DOSE CONSIDERATIONS FOR A SITE BOUNDARY FOR SURFACE OPERATIONS AT A DEEP GEOLOGICAL REPOSITORY

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ABSTRACT

Postulated radiological emissions due to surface operations at a hypothetical deep geological repository facility are used to estimate the minimum distance to the site boundary necessary to ensure any consequent dose to members of the public during the preclosure (or operational) period would not exceed the associated Canadian Nuclear Safety Commission regulatory dose limit.

Public dose is calculated at distances ranging from 100 m to 1500 m away from the aboveground Used Fuel Packaging Plant ventilation exhaust; 100 m coincides roughly with the position of the facility's perimeter fence in the current design and represents the minimum distance for which the applied air dispersion modelling is valid. Environmental pathway analyses are performed as outlined in guidelines N288.1 and N288.2 of the Canadian Standards Association.

Normal Operations of the repository surface handling facilities may result in emissions of radioactivity, for example from routine used fuel receipt from transportation and re-packaging into long-lived containers. Conservative estimates of chronic public dose consequences due to Normal Operations are several orders of magnitude below the regulatory dose limit of 1 mSv/a.

Anticipated Operational Occurrences are considered outside the range of normal operations, but are assumed to occur with frequencies of at least 10^{-2} per year. Several Anticipated Operational Occurrences were considered in this assessment: an Irradiated Fuel Transportation Cask carrying water from an Irradiated Fuel Bay; significantly longer transportation or staging times; increased processing load; a 5-fold increase in pre-existing fuel sheath failures; and failure of the ventilation exhaust filtration system. Conservative estimates of the consequent public dose are several orders of magnitude below 1 mSv.

Design Basis Accidents are outside the range of Anticipated Operational Occurrences and are assumed to occur with frequencies of between 10^{-2} and 10^{-5} per year. Postulated Design Basis Accidents considered in this assessment are scissor lift failure causing an Irradiated Fuel Transportation Cask to fall, and overhead carriage failure causing one used fuel module to fall on another module. All accident scenarios are considered both with and without concurrent failure of the emergency High Efficiency Particulate Air (HEPA) filtration system. Predicted acute public dose consequences from the Design Basis Accidents are well below 1 mSv.