Research and Development Plan SURAO 2020

Main review findings

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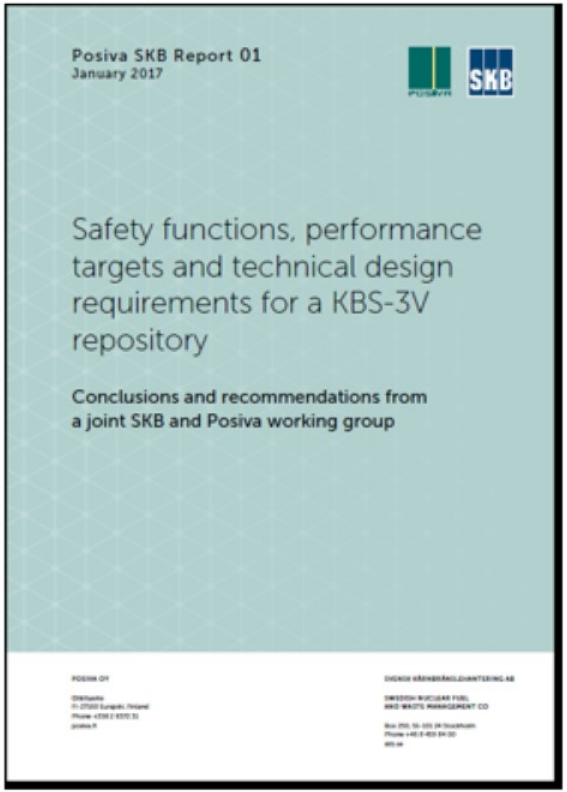
General

- The Research and Development Plan SURAO 2020 is an impressive document
  - It is well thought out and appears generally appropriate considering the state of the Czech programme in its current phase of siting.
  - Balance between the what R&D needs to be carried out by SURAO and what can be obtained by other means seems appropriate.

- However, there are several areas where the plan could be more clear and potentially be improved.

Requirement management system

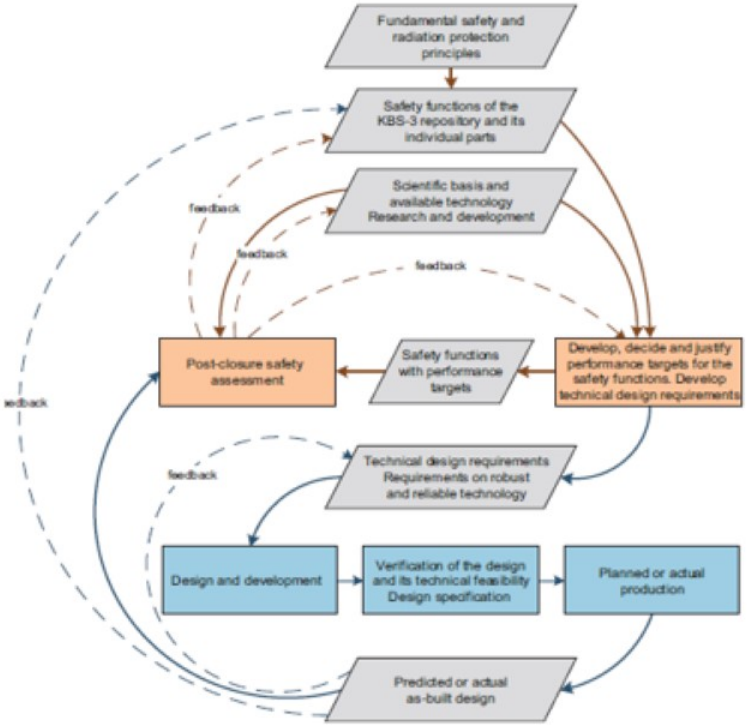
- The suggested development of requirements management system for the DGR with the identification and summary of the design requirements for the deep geological repository is highly recommended.
- Will directly affect how to focus both site characterization, site selection on R&D on repository concepts.
- However, it will be major undertaking that can only be developed iteratively and need to involve a wide range of experts at SURAO since it needs to be ensured that requirements are both adequate and possible to meet.



Formulation of requirements not trivial

- Safety Assessment perspective
  - Requirements should be sufficient to lead to safe repository
  - Assessment usually studies one or a few specific designs
  - Would generally not say if there are other designs that may also lead to safety.
- Designers perspective
  - Requirements needs to be possible to implement and verify
  - Easy to formulate rules that would lead to safety, but are impossible to implement and verify

Iteration and "negotiations" between safety assessment and design work needed



Siting, site characterization and site description

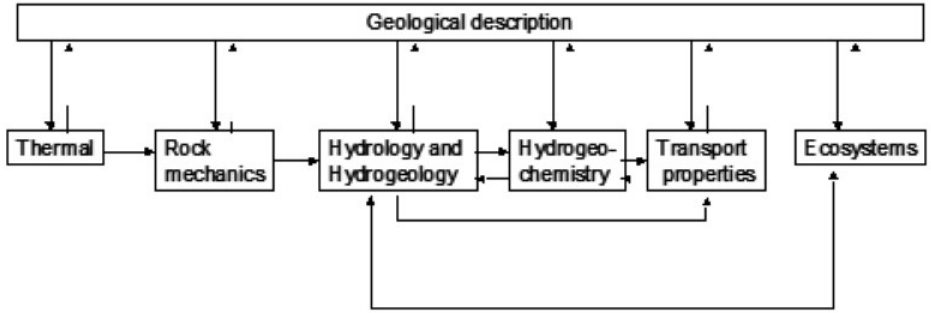
- Would be appropriate to at least provide a brief overview of the geological setting of the Czech republic, what potential type host rock could exists and why the programme has focused on a repository concept developed for the crystalline basement rock.

- More information on the site selection criteria used to select the nine potential localities and to be used in the next steps would help to understand the site characterization needs. How and why, were these nine sites selected?

- Integration between the different geoscientific disciplines is poorly described.
  - There is a strong need for integration between the different subjects. Even if geology provides the basic framework and hydrogeology in turn provides a framework for transport and hydrogeochemistry, there is also reason to consider feedback from these disciplines.

Site descriptive modelling

- Introduced by SKB in 2001 and applied by SKB and Posiva since then
  - to be used both as input to the safety assessment and to the engineering design work.
  - Entails transfer of the information from quality-assured databases produced by the site investigations to discipline-specific descriptions applicable to various subdivisions of the system made up of surfaces and volumes.
- SDM work includes
  - Control of primary data
  - Disciplinary and interdisciplinary integrated modelling providing basic geometrical descriptions and parameterizations of the bedrock and the surface system
  - Evaluation of uncertainties in values of parameters describing the material properties and states of the studied system and the realism in the subdivision of the studied system
- *Development and updating an SDM forces interaction and transfer of knowledge*
  - between experts from different geoscientific disciplines
  - between experts and designing engineers and safety assessment teams.



DGR design

- The formulation that *the design should be optimised so as to ensure the highest level of safety that can reasonably be achieved* is unclear and may also be potentially overambitious.
  - More elaboration what the objective really is is needed. (For example, if this ambition level was really true it would be hard to argue for a steel canister instead of a Cu canister).
  - If SURAO robustly can show that the repository meets dose and risk constraints also considering a wide range of uncertainty – what more would be needed (apart from an aim to reduce cost)?
- Some specifics:
  - More justification for the double-walled steel waste packages seem needed. Is it shown that dose rates can be sufficiently low if all containers fail within a relative short time window? What about I-129?
  - The statement that at temperatures of lower than the critical temperature, the corrosion resistance of stainless steel is guaranteed seems overconfident. There are several factors (chemical composition and temperature) that could result in (localised) corrosion of stainless steel.
  - Several statements on findings from different Cu corrosions studies that are poorly supported. Copper corrosion is e.g. discussed at depth in the SKB report TR-19-15. Initially (e.g. after 2 years) some transient effects due to oxygen of sulphide in the system could be observed but the supply of these substances are soon depleted.
- The discussion on R&D on buffer and backfill seems appropriate and has a good balance between SURAO's own work and international cooperation.

Safety case work

- Further progress in the safety case work is needed. This should be stated more clearly especially in order to find the critical path of the work.
- A safety assessment and creation of a safety case is so much more than RN transport modelling, e.g.
  - Methodology, including approach to assess uncertainties
  - Assessment of site and EBS conditions at the start of the analysis (“initial state”).
  - Identification of safety functions and performance targets
  - Assessment of evolution of the repository components over time and how this affects safety functions
  - Identification of scenarios
  - RN-release and transport calculation to assess dose and other endpoints
  - Additional safety arguments
  - Conclusions and feedback to next phase of safety assessment
- This should be better reflected in the plans.

Impact of the deep geological repository on the environment

- Plans for the environmental impact assessment are clearly presented and seem appropriate.

- An experience from at least SKB's programme it to ensure that the biological and dispersion studies is carried out in close cooperation with the development of biosphere models for the safety assessment.
  - They type of information needed will be very similar and the type of experts needed will also be the same to a large extent.

- Important to present the potential radiological impacts from the repository, based on input from the safety assessment.
  - While these will be small, experience suggest that it is almost impossible not to talk about this aspect during public consultations etc.

Schedule of the Research and Development Work

- Needs more elaboration.
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- Table 10 on expected outputs of the DGR project up to 2025
  - Hard to follow as a table.
  - A Gantt scheme showing interdependencies between different WP, activities and milestones is needed.
- Interdependencies between WPs more important than the different dates
  - Time schedules have a tendency to be modified for a long list of reasons
  - Even if delays would occur the order between WP usually need to remain the same.
- What happens after 2025?


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