Working Group 2 Report: Confirmation and Demonstration of the EBS in the Context of Confidence Building

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Working Group 2

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WG2 – Confirmation and Demonstration of the EBS

- ***Demonstration Experiments***
  - What approaches exist for detailed modelling of EBS in PA and design, based on our understanding of the processes? In particular, how do programmes scale processes in time, and in space, to the level of a disposal system?
    - **Modelling aspects handled in LaCoruna meeting very well.**
    - **Design 'toolbox' is different from PA toolbox.**
    - **Design and PA require models at different levels of detail.**
    - **Experiments at large-scale (demonstrations) can support modeling at larger scales and can appeal to public.**
    - **Modeling spatial scales credible, can verify with mockups where EBS is concerned**
    - **But time-scale is intractable except through addressing future expected effects piecemeal.**
    - **Long term tests (>10 years) can address some aspects, not all.**
    - **Testing of materials not likely to be used can provide analogue-type insights, and allow flexibility if change seems warranted.**

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- **Demonstration Experiments**
  - What has been demonstrated successfully in terms of EBS components, and what remains to be done? (i.e., what can we do well, and what are the practical problem areas associating with fabricating, constructing, and emplacing engineered barriers?)
    - **Merits of large scale experiments are self evident, but none are saving the world, need small-scale test understanding as part of many lines of defense to explain outcomes.**
    - **Iterative multi-scale testing/modelling approach may be warranted.**
    - **Operational safety issues require different information from tests than long-term performance issues.**
    - **Boundary/interface problems may need to be addressed at several scales.**
    - **Small scale tests leading to larger scale tests may be good approach. Sometimes the small scale approach is all that is needed, especially when the effects to be observed are confidently predictable.**
    - **Testing needs are concept-specific: in some cases water pressure at depth may require testing of grouting methods, in other cases grouting can be done by established methods and needs no further work.**
    - **An underground laboratory can be both a demonstration and a test.**

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- **Demonstration Experiments**
  - What further experiments and modelling programs are planned, and with what objectives?
    - Wide range of program-specific responses from participants
      - Range is from manufacturing and emplacement technique tests and demonstrations, to scientific process experiments to improve or substantiate models.
    - Some examples will be cited in the meeting report.
      - Report is not intended to be a comprehensive survey, however.

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- **Demonstration Experiments**
  - What level of practical experience in engineered barrier fabrication, construction, and emplacement have we gained from conducting demonstration experiments and large-scale tests on the EBS or its components?
    - **Manufacturing is tractable, demonstrations have gone well.**
    - **Welding to depths of 19 cm and making buffer-blocks has been demonstrated**
    - **Underground construction is within experience base also (with possible exceptions for high water pressure situations as noted).**
    - **Emplacement has been done on several occasions as demonstrations.**
    - **But there are still problem areas, the largest area is demonstrating processes and approaches at the industrial scale**
    - **Some examples to be discussed in report (not comprehensive).**

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- **Monitoring**
  - What are the role and limitations of monitoring for performance confirmation and demonstration?
    - Demonstration phase (~ 10% of fuel in place) would allow monitoring
    - Monitoring possible during decades of operation (<100 years).
    - After closure, perhaps from 100-1000 years.
    - But what would be meaningful monitoring after closure?
      - Group generally felt that postclosure monitoring would necessarily be very limited
      - Surface monitoring for safeguards purposes may be all that can be done
      - Current technologies are limiting
    - Law may require monitoring, without further specifications

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- **Monitoring**
  - What are likely monitoring parameters?
    - **Temperature, displacement, atmosphere (H).**
    - **Chemical monitoring not likely to be achievable for longer term (with current technology).**
    - **Could we accept requirement to monitor entire system or only some representative cells?**
    - **Meaningfulness questioned:**
      - **What to do with and false positive: sensor deterioration**
      - **How to cope with sensor failure?**
    - **Swiss and US planning separate, accessible drift for monitoring some portion of repository**

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- **Additional Lines of Evidence**
  - What approaches and arguments can be used (in addition to modelling and experiments) to support a demonstration of satisfactory EBS performance in the context of the safety case?
    - **Much discussion of need for sound management and QA approaches to assure confidence**
    - **Best Available Technology requirements have to be interpreted in a practically achievable way, technologies are expected to always change and improve**
    - **Role of local communities in making decisions between viable technological choices discussed**

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- **Additional Lines of Evidence**
  - How can natural and anthropogenic analogues be used to support performance confirmation and confidence-building?
    - **Discussion started with illustration of an iron analogue**
    - **Caution in use of analogues was urged:**
      - **Counter-analogues are possible**
      - **Conditions leading to material preservation need to be understood and comparable with what is expected**
      - **Analogues for engineered systems exist, choice of materials may be made with a view to the availability of analogue information**

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- **Additional Lines of Evidence**
  - What factors have been identified as contributing to confidence in EBS decisions by stakeholders (the public? the local, affected community, the regulators?) Are these factors the same or different from those important, in a technical sense, to demonstrations or confirmations of performance?
    - **This discussion quickly focused on public confidence issues:**
      - **Appearance of EBS materials shown to the public must inspire confidence**
      - **Waste package inspection for acceptance must have some requirements that can be shown to have been met**
      - **Public support may be enhanced by involving representatives from communities in public information efforts and/or in consultations**
      - **Public may respond positively to materials and techniques readily recognized**
        - » **Understandability and Associability concepts apply**