

Observations of the NEA Peer Review on Dossier 2001 & Future steps

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Outline

- Dossier 2001 and Andra's program.
- Lessons drawn from the NEA Peer review in terms of :
 - ◆ presentation of the dossier,
 - ◆ safety strategy,
 - ◆ methods,
 - ◆ key issues.
- Andra's program regarding those items for 2002-2005.



Andra's dossier 2001

- Andra is required to produce an evaluation of the feasibility of an underground repository for intermediate and high level - long lived wastes in view of a parliamentary debate in 2006.
- Studies focus on :
 - ♦ Clay, using data from the Bure URL,
 - ♦ Granite, generic studies.
- Dossier 2001 is a milestone in the development of the French programm, focusing on clay.

Andra's dossier 2001 (2)

- Its main objectives were :
 - ♦ Formalising and testing the safety assesment methods in the view of the dossier 2005,
 - ♦ Evaluating if scientific and technical knowledge for safety assessment is available and identifying gaps and uncertainties,
 - ♦ to inform the research programme for 2002-2005,
 - ♦ to allow a further revision of the design of the concepts.
- Dossier 2001 drew no definitive conclusion about the feasibility of the repository.

Presentation of the dossier

- Dossier 2001 consisted of :
 - ◆ a synthesis file (“part A”),
 - ◆ a more detailed file, meant for an audience interested in a deeper understanding of the lines of arguments (“part B”),
 - ◆ Reference files (on waste forms, materials, geology, biosphere),
 - ◆ Technical notes.

The IRT findings

- A clear presentation of how the various components of the Dossier fit together is needed.
- Not all information is documented, or easy to find.
- The clarity of the documentation is variable :
 - ◆ partly because only preliminary information available,
 - ◆ partly because on “learning curve” for such a documentation exercise.
- Dossier does not always reflect the work performed (e.g. hydrogeological modelling).

Synthesis Documents

- Parts A and B not successful in terms of meeting needs of different audiences.
- More comprehensive overview of entire Dossier needed.
- More extensive referencing needed to the underlying documents.
- More illustrations needed to support and clarify the written text.

Individual Documents

- Make more complete and able to stand alone.
- Provide more exhaustive referencing to the underlying sources of information.

Overall recommendation

- Dossier 2005 documents should be written to fit a pre-designed structure, tailored to the needs of different audiences.

Andra's intentions for the structure of dossier 2005

- The peer review was very useful to revise the intended structure for dossier 2005 :
 - ◆ different volumes meant for different kinds of audiences :
 - a volume for the « general public »,
 - specialized volumes meant to address different points of view, each able to stand alone,
 - Might imply having some degree of duplication from a document to another.

Andra's intentions for the structure of dossier 2005 (2)

- Structure of the rest of the documentation :
 - ◆ structure of the reference files revised so they can reflect more accurately the work performed by Andra and its partners,
 - ◆ reflections on the referencing structure,
 - ◆ reflections on the iconography,
- Reflections on the possibility of “internal reviews” while writing the dossier.

Safety Assessment Methodology

- All steps of the (preliminary) safety assessments were reviewed and compared to “good international practice”.
- Topics addressed more specifically :
 - ◆ APSS : analysis and modelling of system evolution.
 - ◆ Qualitative Safety Assessment (AQS) :
 - identification of potential failures,
 - derivation of scenarios.

Consistency and Adequacy of Applied Methodologies

- All key methodological elements for a safety assessment are present.
- Some newly developed elements (APSS, AQS) potentially useful but need further development (alternative evolutions, integration of temporal evolution in the AQS).
- Consistency between method descriptions and applications not always transparent regarding e.g. choice of parameters.
- Application of methods : consistency between elements generally adequate, but propagation of uncertainties needs improvement e.g. fixation of time frames.
- Methods allow identification of key sensitive components of repository at present stage ; need development to a more formalised approach for future assessments .

Andra's work on the revision of methodologies

- APSS will be revised to take into account phenomenology of alternative evolutions.
- The safety analysis is being revised so it can :
 - ♦ be more convincing in presenting the arguments of the safety analysis ,
 - ♦ be more transparent regarding subjective elements,
 - ♦ be more explicit as regards the management of uncertainties,
 - ♦ take into account time frames in a more explicit way.
- The failure modes derived from qualitative safety analysis will be compared to international FEP's databases.

Internal Consistency Between Knowledge Base and Hypotheses

- Cautious approach has been adopted.
- Basic knowledge already supports greater confidence than presented.
- Phenomenological descriptions : clearly traceable to existing knowledge.
- Selected values of parameters : consistent - often in sense of sound identification of pessimistic value, but the procedure for selection not easy to trace.

Andra's lines of progress in terms of safety strategy, as identified after the NEA review

- Improve the consistency between the level of knowledge and the hypotheses of the safety assessment.
- More explicit management of uncertainties, at the heart of the safety assessment :
 - ◆ how they informed the proposed design of the repository,
 - ◆ how they informed the choice of parameters and models for the safety assessment,
 - ◆ how they inform sensitivity analysis,
 - ◆ how they relate to the building of alternative evolution scenarios.

Lifetime of Metallic Materials

- Focus
 - ◆ Secondary containers for vitrified waste packages,
 - ◆ Containers for spent fuel.
- Recommendations
 - ◆ More complete analysis of expected hydrogen partial pressures in the repository environment, in relation to possibility of embrittlement of the carbon steel overpack ;
 - ◆ Strengthen hypotheses and supporting evidence for iron/clay interactions, in relation to evolution of overpack-clay system.

Waste Package Source Terms

- Wide range of waste types (greater than in most other programmes), creating challenge for integrating information nationally and from abroad
- B wastes
 - ◆ comprehensive, sophisticated treatment,
 - ◆ new approaches, work at the forefront internationally.
- C (Vitrified) Waste
 - ◆ key uncertainties clearly identified and represented,
 - ◆ reasonable conclusions, prospects for improvement identified.
- Spent Fuel
 - ◆ depth of understanding that exists in international work and CEA studies not reflected in document (unbalanced and too brief),
 - ◆ values for safety assessment appear conservative.

Waste Package Source Terms (2)

- Recommendation :
 - ◆ More balanced and comprehensive treatment of scientific understanding of spent fuel dissolution, with a clear presentation of the relative importance of specific uncertainties.
 - ◆ Make maximum use of verified data from international studies.

Non-treatment of Gas in Safety Analysis

- Only important omission from the Dossier.
- Recommendation :
 - ◆ To inform design choices and possible need for further waste characterisation, and take account of limited transport in tight formation, boundary conditions for far-field gas transport to be evaluated as soon as possible.

The Callovo-Oxfordian and its Surroundings

1. Sound overall geological characterisation, in forefront in assessing long-term stability :
 - ◆ Efficiency of retention processes to be supported further.
2. Multiple arguments supporting :
 - ◆ Overall favourable properties/ability to fulfil the confinement roles given to the argillites in the Dossier 2001 safety approach,
 - ◆ Basic hypotheses for the conceptualisation (especially diffusion-control),
 - ◆ Presence of safety reserves or margins.

The Callovo-Oxfordian and its Surroundings (2)

3. Transition from hydrogeological phenomenological modelling towards safety model well justified but poorly documented
4. "a priori" URL representativeness tested by "equivalent geological area"
5. Scientific programme 2002-2005 systematically informed by the Dossier 2001 (e.g. testing of hydrogeological model, quantifying retention)

Andra's program for 2002 - 2005 regarding these topics (1)

- Focus on interactions between Iron/Argilites so as to model the nature and extension of the disturbed zone.
- Extensive work on the choice of better source terms for spent fuel, taking into account dissolution mechanisms. Andra will integrate the results from the international SFS program.
- Analysis (not performed at the stage of dossier 2001) of gas emissions from the various waste packages. Evaluation of the quantities accumulated and their possible mechanical interactions with materials / host formation.

Andra's program for 2002 - 2005 regarding these topics (2)

- Regarding the host formation and its surroundings
 - ◆ Andra participates in the AMIGO group,
 - ◆ the definition of the « transposition zone » including geochemical and geomechanical characteristics,
 - ◆ the better characterization of the chemistry of the host formation waters,
 - ◆ the better characterization of transportation mechanism (sorption...).

Reversibility

- Andra's analysis is systematic. It considers technical and scientific aspects ; it does not address the interface between reversibility and operational and long-term safety.
- Recommendations :
 - ◆ The principles underlying reversibility should be gathered in one document along with definitions of concepts and policy indications, and ensuing "reversibility" options catalogued and analysed.
 - ◆ It would be good to promote a wide discussion of principles and management solutions to enable integration of the views of Andra and those of relevant stakeholders in anticipation of the national debate.

Andra's lines of progress for 2002-2005

- Developments in the design of reversible concepts.
- Reflections on the implication of reversibility regarding safety.
- A specific part of dossier 2005 will be dedicated to engineering and reversibility, so as to enable a debate on these options.

Conclusions

- Dossier 2001 was not a safety case, and not evaluated as such.
- However, some items mentioned in the safety case brochure were analysed in depth
- The Peer review was crucial in terms of helping Andra to establish the structure Dossier 2005
- It was very helpful in optimizing Andra's program for the 2002-2005 period
- It helped a lot in comparing Andra's work to international standards.