

## **Cost for Energy Transition and the issue of Affordability**

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From March 14 through 18, I had opportunities to discuss energy and climate change issues facing Europe and the world with energy policy planners, experts and energy industry stakeholders while touring Paris and Brussels. Among topics for the discussions in Europe were the future course of the European economy, prospects and challenges regarding the United Kingdom's pending secession from the European Union known as "Brexit," the significance of coming European Parliament elections and other European issues. Given that Europe is aggressively tackling climate change, our discussions focused on energy transition or how the enhancement of climate change countermeasures under the Paris Agreement would transform global and European energy markets over a long time.

Major European industrial countries have advocated ambitious long-term targets of reducing greenhouse gas (GHG) emissions in 2050 by around 80-90% from 1990. If such targets are attained, Europe would realize a "decarbonized society" rather than a "low-carbon society." Decarbonization would require an energy supply and demand structure to almost eliminate GHG emissions accompanying human life and economic/industrial activities. Basically, energy consumption efficiency would have to be increased thoroughly to attain an extremely energy-efficient society and energy sources for consumption would have to be replaced with zero-carbon sources.

In reality in 2017, oil accounted for 38% of EU primary energy consumption, gas for 24%, coal for 14%, nuclear for 11%, renewable energy for 9% and hydro for 4%. Fossil fuels combining oil, gas and coal commanded 76% or three quarters of the total. Unless not only coal coming under fire for its high GHG emission intensity but also the two most frequently consumed fossil fuels of oil and gas are replaced with zero-emission energy sources, overall decarbonization would be difficult to attain. Such replacement would represent a large-scale, full-blown energy transition.

The highest hopes might have been placed on renewable energy as an approach to such turnaround in the world and in particular in Europe. Solar photovoltaics and wind power generation has rapidly expanded as relevant costs have declined at a surprisingly high speed. The rapid expansion is one of the largest surprises to energy stakeholders in the world. Given great expectations on the fast development of and cost falls for electricity storage technologies responding to the intermittency of renewable energy power generation, Europe has placed high hopes on renewable energy's great role in reducing GHG emissions.

However, a growing view is that renewable energy expansion alone would not be enough to build a decarbonized society to cut GHG emissions by 80-90%. After the maximum electrification of energy demand, not only the power generation sector but also transport, industry, buildings and

other energy consumption sectors would have to become almost zero-emission. To this end, innovative technologies and innovations would have to be developed and diffused. Innovative technologies, which are still difficult to develop or diffuse under the current social, economic and technological conditions, include hydrogen utilization, the combination of biomass energy with carbon capture and storage into BECCS known as a negative carbon technology, and a direct air capture (DAC) technology to directly absorb and collect atmospheric CO<sub>2</sub>. Interest in these innovative technologies is growing globally.

However, these innovative technologies have yet to be incorporated into the existing energy system and are being developed for the far future. There are not only social and technological hurdles but also difficulties in outdoing existing technologies due to economic efficiency problems. Although conditions are set to change depending on future technological development and cost reduction, the replacement of existing technologies with innovative ones for the energy system may take much cost. As a matter of course, it may be concluded that the ambitious target of building a decarbonized society should be attained even at considerable cost.

While efforts are being made to attain an ideological target, however, it is important in the present society to consider the cost of such efforts and their social impact. France is now planning to cut its share of nuclear power from more than 70% at present to around 50% in the power mix while nuclear has been considered as a key energy source for energy security and climate change prevention. To attain the ambitious target of cutting GHG emissions by 75%, however, France will have to make up for the nuclear share drop with the expansion of other zero-emission energy sources. It is now considering utilizing wind power and other renewable energy sources, hydrogen and biogas. The problem is that the replacement of existing nuclear power generation as the most cost-competitive energy source at present with other zero-emission energy sources could boost electricity cost or energy bills.

There may be a view that it is inevitable to pay higher cost to address key externalities including climate change. Given that a fuel tax hike triggered France's Yellow Vest movement suddenly last November, however, the affordability of energy prices is a factor that even industrial countries such as France cannot ignore. It may be understandable that some cost would be required to address key externalities such as climate change. Unless such cost is understood clearly and specifically in a society, however, the cost may trigger grave political, social or economic problems depending on social or economic conditions of respective country/society. In this sense, the problem of affordability exists even in industrial countries, as noted above.

Traditionally, the affordability of energy supply cost has been highlighted as an important problem particularly in emerging and low-income developing countries. As these countries featuring lower per capita income must give priority to economic growth and development, the viewpoint of energy price affordability is naturally important in these countries. As far as fundamental social system reforms such as thorough decarbonization are concerned, however, it may be difficult even for industrial countries to shrug off the affordability problem. In the way the world goes, any country makes adjustment or revision depending on situational changes while trying to attain ideological targets. It may be important to make energy transition as affordable as possible while watching the advancement of innovative technologies and progress in relevant cost reduction.

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