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BEHAVIOR OF PWRs IN SPAIN FOLLOWING CHANGES TO MODIFIED CHEMISTRY AND FUEL SPECIFICATIONS

Keywords: CONTAMINATION PREVENTION; PRIMARY COOLANT CHEMISTRY; WATER CHEMISTRY; PH; PH CONTROL; COBALT; RADIATION FIELD CONTROL; PWR

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Objectives: Determine the impact on radiation fields at the large Spanish PWR plants of Asco 1&2, Almaraz 1&2, Trillo and specially Vandellos 2 from primary coolant chemistry control and fuel grid material replacement.

Comments: The main areas of the work presented include:

- Tight follow up of coolant chemistry and radiochemistry.
- Gamma spectrometry of the system surfaces.

Remarks/Potential for dose limitation:

- Three factors found to contribute to system surfaces activation: 1) Cobalt impurity and Nickel content in plant materials, 2) Operating chemistry, 3) Cobalt ingress due to maintenance operations
- The optimum pH(T avg) for Vandellos 2 is just below 7.4
- Different response of Co-58 with respect to Co-60 and Fe-59 to pH changes suggests different source oxide in the core for them.
- There may be different optimum pH values for different radioisotopes.
- Trillo low radiation fields are related to both Co-58 and Co-60 activity.
- The high Co-60 activity in Almaraz 1 and Vandellos 2 is probably due to high Cobalt input from old specification fuel element grids and valve lapping respectively.
- The reduction of radiation fields in Almaraz 2 and Asco 1 and 2 has been due to adoption of the elevated pH chemistry and the fuel substitution by low Cobalt impurity at Almaraz and Zircaloy grids at Asco.

References: Fernandez Lillo, E., Boronat, M., Cascante, C., Adrada, J. and Ortega, A., "Behaviour of PWRs in Spain Following Changes to Modified Chemistry and Fuel Specifications," *Water Chemistry of Nuclear Reactor Systems 6*, Vol. 2, pp. 24-30, British Nuclear Energy Society, London, 1992.

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