Geological WG
Discussion on Topical Issues

Second Plenary Meeting of the Second Phase International Project on Human Intrusion in the Context of Disposal of Radioactive Waste (HIDRA) - TM-55074

January 23, 2017

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Topical Questions/Issues

- “Isolation” – Richard McLeod tomorrow
- “Stylised” Scenarios – this afternoon
- Quantitative assessment for geologic disposal?
- Worst case or random within footprint of facility/waste?
- Inadvertent or deliberate (with knowledge)
- Deep “surface” scenarios (long-lived waste)
- Water use as part of inadvertent intrusion scenario
- Software specific assumptions (how to compare?)

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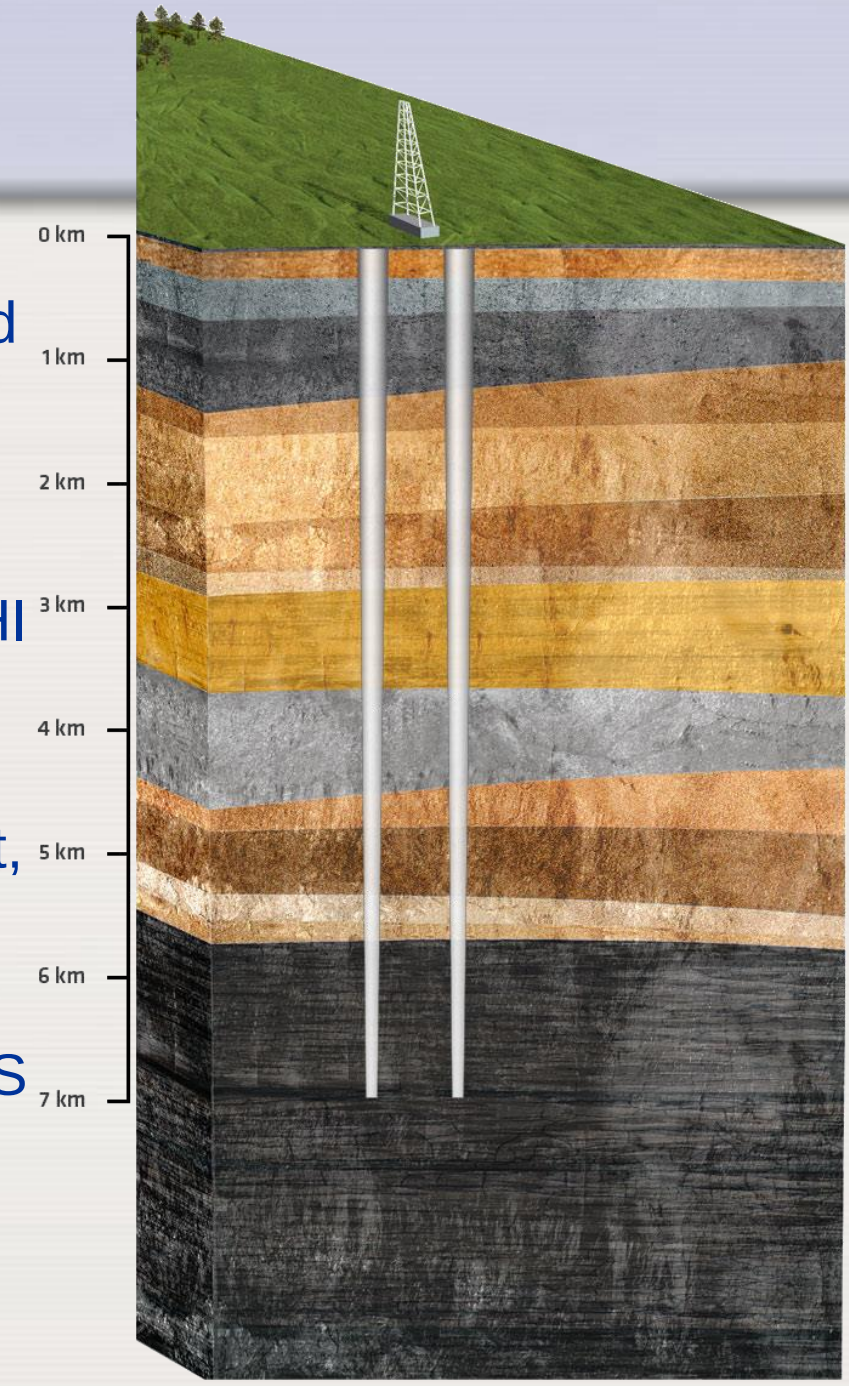
Topical Issues - Isolation

- Isolation is from an IHI point of view less important to dicuss, compared to breach of containment
- Isolation needs to be clarified in the context of containment
- Isolation is directional from the surface (accessible biosphere) and down – contaimnent is acting in the opposite direction
- Remoteness (currently sparsly populate areas) is not relevant for geological disposal due to the long time frame

Topical Issues - Isolation

- Minimum depth, for geological disposal, is predominantly dominated by other factors than IHI
- Although, from a IHI point of view – 'the deeper the better', since greater depths decreases the potential for IHI to occur.
- Other constraints exists (maximum depth related to constructability, heat, chemical conditions)
- IHI should be considered in the requirements to the geology and EBS



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Topical Issues – ‘Stylised’ Scenarios

- Stylization can be seen as reduction of a system to capture its essential features
- Assessing a stylized scenario includes making assumptions on aspects where uncertainties are unquantifiable (such as future human behavior and technological capabilities)
- IHI scenarios do not follow the same systematical scenario development, since we can not predict the ‘evolution’ of FHA during the assessment timeframe – the only reasonable and credible approach is to assume present-day technology and habits.
- Stylization can be seen as an approach to avoid introduce too speculative scenarios
- IHI scenario development does not claim to produce a comprehensive set of scenarios – it is more focused on defining one or a few illustrative scenarios

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Topical Issues - Worst case or random?

- We interpret that this topic relates to conservative/pessimistic/cautious vs realistic/plausible approaches
- IHI scenarios may (often?) assume a long chain of events that needs to happen in order for exposure to actually occur (see HIDRA I, 7.2.2.) – i.e., IHI scenarios tends to be pessimistic
- Exposure parameters/assumptions, if consequences are to be derived, do not necessary need to be pessimistic (no ‘worst case’ doses)
- Unless the regulations require IHI scenarios to comply with dose/risk standards, the parameter/assumptions in the exposure calculation used may be generally based on ‘mean’ values

Topical Issues - Quantitative IHI assessment for geologic disposal

- Three arguments where quantitative assessment are justified:
  - To test the robustness of the system
  - To get information of the effectiveness of measures (ratio of with / without measure)
  - To find a scenario, or scenarios, representative for a group of scenarios (reduce the number of calculation cases)
- Potential doses during the IHI event may be derived for illustration (and needs to be very carefully communicated)
- Optimization could be based on other indicators (e.g. RN-concentrations, doses to larger groups of people, dose rates, normalized doses, collective doses)
- ICRP 122 "For severe natural disruptive events not taken into account in the design-basis evolution and inadvertent human intrusion, application of the risk or dose constraint does not apply."

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Topical Issues - Inadvertent or deliberate

- It is conceivable that an IHI will change into an intentional intrusion, if the hazard is recognized.
- Since our starting point is to address IHI, this does not change anything significant for our approach, however:
  - Measures can be used to sensitize the inadvertent intruder to increase the likelihood to recognize the hazard, but no responsibility can be taken if the intruder anyway decides to continue (or not take protective measures)

Topical Issues - Deep “surface” scenarios (long-lived waste)

- Not input from our working group

Topical Issues - Water use as part of inadvertent intrusion scenario

- Generally, water use would be useful to include as a scenarios in the IHI assessment, and this scenario may have an interface with the water use in the 'other' scenarios *(drill hole may create a path for radionuclides from the repository to a shallow aquifer that may be assumed to be uncontaminated prior to the IHI event)*
- For Hidrania, we exclude the water well due the low potential to produce potable water at the site

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Topical Issues - Software specific assumptions (how to compare?)

- If this is a concern in an assessment, it would likely concern much more areas than just the IHI assessment part
- The conceptualization of the model is more important than the software
- When using IHI calculations for optimization, we are likely interested in comparing results from calculations made with the same software

Life after Second Plenary

Aim

- Before the Third Plenary in early 2018 we should have:
  - Mature draft with a complete structure of the Disposal WG Report
  - Calculation results available
  - Draft text on the synthesis of the Geological WG report

To do before a 2nd WG meeting

- Perform initial calculations, drilling scenario (Thomas H)
- Restructure the WG report (Thomas H + all)
- Suggestion for updated regulatory guidelines (Thomas B)
- Prepare for the discussion at the meeting (all)
- Relative probabilities, footprints (Shizhong)
- Calculations/compartments, Nagra (Jens)
- ST1/deepheat in English (Jarkko)

To do at the 2nd WG meeting

- Site and Design (revisit and screen measures)
- Closure (part of construction)
- Operation (especially measures)
- Institutional control in relation to DGR (land use restrictions, monitoring and RK&M)
- Complete the Regulatory Guidelines

2nd WG meeting

- Switzerland, Jens hosting at Nagra
- Preiminary early September 4-5(6)

Calculations

- Dose in drilling scenario easy to derive, just based on activity inventory, material brought to the surface and exposure pathways
- Optimization calculations (with/without this ‘roof’ to the ILW packages)
- Optimization calculations (compartmentilasation – Jens checks NAGRA results)

Synthesis

- Feedback on the HIDRA I approach


Thank You