

N114. ALARA Reduction During CRDM Changeout And Rebuilding

CRDM changeout and rebuilding is one of the highest dose, most physically demanding, and complicated maintenance activities routinely accomplished by BWR utilities. In the 30 years since the BWR design concept for commercial nuclear power production was first successfully demonstrated, there have been many enhancements in the maintenance techniques used to pull and refurbish CRDMs. However, many utilities have not taken advantage of new tooling and continue to use outdated maintenance equipment, which still adequately performs the task, yet results in higher doses delivered to the worker. According to a questionnaire's responses and nuclear commercial services input, substantial ALARA reduction can be realized by focusing improvements in three key areas associated with CRDM maintenance work: CRDM handling and exchange tools, worker comfort and environment, and worker training. There are currently five different companies offering pneumatically or hydraulically operated devices which can be placed in existing BWR under-vessel work platforms to assist CRDM personnel with changeout activities. They replace conventional, electrically driven winch systems supplied with the plants and require only two technicians for equipment operation. More than half of the sites responding to the questionnaire stated that they had either purchased or used this type of device in the CRDM changeout work, and also verified that it had significantly improved CRDM job performance. Further, most stated that this type of device had reduced job-related exposures, with two plants reporting exposure reductions of 38 and 56 percent. The CRDM Aging Questionnaire asked utilities to indicate which conditions during CRDM changeout had the most influence toward improper CRDM maintenance. High temperatures were recognized by 65% of those participants as having the biggest negative impact on worker performance. In addition, high radiation levels (creating, in some cases, a false sense of urgency in workers not accustomed to this type of work), extremely cramped working conditions (a person works "hunched over" for long periods of time during changeout operations), poor vision (obstructed from instrumentation cabling and hampered by insufficient lighting), and inadequate communication were prevalent conditions that further complicate an already complex task. Other job location factors contributing to mishandling errors were disorientation, remoteness, cumbersome protection clothing, and visual impairment during CRDM "rainshowers" (the normal 2 to 3 gpm leak of reactor water when drives are removed from the vessel).

Taken From: "Managing the Aging of BWR Control Rod Drive Mechanisms," Rebecca H. Green, Nuclear Plant Journal, p. 62, May-June 1991.