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OVERVIEW OF THE IMPACT OF STELLITE REMOVAL ON RADIATION FIELDS IN KWU PWRs

Keywords: CONTAMINATION PREVENTION; STELLITE; HARD FACING ALLOY; COBALT SOURCE; STAINLESS STEEL; RADIATION FIELD

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Objectives: Determine the following based upon data from Siemens PWRs:
1) the effect of a progressive reduction in Stellite on radiation fields
2) the consequences of replacing Inconel 718 gridded fuel by Zircaloy
3) the effect of eliminating antimony from the main coolant pump bearings
4) the effect of an increase in the pH of the primary coolant

Comments: This study updates an earlier analysis covering data collected up to 1989 on primary circuit activity levels and radiation fields from Siemens (KWU) PWRs. The work covers Co-60, Co-58, and Sb-124 concentrations in the primary coolant and deposition on primary circuit surfaces.

Remarks/Potential for dose limitation: The conclusions are:
1) Stellite, other than in the control rod drive mechanisms, is the major contributor of Co-60
2) Cobalt impurities in the primary circuit materials are minor contributors to radiation fields
3) In-vessel Stellite is the most important Stellite source
4) Co-60 contributions to dose rates correlate with cycle-averaged total Co-60 concentrations in the primary coolant
5) Co-58 production showed no particular trend from plant to plant as Stellite was reduced
6) Co-58 contributions to dose rates were reduced on replacing Inconel 718 gridded fuel with Zircaloy gridded fuel
7) Sb-124 contributions to dose rates and circulating coolant concentrations were low for plants commissioned with antimony-free main coolant pump bearings
8) Sb-124 is a significant contributor to dose rates
9) Operation with the KWU/VGB high pH regime substantially reduced dose rates
10) The later KWU PWRs, which have eliminated both Stellite and antimony sources, have extremely low yearly personnel doses

References: Garbett, K., "Overview of the Impact of Stellite Removal on Radiation Fields in KWU PWRs," *Water Chemistry of Nuclear Reactor Systems 6*, Vol. 2, pp. 31-38, British Nuclear Energy Society, London, 1992.

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