

A Thought on the Issue of Electricity Shortages

Ken Koyama, PhD

Managing Director, Chief Economist

The Institute of Energy Economics, Japan

In response to the Great East Japan Earthquake and the subsequent Fukushima Daiichi nuclear power plant accident, the tightening electricity supply-demand balance and electricity shortages have emerged and become one of the most urgent problems for Japan. Behind the problem is the fact that it is indispensable and necessary for citizens' livelihood and industrial operations to secure necessary and sufficient supply of energy, particularly electricity.

On the electricity shortage problem and solutions, various opinions have been given from various viewpoints. It is not an exaggeration to say that now in Japan everyone is insisting on their own views. Here, I would like to provide viewpoints to locate some key points for considering the electricity shortage problem. The viewpoints are (1) how to supply electricity: (a) to meet the maximum (peak) demand (the kilowatt problem); (b) to cover total demand in a given period of time (the kilowatt-hour problem), and (2) the issues of volume (physical shortage) and price impact. These viewpoints are very basic ones, appearing too obvious to experts. Nevertheless, I would like to discuss these viewpoints which should be useful for interpreting the present complicated discussions on the electricity shortage problem.

Regarding the first viewpoint, electricity's nature forces electricity supply to be balanced with and meet demand constantly (at all time). Supply capacity must be large enough to cover the highest (maximum or peak) demand within a given period of time. If maximum electricity demand exceeds supply capacity, we may see a large-scale blackout that would be difficult to control. This may bring about physical shortage of electricity as a serious problem to greatly affect citizens' livelihood and economic operations, as discussed regarding the second viewpoint later. The so-called "kilowatt problem" is very important. Indispensable options to address the problem include the expansion of supply capacity, the reduction of electricity demand and their combination.

Instantaneous electricity demand may be accumulated into daily demand for 24 hours or annual demand for 365 days. As for the kilowatt-hour problem, it is important to cover the annual aggregate demand through management of overall electricity supply infrastructure including electricity sources (power plants). As is well known, electricity sources vary widely in nature, positioned as base load electricity sources, middle sources and peak-addressing sources to play their respective roles. Regarding the present electricity shortage problem, nuclear power plants as base

load supply sources have been or will be lost. Therefore, a key question to be asked is what electricity sources should and could serve as base load sources. In securing sufficient supply from the overall viewpoint including electricity supply infrastructure, we must consider not only electricity generation capacity but also electricity transmission capacity, fuel procurement, capacity of fuel receiving facilities (including domestic transportation ships, LNG tankers and receiving terminals) and other constraints.

Regarding the second viewpoint, the problem of physical shortage and price impact is always important for supply security of not only electricity but also other energies. In the case of electricity that is highly necessary for citizens' livelihood and economic operations and must always see an instantaneous supply-demand match in principle, (although availability of electricity storage capacity may help to some extent stabilization), the tightening supply-demand balance is vulnerable to physical shortages. As indicated by the history of the international energy market, "physical shortages" impose the most important influences and implications on energy security. Physical electricity shortage may not only affect the comfortableness and convenience of people's livelihood but also exert negative effects on human health, lives and safety. Physical electricity shortages may also lead to a decline in economic and industrial operations, bringing about significant problems regarding the maintenance and development of the Japanese economy. Given these points, the momentum may work to take every available measure to avoid physical shortages.

Next, fears for physical shortages may impose price implications if and when various efforts are made to avoid such physical shortages. As far as the present electricity shortage problem is concerned, Japan has no choice but to depend on an expansion of thermal power generation to meet electricity demand for the immediate future. As a result, fuel procurement costs may increase substantially and inevitably. But whether the fuel procurement cost increase would lead to electricity bill hikes may depend on electricity generators' cost-absorbing efforts and should be taken as a separate problem. For the whole of Japan, however, the substantial increase in fuel procurement cost is a real problem, despite whether who (either electric utilities or others including auto generators) expand thermal power generation. The expansion of thermal electricity generation may also increase global warming prevention costs by boosting carbon dioxide emissions.

Even if Japan introduces more renewable energy sources to address the electricity shortages, relatively high costs of renewable energy sources and economic costs including systems costs to respond to intermittency and related policy costs to promote renewable energy (like costs related to feed-in tariffs system) may exert influences on electricity prices. In this sense, considerations may also have to be given to the costs for the entire electricity system including measures for electricity grid networks. We may have to pay attention to the fact that electricity price hikes' effects on sectors exposed to international competition are more significant than those on others.

Of Japan's total electricity consumption in 2010, the industrial sector accounted for 39%,

the residential sector for 33% and the commercial sector for 28%. Given the fact that electricity has been used widely by various sectors including the industrial sector as a primary consuming sector, responses to the electricity shortage problem are very significant for the whole of Japan. In this sense, we may have to consider the present and future electricity supply/demand problems in line with the loss of large-scale base load electricity sources, based on the above-mentioned viewpoints.

Contact: report@tky.iej.or.jp

The back issues are available at the following URL.

<http://eneken.iej.or.jp/en/whatsnew/JPOIEL.html>