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CANADA **R-375**

ACTIVITY TRANSPORT AND CORROSION PROCESSES IN PWRs

Keywords: CONTAMINATION PREVENTION; WATER CHEMISTRY; PWR COOLANT; PH; COBALT; COBALT SOURCE; CORROSION; CRUD; CRUD TRANSPORT; CORROSION PRODUCT TRANSPORT; CORROSION PRODUCT DEPOSITION; CORROSION PRODUCT

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Objectives: Outline current understanding of activity processes in PWRs.

Comments: This study discusses the major scientific principles underlying the reduction of radioactivity within reactor systems and the controlling of radiation fields around components. The following topics are covered:

I. Basic Theory of Activity Transport
II. The Production of Radioactive Species
  A) Particle Transport
  B) Particle Formation
  C) In-core Processes Involving Dissolved Cobalt
  D) Sources of Cobalt
III. The Activation of Out-Core Surfaces

Remarks/Potential for dose limitation: The following general statements can be made in regard to activity processes:
1) Solubility differences move corrosion product oxides between in-core and out-core surfaces.
2) The source of dissolved corrosion products, especially cobalt, is described in terms of "corrosion release" from corroding surfaces.
3) The contamination of out-core surfaces is dependent upon the contamination parameter, which describes the properties of the oxides growing on the surfaces.
4) From information on cobalt adsorption-desorption processes on in-core materials, coupled with the release and incorporation processes on out-core surfaces, a simple model for the evolution of total cobalt concentration in PWR coolant can be devised.

References: Lister, D.H., "Activity Transport and Corrosion Processes in PWRs," *Water Chemistry of Nuclear Reactor Systems 6*, Vol. 2, pp. 49-60, British Nuclear Energy Society, London, 1992.

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