

N94. Getting Exposures Down At U.S. Plants

For some years, U.S. utilities have been committed to maintaining exposures as low as reasonably achievable, but have recorded much higher exposures than other countries with large LWR programs such as France, Germany, and Japan. As a result of this, and recognizing that exposure limits could become more restrictive, U.S. utilities have been aggressively reducing individual and cumulative exposures and average occupational exposures since the early 1980s. In 1989, there was a drop from 345 to 290 man-rem per plant at PWRs and from 510 to 440 man-rem per plant at BWRs. Preliminary data for 1990 suggest exposures similar to 1989. Based on 1982 plant averages, total collective exposures totaled over all U.S. plants would have increased from 55,000 man-rem in 1982 to 77,000 man-rem in 1990 as more plants came on line; but the total actually decreased to 39,000 man-rem.

For all countries, older plants have higher exposures than later plants. This is because long-term behavior is influenced by what happens in early life. With the exception of Swedish BWRs, little attention was paid to avoiding in-core cobalt sources or to tight water chemistry control in the 1970s, resulting in high cobalt-60 inventories, which can only be reduced slowly. Even so, exposures are declining at pre-1980 plants, but as there are a higher proportion of these older plants in the U.S., average plant exposures are distorted, particularly in comparison with France, where the average age of a plant is 6 years. W. German PWR plant averages benefit from some extremely low exposures reported by the most modern plants, whose designs post date those of the latest U.S. plants, all designed before 1977. The latest German PWRs have almost eliminated cobalt materials, greatly reducing formation of gamma-ray-emitted cobalt-60 isotope and radiation field buildup. The latest BWRs in Japan also show the benefit of recent design: installation of large feedwater cleanup systems and the capability to adjust water chemistry within tight specifications has resulted in exposures a factor of 10 lower than in early Japanese plants.

Taken From: "Getting Exposures Down at U.S. Plants," Christopher J. Wood, Nuclear Engineering International, May 1991, p. 16.