

A Study of KHNP Nuclear Power Plant Technology Level Evaluation

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1. Introduction

KHNP's 2030 mid & long term plan goal in technology field is securing global No. 1 NPP technology level. Quantifying technology level for this purpose, technology level at present should be surveyed. Technology level of South Korea has been surveyed by KISTEP (Korea Institute of S&T Evaluation and Planning) every two year [1,2] but the technology level of KHNP has not been surveyed by any organization including KHNP itself. Also the size of technology surveyed by KISTEP was too broad to quantifying technology level of KHNP. In this paper, technology level of KHNP and South Korea are presented.

2. NPP Technology Level Evaluation

In this section, technology level evaluation method and the results are described. The results of this study are compared to those surveyed by KISTEP in 2014.

2.1 Delphi questionnaire survey summary

There are some methods used for technology level evaluation like scoring model, patent and research paper information analysis. In this study, Delphi questionnaire survey was used that is widely used in technology level evaluation like KISTEP's study mentioned above.

To do the Delphi questionnaire survey, technologies were divided into element technology level (Level II) and grouped similar technology as a Level I technology including nuclear power, hydro power and new & renewable energy technology considering KHNP's business portfolio [3]. Table I shows number of Level I & Level II technology.

Table I: Response in terms of energy

	Number of Level I Tech.	Number of Level II Tech.
Nuclear Power	21	118
Hydro Power	2	9
New & Renewable	1	6
Total	24	133

Subject list of Delphi questionnaire survey were collected based on Level I technology by experts working inside KHNP. Table II shows subject number.

Table II: Subject of Delphi questionnaire survey

		Number of people	Percentage
Belong to	Inside KHNP	506	42.8
	Outside KHNP	675	57.2
Total		1,181	100.0

The Delphi questionnaire had been carried out by 2-round survey as shown in Table III.

Table III: Delphi questionnaire survey period

	Survey Period
1-round	'15.8.17 ~ 9.10(4 weeks) - Online & Offline survey
2-round	'15.10.2 ~ 10.23(3 weeks) - Online survey

The number of Respondent, degree of confidence in response and the number of response in terms of energy are presented in the following Table IV, V and VI. Career of respondent and degree of confidence in response are proper for this technology level evaluation.

Table IV: Respondent of Delphi questionnaire survey

		Number of people	Percentage
Belong to	Inside KHNP	241	55.8
	Outside KHNP	191	44.2
Career	~ 10 years	56	13.0
	10 ~ 20 years	125	28.9
	20 ~ 30 years	164	38.0
	30 years ~	87	20.1
Total		432	100.0

Table V: Degree of confidence in Response

Degree of confidence	Number of response	Percentage
1 (Low)	16	2.0
2	57	7.0
3	205	25.2
4	368	45.2
5 (High)	169	20.7
Total	815	100.0

Table VI: Response in terms of energy

	Number of response	Percentage
Nuclear Power	708	86.9
Hydro Power	61	7.5
New & Renewable	46	5.6
Total	815	100.0

2.2 Delphi questionnaire survey results

The results of survey are presented only for nuclear power excluding hydro power and new & renewable energy. The highest organization ranking in nuclear power based on Level II element technology is presented in Fig. 1. and KHNP ranks 6th.

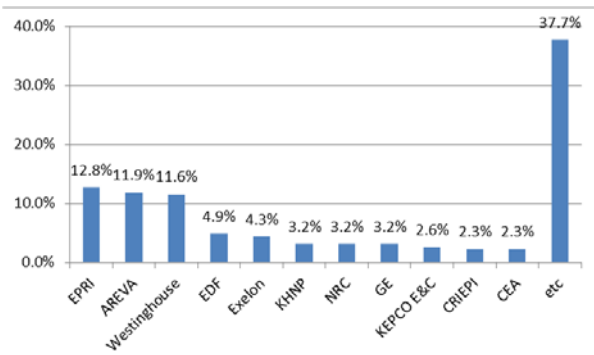


Fig. 1. The highest organization ranking in nuclear power based on the Level II technology

Technology level compared to the ultimate based on Level I technology are presented in Table VII

Table VII: Tech. level compared to the ultimate in nuclear power (Level I base)

	Tech. level (%)
Highest organization	90.7
USA.	89.5
South Korea	72.1
KHNP	66.8

Technology level and gap compared to the highest organization and to the USA are presented in Table VIII and IX each.

Table VIII: Tech. level compared to the highest organization in nuclear power (Level I base)

	Tech. level (%)	Tech. gap (yr.)
USA.	98.6	1.2
South Korea	79.5	5.7
KHNP	73.7	6.6

Table IX: Tech. level compared to the USA in nuclear power (based on the Level I technology)

	Tech. level (%)	Tech. gap (yr.)
South Korea	80.6	4.5
KHNP	74.7	5.5

Technology level and gap of South Korea compared to those of the USA carried by KISTEP are shown in the following table and the results are very similar to results of this study.

Table X: Tech. Level of South Korea compared to the USA (KISTEP, 2014) [1]

	Tech. level (%)	Tech. gap (yr.)
Nuclear power safety secure tech.	78.2	7.0
Nuclear power tech.	82.7	5.3

During the Delphi questionnaire survey the causes of technology gap are also asked and research manpower ranks 1st in nuclear power. Fig.2 shows in details.

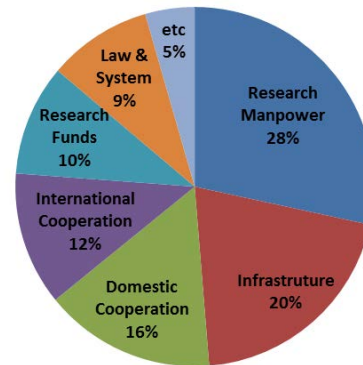


Fig. 2. The causes of technology gap in nuclear power based on the Level I technology

3. Conclusions

In this study, NPP related technologies were divided into Level I & Level II technologies and conducted a survey for each Level II technologies using Delphi questionnaire survey that is widely used in technology level evaluation. The results of technology level and gap will be used from strategic point of view and also as a reference data for technology improvement planning.

REFERENCES

- [1] 2014 Technology Level Evaluation, KISTEP, p. 180, 2015.
- [2] 2012 Technology Level Evaluation, KISTEP, p. 138, 2013.
- [3] The 4th Mid & Long-term Technology Road Map, KHNP, 2013