the global need of GHG reduction. But, diversification of energy sources is essential for Japan to ensure national energy security.

<Highest efficiency coal fired thermal power generation technologies>

Thus, we have been making our best effort to develop clean coal technologies such as USC and IGCC aiming at the world highest thermal efficiency.

<Update of energy mix goal is now under review>

In 2015, Japanese government announced the 2030 energy mix goal; 22-24% renewables, 20-22% nuclear, 27% LNG, 26% coal and 3% oil, respectively.

As the goal is based on “Basic Energy Plan” which is updated by the government every three years, new energy mix goal will be announced next spring.

To achieve this goal, nuclear is a must and coal is either for Japan.