

ABSTRACT

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Complementary Indicators of Safety with Analogues

The most widely used safety indicators for assessing the safety of radioactive waste disposal are expressed in terms of radiation doses and radiation risks. Other safety indicators that may be used in addition to doses and risks are often referred to as complementary safety indicators.

In general, complementary safety indicators are used to enhance the confidence in the outcome of a safety assessment supporting a safety case. Complementary safety indicators may be selected bearing in mind that the audience consists of many stakeholders, ranging from the scientific community itself to members of the community hosting the repository. Natural analogues, as well as anthropogenic analogues, provide valuable information for all scales of process understanding of the long-term behaviour of the spent fuel, EBS and geosphere. Traditionally, natural analogues have been utilised for a wide range of features, ranging from

- supporting site selection;
- supporting material selection;
- improving transport process understanding;
- indicating the overall feasibility of the engineered systems (see, for example, Neall *et al.* 2008, table 3-3); to
- conceptual model building (see, for example, Linklater 1998).

The Complementary Considerations Report (POSIVA *in prep.*) is a part of the Safety Case documentation to be produced for the construction licence application and contains most of the natural analogue information utilised. In addition to natural analogues (including anthropogenic analogues), complementary indicators of safety will include calculation cases.

This work focuses on supporting safety arguments for the Olkiluoto site in Finland, where Posiva Oy is planning to construct a HLW disposal facility in the granitic bedrock at depth of ~-400 m.

In addition to what's been done in earlier analyses (see e.g. Neall *et al.* 2008), an even broader view of complementary indicators has been formulated (POSIVA *in prep.*), perhaps pushing the boundaries of what is traditionally considered to be an analogue. Whereas natural analogues referred to in earlier studies are still of importance, new cases, especially for the cementitious systems, are being introduced in more detail. In addition, regional perspectives for conditions in the repository site geosphere are being highlighted. Site understanding is presented as a "self analogue" and site understanding deepened by providing a regional context and broader temporal and spatial scale analogous information. Also external conditions are explored through observations from nature.

In the presentation some examples of the cases that will be included in the upcoming report are presented. Where goes the line between natural analogue studies and more simplistic observations from nature?

References

Linklater, C.M. (1998) (*ed*), A natural analogue study of cement-buffered, hyperalkaline groundwaters and their interaction with a repository host rock. Phase II. Nirex Science Studies Report S/98/003, Nirex, Harwell, UK.

Neall *et al.* (2008), Safety assessment of a KBS-3H spent nuclear fuel repository at Olkiluoto. R-08-35, Swedish Nuclear Fuel and Waste Management Co, Stockholm, Sweden.

POSIVA *in prep.*, Complementary Considerations. POSIVA Report 201X-XX.