

29 Radiation Field Control Manual - 1991 Revision

This updated manual describes recent techniques developed by the Electric Power Research Institute (EPRI) for reducing radiation fields in light water reactors. Recent developments aimed at reducing cobalt sources, preconditioning surfaces, controlling water chemistry, and decontamination are reviewed. The guidelines are mentioned for reducing activation products and their transport to surfaces, qualification of decontamination reagents and materials corrosion and currently available methods for controlling plant radiation fields.

Requests for copies of this report (EPRI TR-100265s) should be directed to the EPRI Distribution Center, 207 Coggins Drive, P.O. Box 23205, Pleasant Hill, CA 94523, Telephone (510) 934-4212. The following is the Report Summary from this manual.

REPORT SUMMARY	
Radiation-Field Control Manual - 1991 Revision	
Utilities are increasingly implementing technology to reduce occupational radiation exposure of nuclear power plant staff. This updated manual describes recently developed techniques for controlling radiation transport and reducing LWR radiation fields.	
<p>BACKGROUND Significant advances have occurred since the first edition of this manual (EPRI report NP-4505-SF), issued in April 1986. Since that time, occupational exposures decreased by 50%, with radiation-field reductions making an important contribution. Occupational radiation exposure in U.S. Nuclear power plants is a continuing concern to the electric utility industry, which has a commitment to maintain exposures as low as reasonably achievable (ALARA). Over the past 15 years, EPRI has supported this industry effort through data analysis, development of radiation control techniques, and field tests of the most promising methods. Many of these techniques have been applied by utilities with nuclear power plants, resulting in significant reductions in radiation doses.</p>	
<p>OBJECTIVE To describe methods of controlling out-of-core radiation fields in LWRs.</p>	
<p>APPROACH EPRI staff used recently published literature and industry sources in compiling the updated manual. They first described BWR and PWR corrosion product release, transport, activation, and deposition. Next, they considered currently available methods of reducing each part of the overall radiation buildup and addressed the following techniques in the manual: cobalt replacement, primary and feedwater chemistry control, out-of-core surface preconditioning, and chemical decontamination.</p>	
<p>RESULTS This manual identifies the following techniques, performed during various phases, as highly cost-effective in reducing occupational radiation exposure:</p> <ul style="list-style-type: none"> • Before power raising: For BWRs, replace cobalt alloys in control blades, electropolish recirculation piping surfaces, and control oxygen during hot functional tests. For PWRs, electropolish channel heads and control chemistry during hot functional testing. • During operation: For BWRs, minimize feedwater iron input, improve reactor water quality, and use zinc injection. For PWRs, control pH and use early boration or peroxide addition at shutdown. • Refueling: Use low-cobalt materials in replacement fuel and cobalt-free pins and rollers in BWR control blades; use Zircaloy grids in replacement fuel for both types of reactors. • Maintenance: For BWRs and PWRs, replace valves being refurbished with cobalt-free hardfacing alternatives and improve valve maintenance procedures to remove debris. • Special maintenance and repairs: For BWRs, decontaminate, electropolish, and air condition or water prefilm replacement piping. For PWRs, decontaminate, electropolish channel heads, and use low-cobalt Inconel for replacement steam generator tubing. • Plant life extension: For BWRs and PWRs, decontaminate the complete primary system. 	

EPRP PERSPECTIVE The manual—which covers both the background of LWR radiation field control and recent techniques—is valuable to plant managers and chemists, health physicists, maintenance superintendents, and utility corporate ALARA engineers. EPRI plans to continue this program with full-scale demonstrations of some techniques recommended here for both BWRs and PWRs.

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