Points of Discussion Concerning the Strategic Energy Plan: Toward policy measures to take advantage of the market mechanism

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The Strategic Energy Plan is based on two major principles. The first principle is that the government sets numerical targets regarding the future energy mix. Under the fifth draft plan, the government would maintain the policy of aiming for a share of around 60% for thermal power and around 20% each for both nuclear power and renewable energy.

The second principle is that the government determines policy measures to achieve various policy goals. For example, means of reducing CO_2 emissions include the use of renewable energy and nuclear power and the promotion of energy conservation. The new Strategic Energy Plan is expected to indicate numerical targets for emission reduction with respect to each means of reduction.

In economics, this policy design approach is known as "optimization by social planners." Under this approach, the government gathers as much information as possible as a social planner and develops the optimal path for achieving goals. Another popular approach is optimization through the market mechanism. This approach is different from market fundamentalism, which argues that everything should be left to the market. While taking advantage of the market mechanism, the government intervenes in cases of "market failure," such as environmental and anti-trust problems caused by inefficiencies in the market, in order to provide solutions through policy measures.

In this article, I will discuss what kind of institutional designing will be effective for policy implementation in Japan from my standpoint as an economist while reviewing the approaches of optimization by social planners and optimization through the market mechanism.

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First, let us examine the energy mix, which is a key point of discussion concerning the Strategic Energy Plan. Under the approach of optimization by social planners, the government is required to gather information concerning the costs of various energy sources, including future costs, and determine the energy mix that minimizes the burden on the people while taking into consideration the safety and environmental impact of the energy sources.

One problem with this approach is the difficulty of foreseeing the future due to rapid and unpredictable changes in the energy situation. For example, in the United States, natural gas prices have fallen to an unforeseen level because of the shale gas revolution that started around 2008. Global oil and coal prices have shown unforeseen volatility in the past 10 years. Given the technological innovation and uncertainty over the global situation, it is difficult to estimate what the optimal energy mix will be decades later. Rather, fixing the framework for future energy policy based on information available at the moment would undermine flexibility.

In view of this problem, the United States has been shifting its energy policy toward optimization through the market mechanism. For example, many states hold competitive auctions concerning electricity supply. Electricity suppliers that offer lower bids are given precedence in selling electricity, resulting in the selection of low-cost energy and the supply of electricity to consumers at low prices. By taking advantage of the market mechanism, these states have designed a system that does not rely on cost forecasts by social planners.

Since the shale gas revolution, a shift from coal-fired thermal power generation to natural gas-fired one has been proceeding in the United States. Furthermore, as nuclear power generation has lost its cost advantage over other types of power generation, new construction of nuclear power stations has almost stopped. These changes in the energy field obviously have taken place not because of governmental planning or initiatives but as a result of the market's reactions to technological innovations.

Next, let us consider another key point of discussion concerning the Strategic Energy Plan, namely, the issue of how to achieve the CO_2 reduction target under the Paris Agreement.

There are a variety of means of reducing CO_2 emissions, including the introduction of renewable energy such as solar and wind power, a shift from coal and oil to natural gas, and the promotion of energy conservation. In light of the knowledge gained through cutting-edge research in economics, many problems could occur if social planners arbitrarily determine concrete measures to promote an energy policy shift. That has become clear in theoretical research in the field of economics and empirical research conducted in various countries based on data analysis.

The fundamental reason for this dilemma is the presence of "information asymmetry," a phenomenon which attracted attention when the Nobel prize in economics in 2001 was awarded to economists studying it. While companies hold detailed information concerning present and future technological innovations and costs, governments do not. Governments are in the difficult position of having to regulate companies in this state of information asymmetry.

Are there policy solutions for information asymmetry? Here, I will cite emissions trading, which is a policy scheme with a mix of elements of the approaches of optimization by social planners and optimization through the market mechanism.

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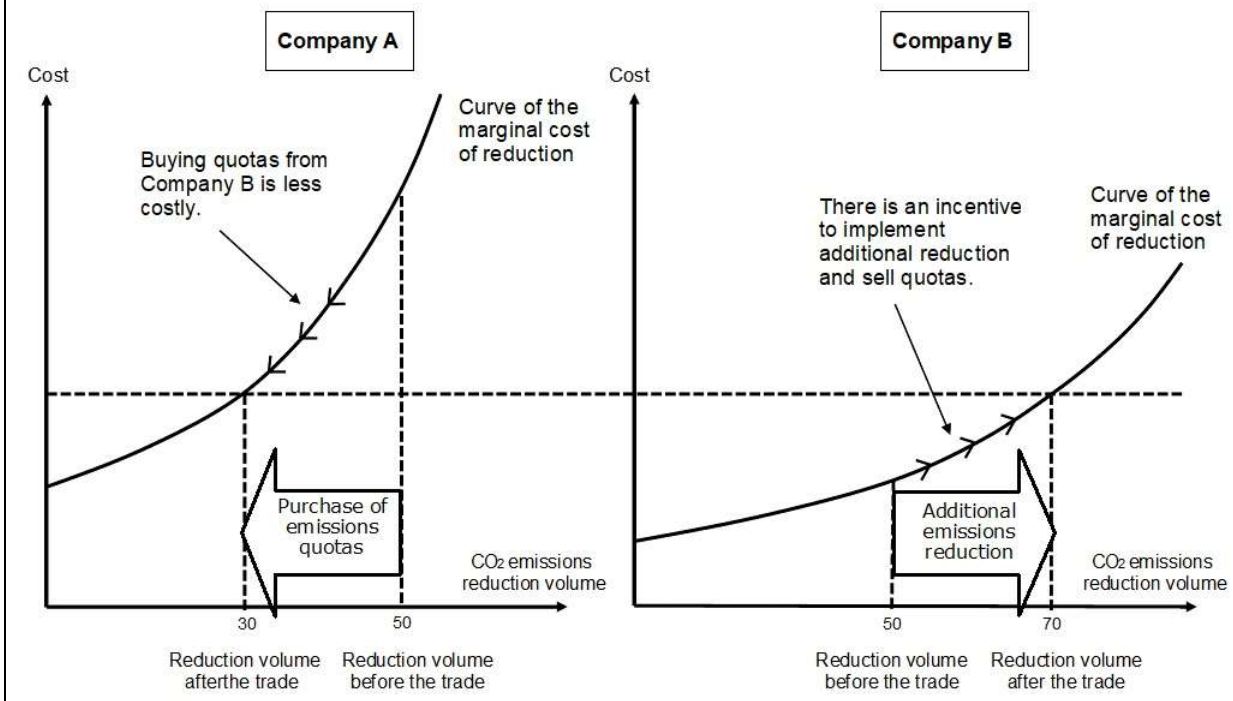
First, social planners determine the emission reduction volume for the whole of society. In Japan's case, the country must honor its commitment to the CO_2 emission reduction target under the Paris

Agreement. Next, emission quotas are allocated to CO_2 emitters, who can sell their quotas or buy ones from others. One advantage of emissions trading is that it makes it possible to achieve policy results that minimize the burden on the people even when social planners do not have perfect information concerning companies' emission control technologies.

As a simple example, let us consider a case in which the emission reduction target has been set at 100 units of emission (see Figure) for the whole of society where there are only two companies, Company A and Company B. The marginal cost of reduction refers to the additional cost necessary for reducing one unit of CO_2 emission.

Figure: Emissions Trading as a Scheme to Minimize the Cost of Reducing CO_2 Emissions for the Whole of Society



In this case, Company B is assumed to have technology capable of reducing CO_2 emissions at lower cost compared with Company A. If the government requires each company to reduce emissions by 50 units, Company B would have an incentive to reduce its emissions by more than the required 50 units—with an additional reduction of 20 units, for example—and sell quotas corresponding to the additional reduction. For Company A, reducing its emissions by 30 units and buying quotas corresponding to the remaining 20 units from Company B would be less costly than realizing the reduction of the whole of 50 units on its own. As a result of emissions trading between the two companies, the cost for the whole of society would be minimized.

Emissions trading is useful in that it minimizes the cost of reducing emissions for the whole of society regardless of the shape of the curve of the marginal cost of reduction shown in the Figure. In other words, even when the government cannot obtain information concerning cost

reduction on the part of companies, it is possible to minimize the burden on the people through competition. Moreover, it is not necessary for the government to arbitrarily determine which means of reduction should be adopted. The principle of competition concerning emission reduction determines the way of minimizing the social cost.

Around the world, moves to introduce CO_2 emissions trading are accelerating. In addition to the European Union (EU), which introduced emissions trading early on, the state of California has opened an emissions trading market. China has also decided to introduce emissions trading as a national strategy.

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As is clear from the cited cases, the global trend of energy policy is moving toward policy designing that takes advantage of the market mechanism while giving consideration to the viewpoint of social planners. Indeed, Japan has also launched pioneering initiatives at the level of specific policy measures. For example, the Ministry of Economy, Trade and Industry has started an auction system following the revision of the feed-in tariff system concerning renewable energy. The Ministry of the Environment has distributed some energy conservation subsidies in accordance with the results of auctions. An institutional reform intended to invigorate the electricity market is also ongoing.

Of course, market mechanism is not a magic bullet. However, if the approach of taking advantage of the market mechanism takes hold not only at the level of individual policy measures but also at the level of overall policy designing, the range of energy policy options available for Japan is expected to expand significantly.

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