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DEPLETED ZINC OXIDE ADDITION FOR BWRS

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Objectives: From the results of mass spectrometry, fuel deposit analyses, reactor water isotopic measurements and pipe gamma ray scans for the BWR plants participating in this study, to investigate the effect of using depleted zinc oxide (DZO) to reduce the effects of zinc-65 on plant dose rates.

Assess impact of using DZO in zinc injection passivation (GEZIP) plants.

- Those plants switching from natural zinc oxide (NZO) to DZO
- Plants starting GEZIP with DZO.
- Plants using Hydrogen (HWC) or Normal Water Chemistry (NWC)

When zinc addition began to be used to reduce shutdown dose rates it was found that zinc-65 became a prominent part of the activated corrosion product isotopes which reduced the net benefits of zinc addition on dose rates. It was decided to use a grade of zinc oxide depleted in zinc-64, which is the precursor to zinc-65. This grade of depleted zinc oxide contains 1% of zinc-64 compared to the 48% present in naturally occurring zinc.

Comments: Answers to some questions:

* Can DZO be used part time at the end of a cycle?
- No. Addition of DZO part time does not impact the effects of zinc-65 significantly during the refueling outage because the zinc-65 inventory is too great.

* How long will it take to clear out natural zinc, i.e. Zn-65?
- It appears that the primary removal mechanism is refueling. A factor of 4 reduction has been seen at the first refueling. Three refueling should result in Zn-65 levels similar to a DZO only plant.

* How much zinc-65 should a DZO plant expect?
- Very little. RxW Zn-65 should be about 0.1 μCi/kg with a specific activity of abut 0.01 Ci/g.

Remarks: Present results indicate that the reactors that implement zinc addition, using DZO from the beginning, will not see appreciable levels of zinc-65 in the plant. However, reactors that have used natural zinc for several years prior to switching to DZO should expect it to take one to two years, with at least one refueling outage, before zinc-65 concentrations throughout the primary system are greatly reduced. It is intended that the data from this project will

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assist utilities in performing cost/benefit analyses with respect to the use of DZO in their reactors.

References: Marble, W.J., "Experience with Depleted Zinc Oxide Addition," Proceedings, EPRI Radiation Field Control and Chemical Decontamination Seminar, Tampa, Florida, November 1995, EPRI Distribution Center, P.O. Box 23205, Pleasant Hill, CA 94523.

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