



Building toward large-scale use of renewable energy in Japan

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The Paris agreement has accelerated worldwide momentum for strengthening global warming countermeasures.

As most greenhouse gas emissions come from energy consumption, key measures to check global warming are saving energy through efficient use and transitioning to low carbon energy. For example, better fuel efficiency would reduce the amount of carbon dioxide issuing from cars that run on fossil fuels. But to bring about a drastic reduction, it is essential to shift from gasoline to electric vehicles and from fossil fuel power generation to renewable energy and nuclear power that do not emit carbon dioxide. Carbon dioxide emissions can be significantly reduced by electrifying equipment and reducing the carbon content of power sources.

Enhancing zero-carbon energy is an urgent task as the Japanese government aims to derive 44 percent of power from renewable and nuclear power by 2030. The use of solar has been growing rapidly in Japan, but still, when we look at the power mix ratio in 2016, renewables other than hydroelectric, such as solar and wind, accounted for only 7 percent, compared with 8 percent for hydro. Increasing renewable energy will have to be a pillar of Japan's energy policy for the foreseeable future.

There is a wide variety of renewable energy in Japan. This nation has the world's third-biggest potential for geothermal power, but many of the sites are in mountainous areas where the power transmission network is fragile, or in national parks subject to nature conservation regulations, making development extremely costly and time-consuming. Japan is reportedly rich in biomass reserves, but domestic reserves alone are insufficient to provide enough feedstock to operate large numbers of power stations. The best large-scale hydroelectric power sites in Japan have already been identified and exploited, so there is little potential remaining for new development. For

the foreseeable future, the key will be to boost solar and offshore wind power, as onshore wind projects face land use restrictions.

Solar and wind power are domestic energy sources that produce no carbon dioxide emissions during power generation, and they have the advantage of near zero marginal costs since their fuel does not have to be bought. On the other hand, their output depends a great deal on weather. In electrical power systems that require a balanced supply and demand, as generation via renewables increases, various costs will be incurred for such needs as building more transmission lines, securing power storage and providing maintenance for backup thermal power generation.

It's no exaggeration to say that the biggest theme in our nation's energy policy is curbing the overall cost to the public while reaping the benefits of renewable energy to the fullest.

To make large-scale use of renewable energy possible, the price tag needs to be as low as possible. But, unfortunately, under the feed-in tariff (FIT) system that Japan introduced in 2012, the burden on the public will total ¥2.4 trillion (\$22 billion) in fiscal 2019 alone, with the cumulative total of about ¥10 trillion since its introduction in July 2012. That is because the Fukushima No. 1 nuclear disaster that started in 2011 generated blind faith in renewable energy, resulting in a system that provides excessive support for renewables.

To be sure, Japan will have to overcome unfavorable conditions for renewable energy that other countries don't have to face, such as a narrow and predominantly mountainous land with varied weather conditions, including a rainy season and regular snowfall. But considering that the price paid for solar power in Japan is roughly double that in Germany, despite it being situated at a higher latitude, it has been already recognized that the FIT system needs to be improved immediately. Discussions for a radical revision of the FIT regime has are already underway and an auction system is being introduced for nonresidential solar power. That is because cost reduction is the most important factor in determining whether renewables will become a main power supply source.

In addition, to utilize renewables on a cost-efficient basis, effective use of the existing power grid will be essential. Beefing up transmission lines in conjunction with an expansion of renewable energy would require vast investments and time. Unless careful consideration is made on the cost effectiveness of investments in the

transmission network, the future could be left with a huge financial burden.

But rules for managing transmission networks have already been improved. Japan's transmission network had previously been run on the assumption that all power plants would run at full capacity, thus choking room for renewable expansion, but the transition to more flexible operations of transmission networks is underway.

Japan is an island with a power grid isolated from other countries. In addition, the grid is divided into two frequency areas, 50 Hz in the east and 60 Hz in the west. Even within the same frequency, the areas are divided into several smaller grids, served by former monopolies, with weak interconnections like between Hokkaido and Tohoku, and between Chugoku, Kyushu and Shikoku. The supply-demand balance has to be maintained at each of these small grids, making it more difficult for Japan than in other countries to raise the ratio of renewable power. To accomplish that, all means have to be exhausted, including using pump-storage hydropower and spreading the use of storage batteries, in addition to making the most out of the existing transmission network.

The road to make renewables Japan's main power source will not be smooth, but therein lies many business opportunities. It is reasonable to hope there will be a transformative social change made possible by new services that take advantage of storage batteries, hydrogen and other technologies.