

New Formula for the Costs Estimation of Generating Electricity

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There are several methods to estimating the costs of generating electricity. Therefore, to obtain accurate estimates, it is essential to show, in detail, the estimation method used and the relevant points to be noted. Presenting only the estimation results without such details can lead to extremely misleading interpretations: one such interpretation is the notion held before March 11 that nuclear power generation is inexpensive. Estimates of the costs of electricity generation for different power sources were first made in the 1980s by the OECD Nuclear Energy Agency (NEA). By critically examining earlier studies, let us consider the significance of accurately estimating the costs of electricity generation in a world where technologies for electricity generation are becoming more diverse.

The IEA/NEA estimation is based on the following formula: costs of electricity generation = (capital costs + fuel costs + operational maintenance costs) ÷ amount of electric power generated. The amount of electric power generated is the total amount of electricity generated by the power plants during their operation (an assumed number of years of operation) for each power source. The costs of electricity generation estimated by the IEA/NEA are obtained by dividing the cost incurred in generating electricity by the amount of electric power generated. It is easy to understand, and there seems to be little room for questioning. However, in adding up the costs actually incurred in connection with electricity generation, there are some costs that do not fit into the formula used for the IEA/NEA estimation. Examples include the costs of reducing CO₂ emissions and the costs of purchasing emission allowances. A large amount of CO₂ is emitted in the process of fuel-fired power generation since fossil fuels such as coal are used. In other words, fuel-fired power plants always emit CO₂ when they generate electricity. If electric power companies take no measures to reduce CO₂ emissions, they of course incur no expenditure associated with their CO₂ emissions. In that case, no such expense is listed in their financial reports or it is incorporated into the estimate of the costs of electricity generation. CO₂ emissions are environmental external costs associated with fuel-fired power generation. They are unavoidable costs resulting from fuel-fired power generation and should be regarded as part of the electricity generation costs. Although not listed as costs for the electric power companies, these costs should probably be included in the cost estimate for electricity generation.

The issues discussed above should significantly influence the estimate the costs of

electricity generation. This is because it implies that the costs of electricity generation should include environmental costs in addition to capital, fuel, and operational maintenance costs. In other words, the formula used for estimating the costs of electricity generation should be as follows: costs of electricity generation = (capital costs + fuel costs + operational maintenance costs + environmental costs) ÷ amount of electric power generated.

Besides environmental external costs, there are mainly two types of costs that the IEA/NEA estimation fails to take into account for nuclear power generation. One is government expenditures related to nuclear power generation. In connection with his estimation, Professor Oshima points out that nuclear power plants are designed, constructed, and maintained only when government expenditure is made to support nuclear power generation. If nuclear power plants cannot be operated without such expenditure, this expenditure should be considered as part of the costs of electricity generation. It is not a cost directly linked to electricity generation, but should be considered as necessary supplemental costs of electricity generation. In this case, the formula used for estimating the costs of electricity generation must be revised to the following: costs of electricity generation = (capital costs + fuel costs + operational maintenance costs + environmental costs + supplemental costs) ÷ amount of electric power generated.

There are other supplemental costs, too. Nuclear power has been the primary power source in Japan, but fluctuations in electricity demand have been handled by pumped-storage hydroelectricity generation which utilizes excess electricity from nuclear power generation. If nuclear power generation needs to be accompanied by pumped-storage hydroelectricity generation, the costs associated with the latter can be regarded as supplemental costs of the former. Also, liability insurance related to nuclear power generation needs to be considered. In response to the accident at the nuclear power plant in Fukushima, the role of private insurance and government compensation associated with damage caused by a nuclear accident will be reexamined, and the supplemental costs will increase further.

Accurate estimates of the costs of electricity generation can be obtained through steady efforts such as announcing the estimation results with clear explanations on the estimation method used and points to be noted, and building social consensus through making revisions based on discussions with a large number of citizens. Accurate cost estimation makes it possible to visualize or directly face previously hidden costs and helps to establish a common foundation for energizing discussions on an ideal electricity generation system and the selection of power sources.