

The assessment of opening the site with RESRAD CODE after decommissioning of Kori Nuclear Power Plant Unit 1 Site.

Sun Young Lee^a, Chang Gyu Kang^a, Jeong Ho Kim^a, Seok Young Ahn^a, Seung Wook Lee^{a*}

^aSchool of Mechanical Engineering, Pusan National University, Pusan, Republic of Korea.

*Corresponding author: seunglee@pusan.ac.kr

1. Introduction

In 2015, Korean Government decided to decommissioning Kori Nuclear Power Plant Unit 1 Site. In this study, we tried to assess the residual radioactivity analysis and possibility of opening the site. In case of overseas countries, there are many cases for decommissioning and decontamination of Nuclear Power Plant.

In Korea, Government had experienced decommission about triga, but it is Research Reactor. Therefore, It is the first attempted to decommission like Kori Nuclear Power Plant Unit 1 Site.

So, A variety of researchers have been studied on decommission and decontamination in Korea.

Among the many studies, after decommission the Kori Nuclear Power Plant, we tried to assess the things which are concentration of radionuclide, Cs-137 and Co-60, and exposure dose for local residents to assessment of the area with RESRAD CODE.

Based on this assessment, we can examine the results after a reasonable period of time, whether the site may be released or not.

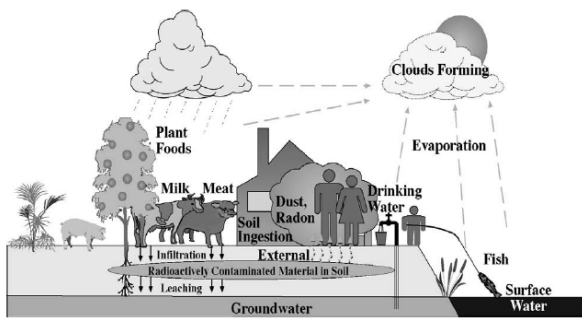


Fig.1 Exposure Pathways Considered in RESRAD

2. Methods and Simulation.

In this section, consider the two cases which take direction of the approach to method and simulate the RESRAD CODE for decommissioning.

2.1 Collect conditions and division cases.

First, we will collect the environmental conditions about Kori Unit 1. And then we have to consider many factord like climates, site area, inhalation and ingestion of plants and meat etc. Input data is based on KINS Report in 2005, KINS/GR-297.

Also, after considering the decommission the Kori Unit 1, we have to consider the different factors in two scenarios which are using the farm or industrial place.

In case 1, Government will use the site for farms after decommission the Plant. So we have to consider inhalation and ingestion for 24 hours a day, as they can be exposed to the radiation.

In the other cases, Government can use the site for industrial complex. If we assume that workers are working for 2000hrs/yr, exposure time will be shorter relatively and we consider the worker's inhalation because of provision of the food and drink from the outside.

Therefore we individually assess the two cases for purpose of use the site with RESRAD CODE.

Finally, the opening site criterion is 0.1mSv/yr which refer to the KINS-HR-1169.

3. Simulation Results

We indicate the results below.

Table 1: Concentration of radionuclide about Farm condition <mSy/yr>

	t=1yr	t=10yr	t=80yr	t=88yr
Co-60	1.89E+00	5.7E-01	5.44E-05	1.89E-05
Cs-137	7.4E-01	6.0E-01	1.19E-01	9.88E-02
All Pathways	2.6E+01	1.17E+00	1.19E-01	9.88E-02

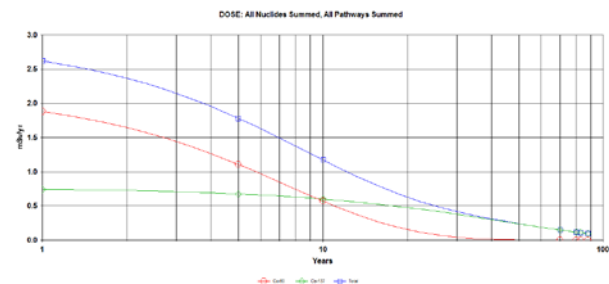


Fig. 2 Graph of the Farm conditions.

Table 2: Concentration of radionuclide about Industrial complex.

	t=1yr	t=10yr	55yr	t=65yr
Co-60	1.76E+00	5.34E-01	1.38E-03	3.7E-04
Cs-137	4.29E-01	3.48E-01	1.23E-01	9.75E-02
All Pathways	2.19E+00	8.82E-01	1.24E-01	9.78E-02

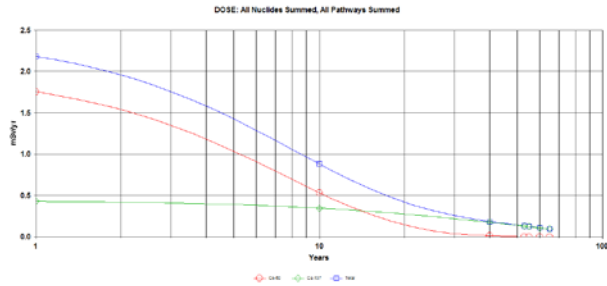


Fig. 3 Graph of the Industrial complex.

Above the data, we know that site is opened at 88yr because of below the 0.1mSv/yr in Farm conditions. And look at the Table 2. The site is opened at 65yr because of below the 0.1mSv/yr in Industrial complex.

4. Conclusions

In the results, we compared the two cases using the RESRAD CODE. We adjusted the decommissioned research reactor for Kori Nuclear Power Plant. Its criterion is 0.1mSv/yr about research reactor. So, Kori Nuclear Power Plant will be opened about 88years by case 1. This period is so long term. However, If we consider NCR's criterion, 0.25mSv/yr, Kori Nuclear Power Plant will be opened below 60years. Difference of data is determined by criterion.

When considering the Industrial conditions, the opening site time is faster than Farm conditions. There is roughly 23 years difference between two cases, because Industrial conditions consider the only worker's inhalation unlike Farm condition.

We will reevaluate the concentration of radionuclide and exposure dose for residents following the decontamination method and reconsider the various climates and site area.

REFERENCES

- [1] KINS/GR-297, Development of Regulatory Technology for radioactive Waste, KINS, 2005
- [2] User's Manual for RESRAD Version 6, Argonne National Laboratory
- [3] KINS/HR-1169, Development of Safety Verification Technology for Reuse of Decommissioning Waste and Site in Nuclear Power Plant.
- [4] Rick Reid, PhD, Evaluation of Dose and Risk in the Site Release Process for Commercial Power Reactors, Waste Management Symposium 2014, Session #83