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EFFECT OF VARIOUS PROCESSES ON BWR DOSE RATES

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Objectives: To investigate in detail the effect on BWR dose rates of zinc, hydrogen water chemistry (HWC), condensate treatment systems and decontamination to provide calendar year and EFPY perspective.

EPRI BRAC and Radiation Field Assessment programs identified the most significant operating parameters that effect dose rates at BWRs. These are:

1. The extent of zinc in the reactor water
2. Whether hydrogen water chemistry is in use
3. The type of pipe surface treatment
4. Whether the plant has forward pumped heater drains (FPHD)
5. The type of condensate treatment in use
6. Whether the plant has recently undergone a decontamination

The newer EPRI programs now focus on zinc and hydrogen water chemistry. The EPRI program data is evaluated in this project.

The data is based on contact dose measurements at specified locations on the recirculation piping for all US BWRs. The instruments used were an Eberline ESP-1 digital, auto-ranging probe and a small size, location specific G-M tube of type HP-220.

Comments: Through analysis of the data the following conclusions were arrived at:

- (1) Using chronological dose rate history, the zinc plants had lower dose rate than non-zinc plants.
- (2) Resetting post-decontamination EFPY to zero EFPY and comparing, the zinc plants still had lower dose rates.
- (3) Considering post decon EFPY dose rates, zinc and HWC, HWC seem to have no long term effect on dose rates.
- (4) Considering non-zinc HWC and normal water chemistry (NWC) plants and post decontamination EFPY dose rates, the non-zinc HWC dose rates appeared in the mid-range of non-zinc data.
- (5) Using same considerations as item 4 above, early HWC/zinc dose rates are in the upper range of zinc plant data, later HWC/zinc dose rates follow the general population.
- (6) For NWC plant post decon EFPY dose rates, the zinc/NWC dose rates were lower than

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non-zinc/NWC dose rates.

(7) For HWC plant post decon EPFY dose rates, the zinc/HWC dose rates were lower than non-zinc/HWC dose rates.

(8) Regarding non-zinc plant condensate treatment, DB dose rates were lower than F/D dose rates.

Remarks: Summary:

* Overall, zinc plants have lower dose rates than non-zinc plants

- Under NWC
- Under HWC
- Without decontamination
- With decontamination

* HWC does not have long term effect on dose rates

- Non-zinc plants have HWC dose rates in mid-range
- Zinc plants have HWC dose rates early in the upper range but later in the general population

* Condensate treatment show the following effects:

- DB dose rates are lower than F/D for non-zinc plants

There appeared to be no clear winner from zinc plants data.

References: Kincaid, C.B., A.E. Conti and J.C. Swanson, "BWR Dose Rate Review," Proceedings, EPRI Radiation Field Control and Chemical Decontamination Seminar, Tampa, Florida, November 1995, available from EPRI Distribution Center, P.O. Box 23205, Pleasant Hill, CA 94523, Phone: (501)934-4212.

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