

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

Ogawa, Y. (The University of Tokyo)
 Okano, K., Asaoka, Y., Hiwatari, R. (CRIEPI)
 Konishi, S. (Kyoto University)
 Tobita, K. (JAERI)
 Norimatsu, T. (Osaka University)
 Sagara, A.

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 requires for future energy resources, based on questionnaire research from ordinary people. Several items are selected, and issues to be compared are defined. For each issue a social weight and scientific score are estimated. A social weight is determined by the public questionnaire, and a scientific score is by the scientific data for each energy technology. Here we have selected five items and related issues, as shown in Table 1, where a social weight and a scientific score are denoted by W_{ij} and P_{ij} , respectively.

Table 1. Items and issues to be compared.

Item	Issue	Social weight	Scientific score
Energy resource	1) total amount	W_{11}	P_{11}
	2) distribution	W_{12}	P_{12}
Environmental load	1) CO2 emission	W_{21}	P_{21}
	2) waste disposal	W_{22}	P_{22}
Economics	1) construction cost	W_{31}	P_{31}
	2) operation cost	W_{32}	P_{32}
Reliability and stability	1) natural vulnerability	W_{41}	P_{41}
	2) social vulnerability	W_{42}	P_{42}
Safety and security	1) hazard potential	W_{51}	P_{51}
	2) military application	W_{52}	P_{52}

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.

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?]

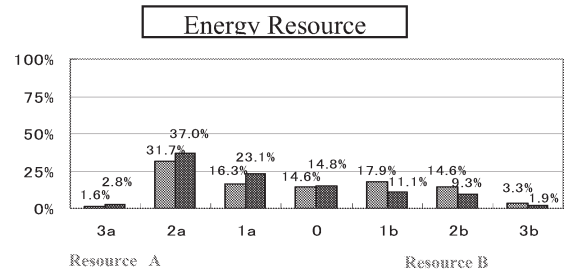


Fig. 1 Population of questionnaire for the energy resource.

Figure 1 shows the results of the questionnaire, where the left side such as “3a” means that a people supports the resource A strongly; i.e., the total amount is important. A people who supports both issues equally has voted at the middle point “0”. The results of Fig. 1 would indicate that people might support the total amount rather than distribution as an energy resource.

The same questionnaire has been carried out in two times, where in the second time the questionnaire results of the first time are presented for each people. This is usually called “Delphi” method. The right column denotes the result of the second questionnaire.

Next 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
- 2) SOFC top combined cycle (natural gas)
- 3) Solar power
- 4) Wind power
- 5) Space solar power station
- 6) Advanced fission
- 7) Fusion

At first we have to compile 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 group¹⁾, and a preliminary questionnaire for evaluating scientific scores in Table 1 has been carried out.

Reference

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