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Applying the CARE concept to small regional repositories

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There is an international consensus that geological disposal provides the safest and most secure option for managing high-level radioactive waste (HLW). For smaller (or less affluent) national programmes, however, conventional geological repositories suffer from being rather expensive and inflexible in terms of leaving open a range of responses to the uncertain future of nuclear power generation. Nevertheless, the decision to postpone moving ahead with geological disposal is also associated with costs – due to the expenses and risks associated with surface interim storage of highly radioactive material.

There is, however, a less conventional approach to geological disposal which could be attractive to nations with small programmes or, indeed, regional compacts of such nations – the CAvern REtrievable (CARE) concept. This particular disposal variant was originally developed in Japan to balance the desire to move repository projects forward in small steps, at a rate governed by the slow growth of public acceptance, with the ethical requirement that the generation benefiting from nuclear power take care of resulting wastes and the increasing concern about the vulnerability of surface facilities containing highly radioactive materials. Although the required long periods of active institutional control are often considered problematic in Europe and North America, these may be compatible with Asian cultural history and traditions.

The CARE concept is, effectively, a dry storage facility for HLW which is constructed in caverns excavated deep in a geological environment which would be suitable for permanent disposal. The facility is, however, engineered to remain open for periods of hundreds of years, until a decision is taken to transform it into a standard repository - which then requires only backfilling and sealing of the caverns and access tunnels / shafts. For the particular case of spent fuel which is presently considered as a waste, this time period may be sufficient to determine the future of nuclear power generation and allow re-classification of this material as a resource. The CARE concept also explicitly includes the requirement to make this option attractive to the local community, by setting up the facility as an R&D centre of excellence in waste management. The paper will provide a more detailed description of the CARE concept, with particular emphasis on its relevance and applicability to the Asia-Oceania region.