

3449. MAINTAINING PUBLIC DOSE ALARA AFTER DECOMMISSIONING

The NRC's proposed revision to 10CFR20 would limit dose to 15 mRem/y (0.15 mSv/y) for unrestricted use of a site any time within 1,000 years following decommissioning, with residual radioactivity reduced as low as reasonably achievable (ALARA). A dose limit rather than a contamination limit provides opportunities for dose reduction using on site chemical and physical techniques as an alternative to brute force removal. Radionuclides with long lived daughter products provide a challenge for cleanup at and below the proposed limit. One of the largest challenges is Th-230, due to ingrowth of Ra-226 and its decay chain. Th-230 is described in this study due to its significance for power reactor fuel fabricators and for the Department of Energy at many of the old Manhattan Project sites, as well as at more modern weapons and fuel processing sites.

Environmental pathway modeling performed for Th-230 contamination indicates that depth of overburden (to limit direct radiation and radon-222 migration) and chemical form of the daughter Ra-226 (to limit solubility in groundwater and to reduce crop uptake), are controlling factors in limiting dose. Concentrations of up to 100,000 pCi/g (3.7 MBq/kg) Th-230 could be retained on a site with doses below the proposed limit if treated to maintain radium in sulfate form, and covered by approximately nine meters of fill. This paper discusses treatment and ALARA considerations for residual contaminations of the thorium isotopes Th-230 and Th-232, and application of similar analyses to other radionuclides such as those which may be present in the environments of nuclear power facilities.

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