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## Activity Reduction Estimation by CRUDSIM-SNU

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### 1. Introduction

Activated Corrosion and wear products in the primary systems of Pressurized Water Reactors(PWRs) are major sources of occupational radiation exposure to plant maintenance personnel. In such radioactive nuclei,  $\text{Co}^{60}$  is the major concern. A valve hard-facing material is one of the sources of  $\text{Co}^{60}$ . In this study,  $\text{Co}^{60}$  activity reduction in Steam Generators(SGs) was estimated in the case of replacement Co-based valves with Co-free valves.

### 2. Model Description

We adapted the CRUDSIM-MIT code to evaluate the valve effect on the reduction of activity in SG. The modified code was named CRUDSIM-SNU. Crud and activity transport is primarily based on the solubility difference caused by temperature difference.

#### Crud Transport

CRUDSIM-MIT is divided into three parts in crud transport modeling : SG, coolant, and core. As corrosion of SGs proceeds, corrosion products are released from the inner surface of Alloy 600 tubes into the primary coolant. In the coolant, the released can be in the form of both solubles and particulates. The Circulating coolant transports corrosion products released from SG, and crud is deposited on the fuel cladding surface in the core.

CRUDSIM-MIT considers SG corrosion as the only source of Co and we therefore, modified the code. CRUDSIM-SNU has a new part which describes the valve wear particles.

#### Activity Transport

The activity transport modeling of CRUDSIM-MIT is divided into three parts the same as crud transport. Activated crud in the core is released into the primary coolant and transported by the circulating coolant. Just as the reverse mechanism of crud transport, the activated crud in the core is deposited on the SG tube surfaces. CRUDSIM-SNU did not consider the valve parts because the surface areas of valves are negligible compared with those of other parts. Therefore the activity transport model of CRUDSIM-SNU is identical

to that of CRUDSIM-MIT.

### 3. Results and Discussion

Kori-4 plant geometry and operation data was used as the code input data. The results of activity buildup in SGs are shown in Figure 1. This results demonstrate 60% activity reduction at SG after 27 years. We know that valve parts are the major source of SG activity buildup.

### References

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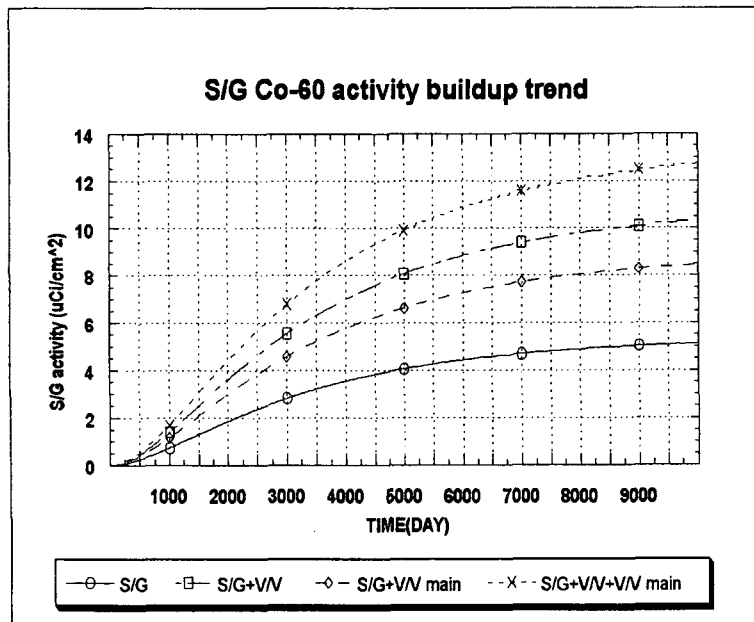


Figure 1. Co-60 Activity Buildup Trend in SG.