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Study on the Outside Risk Contribution Factor for ILRT Interval Extension

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1. Introduction

In Korea, the containment Integrated Leakage Rate Test (ILRT) was performed with 5 year interval. But, in MOST(Ministry of Science and Technology) Notice 2004-15 "Technical Standards of Primary Reactor Containment Leak-Tightness Tests", the extension of the ILRT interval to once per 10 year can be allowed if some conditions are met. According to that notice, the extension of Yonggwang Nuclear (YGN) Unit 1&2 ILRT interval extension to once per 10 years was endorsed in September, 22, 2005 based on the review results by regulatory body, KINS, for the safety analysis report. And, the study for the ILRT interval extension of other PWR plants is in progress.

In general, the risk in associated with ILRT interval extension was affected by the site specific conditions, such as climate and population. We already analyzed two site specific conditions, Yonggwang and Kori. In this paper, those site specific conditions and the measure of impact to risk according to the ILRT interval extension by them were compared.

2. Site Specific Conditions

2.1. Yonggwang Site

The weather data measured from the observation tower around the YGN site from 1999 to 2004 was collected and analyzed. The base case data for risk assessment was that measured in 2003, which had been expected to be the most conservative results due to the large amount of rain as shown in Fig 1.

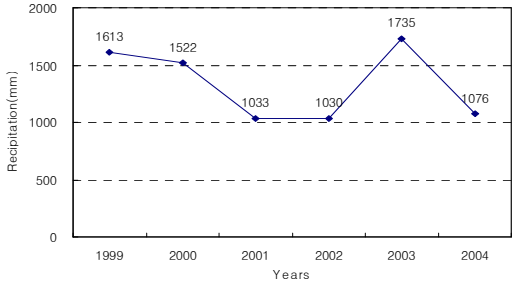

Fig 1. The amount of rain measured by YGN

The Fig 2 shows the annual wind direction in 2003, and the north wind is shown to be dominant.

The population distribution within 80 km around the YGN site was calculated using annual statistical report of local autonomous entity published in 2004 and shown in Fig 3. According to analysis results, the total number of population within 80 km for risk assessment was 3,370,358.

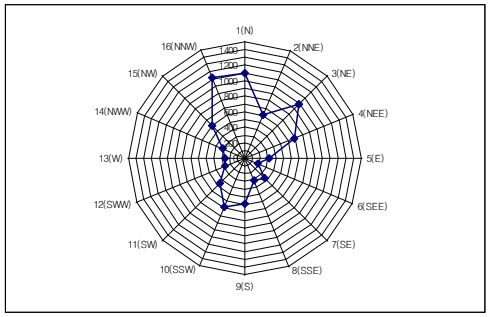

Fig 2. The wind direction distribution around YGN

Distance(km)	0-16	16-32	32-48	48-64	64-80	Sum
Population	78,231	119,561	1,323,386	685,040	1,164,139	3,370,358

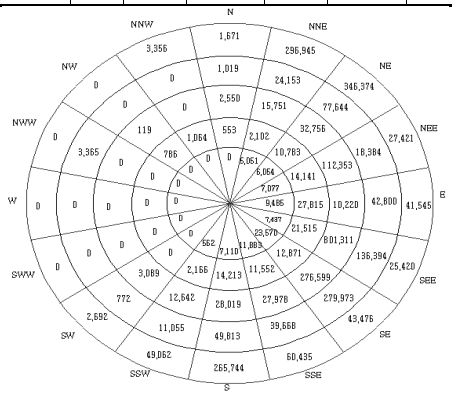

Fig 3. The population distribution around YGN

2.2. Kori Site

The weather data measured from the observation tower around the Kori site from 2000 to 2004 was collected and analyzed. The base case data for risk assessment was that measured in 2003, which had been expected to be the most conservative results due to the large amount of rain as shown in Fig 4.

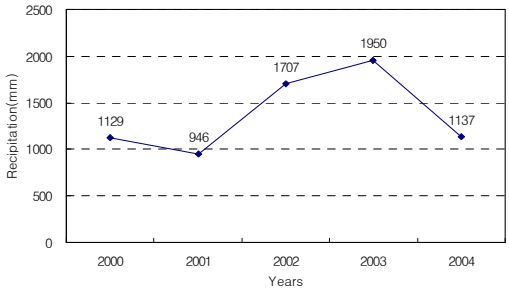

Fig 4. The amount of rain measured by Kori

The Fig 5 shows the annual wind direction in 2003, and the north wind is shown to be dominant.

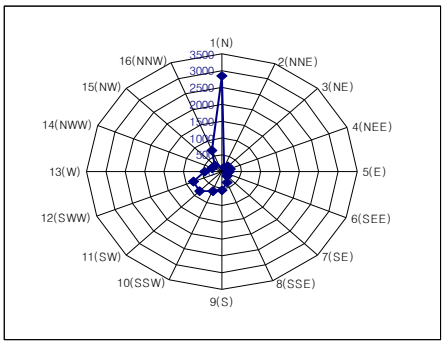

Fig 5. The wind direction distribution around Kori

The population distribution within 80 km around the Kori site was calculated using annual statistical report of local autonomous entity published in 2004 and shown in Fig 6. According to analysis results, the total number of population within 80 km for risk assessment was 7,901,975

Distance(km)	0-16	16-32	32-48	48-64	64-80	Sum
Population	416,141	3,654,137	1,390,761	1,027,407	1,413,529	7,901,975

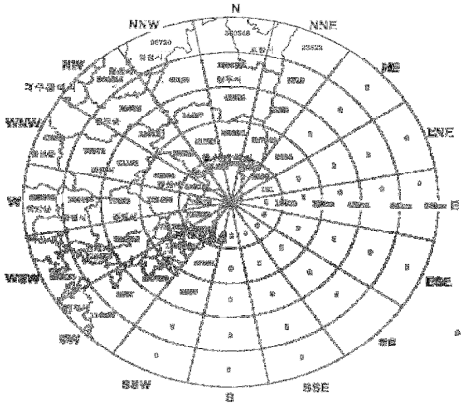

Fig 6. The population distribution around Kori

3. Risk Assessment

The first step for risk assessment for ILRT interval extension is to perform the off-site consequence analysis which calculates the population risk due to the release of radioactivity material. The second step is to estimate the change of population risk due to the ILRT interval extension based on the methodology described in NUREG-1493 and NEI interim report (using 5% undetectable leakage rate).

Table 1. The risk assessment due to weather condition

		2000	2001	2002	2003	2004
YGN 3,4	Population dose	1.15E+07	9.51E+06	9.51E+06	1.03E+07	9.75E+06
	Risk Increase	0.14438	0.14291	0.14291	0.14247	0.14770
KOR 3,4	Population dose	7.90E+07	1.12E+08	1.08E+08	1.01E+08	5.70E+07
	Risk Increase	0.12818	0.12952	0.12892	0.13089	0.12392

Table 1 shows the risk change due to ILRT interval extension using the weather data collected from 2000 to 2004. The population dose was calculated using MACCS II numerical code and the risk increase rate was calculated based on NUREG-1493 methodology. In this table, we know that the risk impact due to annual weather condition is negligible.

Table 2. The Results of Risk Assessment

NUREG Methodology	KOR 3,4	YGN 3,4
Population Risk	18.1	0.72
Risk Increase Rate (%)	0.131	0.142
NEI Methodology	KOR 3,4	YGN 3,4
Risk Increase Rate (%))	0.015%,	0.018
LERF Change	3.91E-08	2.17E-8

Table 2 shows the results of risk assessment for the extension of ILRT surveillance intervals of YGN 3&4 and KOR 3&4. The population risk of KOR 3&4 is much higher than that of YGN 3&4 because of the high population density. But, in this case, the risk increase rate due to ILRT interval extension is negligible.

4. Conclusion

In the risk assessment for ILRT interval relaxation, the risk impact due to weather condition and high population density is negligible, though the off-site consequence results directly affected by the population.

Since the factors affected the integral risk can be much various, it is necessary to make the more effort to discover the uncertainties and the relation of each factor.

REFERENCES

[1] "Performance-Based Containment Leak-Test Program," NUREG-1493, January 1995.

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[4] "Risk Assessment for the Containment ILRT Interval Extension of Yonggwang Unit 1&2", ICAPP05, May, 2005.