# A Comparison Study of the Inventories Released from Radwaste Management Systems of Yonggwang (YGN 3) and Ulchin Nuclear Power Plants #3 (UCN 3)

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## 1. Introduction

In the preparing stage of Final Safety Analysis Report (FSAR), the expected inventories of radwaste systems are estimated. The inventories calculation plays an important role in the estimation of environmental radiation as well as the NPP integrity, and further improvement of the public perception for NPP or radiation. The inventories have been periodically measured and accumulated for every nuclear power plants (NPP) during the whole operation in Korea. But, a detailed analysis and database construction for the inventories have not still been carried out, which are essential to the radwaste assessment. Therefore, the analysis and comparison of the inventories released from the radwaste management systems of YGN 3 and UCN 3 were performed during the whole operation. These comparisons and analyses for the inventories of both NPPs (hereinafter referred to reference NPPs) are an useful guidance in understanding the actual activity released to the environment and the principal nuclides, such as fission products or activated products, contributing to total activities in the radwaste systems.

## 2. Methods and Results

This study is done based on the activities released to the environment from gaseous radwaste management system in containment (CV) and liquid radwaste management system (LRS)[1], which are the subject of radiological safety management in NPP[2]. The comparison and analysis for the inventories from both radwaste systems were done based on the total activities from both radwaste systems during the whole operation and the principal nuclides contributing to total activities. The principal nuclides were derived from the analysis among all the nuclides contributing to total activities in both systems.

### *2.1 Comparison of the gaseous activities released in CV*

Figures 1 and 2 show the comparison of total activities and principal nuclides contributing to total activities released from CV of the reference NPPs during the whole operation, respectively. The principal nuclides are found to be $^{41}$Ar, $^{3}$H and $^{133}$Xe, and their percentages for total activity are about 74.3 %, 21.5 % and 4.2 %, respectively, in YGN 3. On the other hand, the principal nuclides are found to be $^{133}$Xe, $^{41}$Ar and $^{3}$H, and their percentages for total activity are about 98.6 %, 0.006 % and 0.005 %, respectively, in UCN 3. In the case of total activities, the activity release in UCN 3 was larger than that of YGN 3, nevertheless the whole operation of YGN 3 was longer than that of UCN 3. The difference in total activities for the reference NPPs results from the increase of fission product, such as $^{133}$Xe, according to the release of the defective fuel in UCN 3 in November of 2002 year. However, the principal nuclides are the same despite the reference NPPs and the release of the defective fuel.

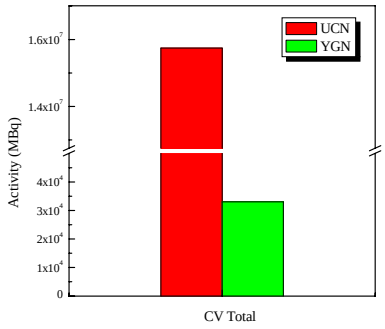


Figure 1. Total activities released from CV

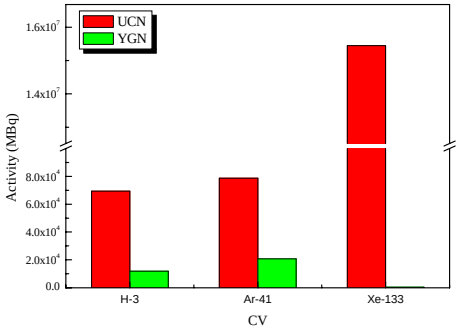


Figure 2. Principal nuclides contributing to total activities in CV

### *2.2 Comparison of the liquid activities released in LRS*

Figure 3 and 4 show the comparison of total activities and principal nuclides contributing to the total activities released from the LRS of reference NPPs during the whole operation. The principal nuclides

contributing to total activities are found to be $^{58}$Co, $^{60}$Co and $^{131}$I, and their percentages for total activity about 47.3 %, 10.3 % and 5.9 %, respectively, in YGN 3. However, the principal nuclides contributing to total activities are are found to be $^{58}$Co, $^{131}$I and $^{60}$Co, and their percentages for total activity about 50.6 %, 39.1 % and 6.1 %, respectively, in UCN 3. The activity due to the defective fuel considerably contributes to the total activity in LRS of UCN 3, but the total activity of YGN 3 was higher than that of UCN 3 because the whole operation of YGN 3 was longer than that of UCN 3. It is noted that the release of the defective fuel does not considerably increase the activity in LRS compared with the case of CV. The principal nuclides are also the same as is in LRS despite the reference NPPs and the release of the defective fuel.

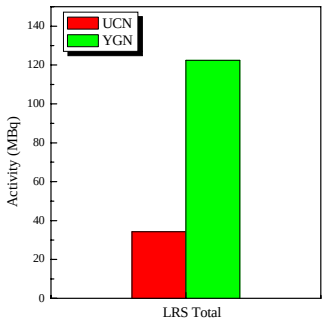


Figure 3. Total activities released from LRS

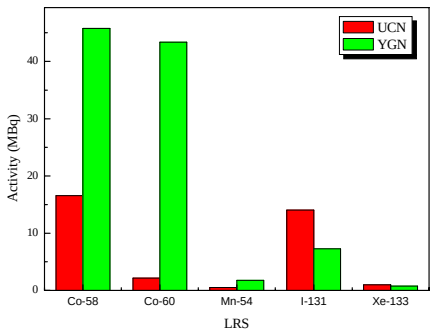


Figure 4. Principal nuclides contributing to total activities in LRS

## 3. Conclusion

The inventories released from radwaste management systems of reference NPPs were collected based on the whole operation, and they were compared and analyzed according to the total activities and principal nuclides contributing to the total activities for the reference NPPs. The principal nuclides contributing to the total activities in the CV and LRS are the same regardless of the reference NPPs, and the release of gaseous activity from CV of UCN 3 was larger than that of YGN 3. The difference in total activities in CV of reference NPPs results from the increase of fission product, such as $^{133}$Xe, due to the release of the defective fuel in UCN 3. It is noted that the release of the defective fuel has more effect on activity in CV in comparison with that in LRS. It is summarized that the analysis about the inventory will be used in obtaining radiological integrity on NPP and establishing a criterion for an estimation of environmental radiation.

## Acknowledgement

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## REFERENCES

[1] KEPCO, Reactor Supporting Systems, pp 257-274, 1998.
[2] KEPCO, Annual Report for Radiation Management, 1998-2002.