§2. Assessment on Fusion Energy Development from the Socio-Economic Viewpoint

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In the 21 century global environment and energy issues becomes very important, and this is characterized by the long-term (in the scale of a few tens years) and world-wide issue. In addition, future prospect of these issues might be quite uncertain, and scientific prediction could be very difficult. For these issues vigorous researches and various efforts have been carried out from various aspects; e.g., world-wide discussion such as COP3 in Kyoto, promotion of the energy-saving technology and so on.

Development of environment-friendly energy has been promoted, and new innovative technologies are explored. Nuclear fusion is, of course, a promising candidate. While, there might be some criticism for nuclear fusion from the socio-economic aspect, because it would take long time and huge cost for the fusion reactor development. Here we have started to assess the fusion energy development, comparing with other innovative energy technologies.

At first, we have considered to evaluate the characteristics which the people require for future energy resources, based on questionnaire research from ordinary people. Several items are selected, and issues to be compared are defined. Here we have selected six items and related issues, as shown in Table 1.

Table 1. Items and issues to be compared.

Item	Issue
(A)Energy resource	1) total amount 2) distribution
(B)Environmental load	1) CO2 emission 2) waste disposal
(C)Economics	1) construction cost 2) operation cost
(D)Reliability and stability	1) natural vulnerability 2) social vulnerability
(E)Flexibility on operation	1) facility size 2) freedom on set-up
(F)Safety and security	1) hazard potential 2) military application

Here we have planned three questionnaires as follows;

1) Screening questionnaire for more than thousand ordinary people,
2) Evaluation of the social weight in each issue for more than one hundred ordinary people,
3) Evaluation of the scientific score in various energy technologies for a few tens specialists.

At the screening questionnaire, interest and recognition for environment and energy issues are inquired. Through the screening questionnaire, about one hundred people are selected, where distribution on men-women, generation is paid much attention.

Next in the questionnaire research on the social weight, two issues for each item, shown in Table 1, are compared, and weight is inquired between two issues. For example in the case of the energy resource, the inquiry is as follows;

[There are two energy resources A and B. The resource A has an inexhaustible amount, but is localized in the earth. The resource B is widely distributed in the earth, but the amount is limited. Which resource do you select?]

In the third questionnaires we are planning to evaluate a scientific score for several new energy technologies. Here we have selected following technologies;

1) Advanced coal technology with CO2 recovery system (abbr. CCT)
2) SOFC top combined cycle: natural gas (SOFC)
3) Solar power (Solar)
4) Wind power (Wind)
5) Space solar power station (SPS)
6) Advanced fission (Fission)
7) Fusion (Fusion)

At first we have compiled scientific data on each item listed in Table 1(i.e., energy resource, environmental load, economics, reliability and tolerance, and safety and security). A first version of the scientific data has been published from the CRIEPI group[1], and a preliminary questionnaire for evaluating scientific scores in Table 1 has been carried out.

Here we have carried out questionnaires for a few tens specialist, so as to evaluate a scientific score for each technology. In questionnaire the most superior technology is selected for each item-issue in Table 1. The total number of the top score is summarized in Table 2.

Table 2. A number of top score of various energy technologies for each item-issue.

Item-issue	CCT	SOFC	Solar	Wind	SPS	fission	Fusion
(A)-1	2	0	3	4	3	17	20
(A)-2	2	0	12	3	5	10	18
(B)-1	0	0	6	10	6	22	21
(B)-2	1	11	13	18	4	1	2
(C)-1	17	11	3	3	0	10	1
(C)-2	12	11	1	4	0	16	7
(D)-1	22	21	0	0	5	24	23
(D)-2	0	1	25	20	3	3	11
(E)-1	15	13	0	0	8	23	26
(E)-2	8	16	12	0	1	2	3
(F)-1	4	2	24	13	3	0	2
(F)-2	21	21	25	25	3	1	8

Based on results of questionnaires on social weight and scientific score, we will try to evaluate characteristics for each energy technology from the viewpoint of public acceptance.

Reference

1) Hiwatari, R., CRIEPI internal report (2005).