

# European Pilot Study on the Regulatory Review of the Safety Case for Geological Disposal of Radioactive Waste

F. Besnus (IRSN), P. Bodenez (ASN), G. Bruno (EC),  
M. Jensen (SSI), P. Metcalf (IAEA), V. Nys (AVN),  
K.-J. Röhlig (GRS Köln), C. Ruiz-Lopez (CSN),  
E. Ruokola (STUK), R. Smith (Environment Agency),  
J. Vigfusson (HSK)

# Framework and objectives

- Initiated by French and Belgian safety authorities as a follow-up of former bilateral harmonisation work
- Pilot study, aiming at sharing experience and opinions on the expectations of the regulator for different elements of a safety case for geological disposal of radioactive waste
- Carried out by a group of regulators and technical support organisations from Belgium (FANC, AVN), UK(EA), France (ASN, IRSN), Finland (STUK), Germany (GRS), Spain (CSN), Sweden (SSI), Switzerland (HSK), as well as representatives of international organisations (IAEA, EC).

# General outcomes

- Safety case should take place in a step-by-step manner with well defined decision points
- Regulatory and licensing authorities and their technical support organisations must be informed about the state of development at each step and involved in the major decisions (e.g. about disposal facility concept or about R&D priorities)
- From a regulatory perspective, the key stages are :
  - Conceptualisation
  - Siting
  - Design
  - Excavation/construction
  - Operation
  - closure

## General outcomes (2)

- The following aspects should be considered at each of key stage :
  - Facility design and the safety strategy
  - Demonstration of site and engineering suitability:
    - Comprises all information concerning site and design selection, characterisation and validation with regard to safety, an analysis, through a performance assessment, of the capacity of these components (including the host rock) to fulfil their given role accounting for all phenomena that may affect system performance,
  - Impact assessment
    - In terms of radiation risk, some combination of both or other entities indicating potential impact
  - Adequacy of management systems
    - Organisational arrangements for implementing the project, planning of major actions to be taken during the different steps, elaboration of operational and control procedures, record keeping and review.

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Case Study:  
Uncertainties and their Management



# Outline

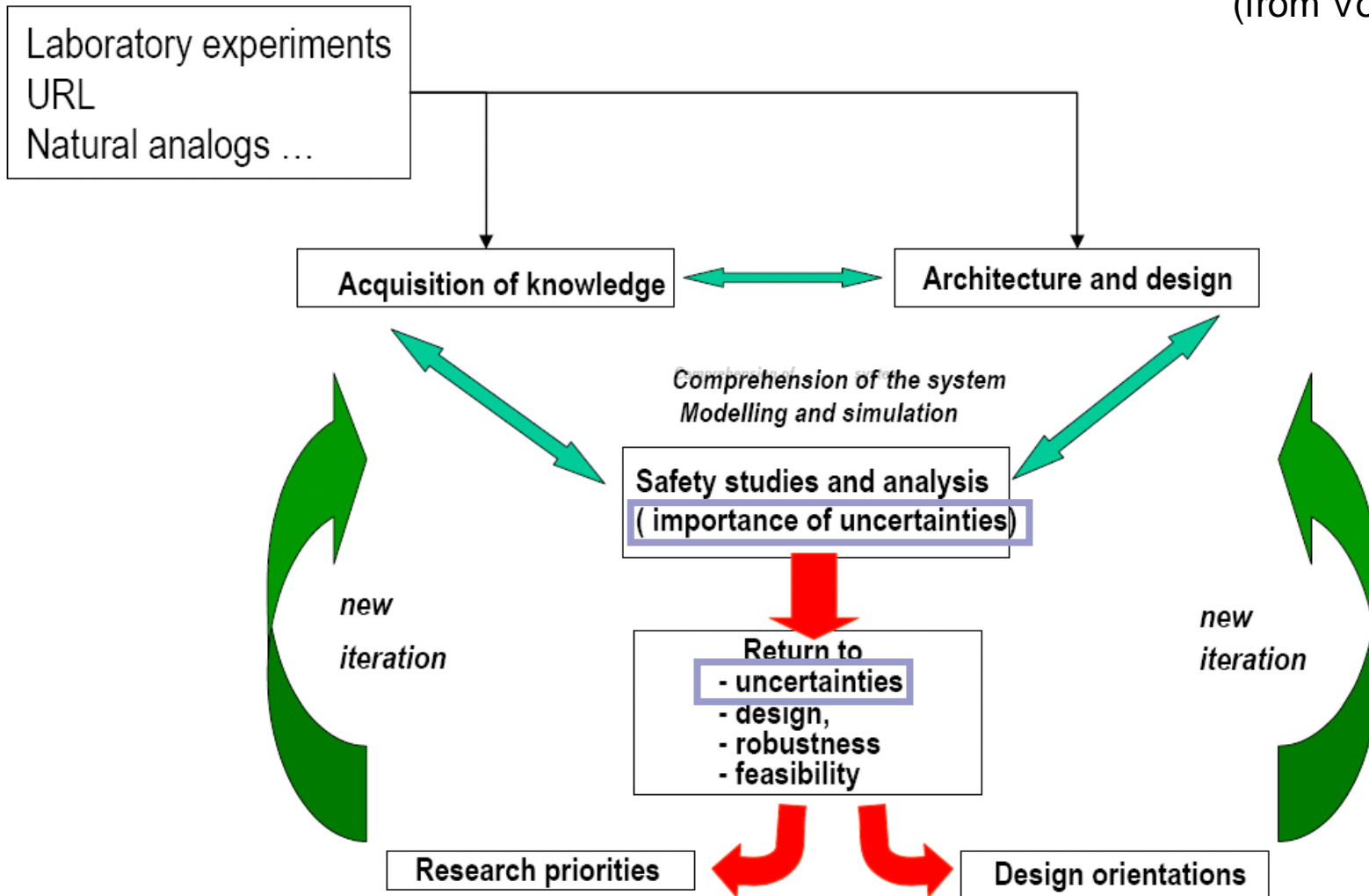
- Motivation
- Acknowledgements
- Major findings of the Case Study
  - Safety Strategy
  - Assessment Strategy
  - Issues of compliance with protection objectives
- Overall conclusions

# Motivation

- “... the issue of uncertainties and their management has been chosen for a more detailed examination in the framework of the Pilot Study in order
  - to identify the level of commonality on this subject among the participating countries,
  - to better understand differences, and
  - to strengthen and develop common grounds for guidance.”
  
- Why uncertainties? ...

# Safety Case –an Iterative Process ...

(from Voinis et al., 2006)



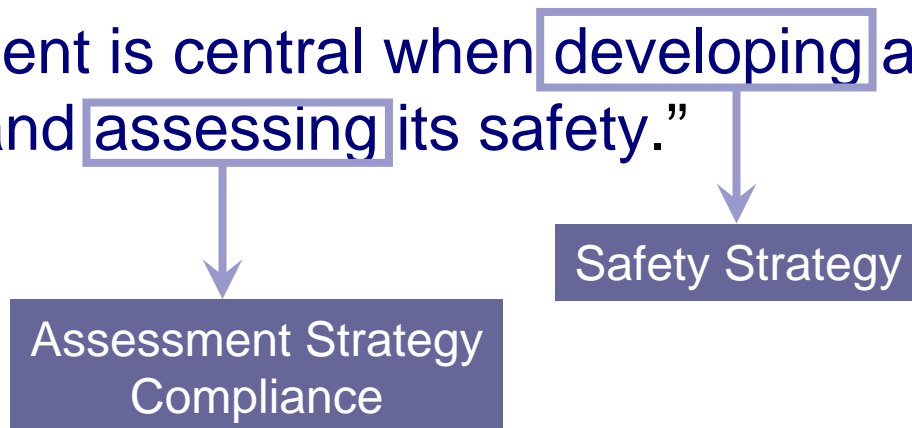
3 iteration loops since 1991 (1996, 2001, 2005) ⇒ Dossier 2005 Argile

# Motivation

- Why uncertainties? ...

“Uncertainties concerning the safety of repositories are unavoidable due to the complexity of the phenomena of concern and the scales in time and space under consideration,

and their management is central when **developing** a repository system and **assessing** its safety.”





# Acknowledgements

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Germany
- Robert E. Smith  
Environment Agency, UK

# Major findings of the Case Study

- Structure as initially envisaged:
  - Factual basis
  - Consensus statements
  - Statements about disagreement
- Last section remained virtually empty, instead:

“The regulatory frameworks differ considerably between countries. The group concerned with this case study however observes that regulatory attitudes towards the achievement and demonstration of safety differ to much less an extent. **This is evidenced by the statements typed in bold face which provide views and conclusions shared by the authors.**”

- „The group is of the opinion ...“
- „The group considers ...“
- „The opinion of the Group is ...”

# Major findings: Areas covered

- Safety Strategy
- Assessment Strategy
- Issues of compliance with protection objectives

# Major findings: Safety Strategy

- Stepwise approach
  - keep regulatory / licensing authorities and TSOs informed at each step
  - involve them in decisions, no matter whether or not this is formally required
  - regulatory involvement necessary for major decisions based on outcomes of safety cases / safety assessments
- Management of uncertainties
  - Register of uncertainties required
  - Developer: present clear forward strategy for managing uncertainties
  - If good reasons can be recorded: no further steps
  - Otherwise: avoid – mitigate – reduce – quantify

# Major findings: Assessment Strategy

**Results rather specific, going beyond other international guidance documents. Issues addressed:**

- Demonstrating compliance
- Strategy of scenarios
- Quantification of uncertainties
  - Scenario development
  - Probabilistics vs deterministic
  - Best estimate vs conservative
  - Model development
  - Parameter uncertainty
- Qualitative treatment
- Expert judgement
- Sensitivity analysis
  - safety strategy
- “What if?” scenarios
- Deliberate introduction of uncertainties
- Specific aspects
  - Disruptive events
  - Human Actions
  - Climate change
- Confidence building

# Major findings: Issues of compliance with protection objectives

- Assessment of compliance
  - Acknowledge: dose or risk = only broadly conservative indicators
  - Aggregation of results: disaggregated presentation needed!
  - Biosphere assessment: Stylisation!
  - Cut-off timescales and evolving role of different compliance measures: formal compliance demonstration becomes virtually meaningless ... more general lines of reasoning ... Scoping calculations ... qualitative arguments
- Non radiation objectives
- Protecting non human biota
- Optimisation

# General conclusions of the Pilot Study.

## Outlook

- Coming from the uncertainties issue, but now considered as conclusions of the whole study
  - “Although regulatory frameworks differ considerably between countries, the Working Group recognised that regulatory practice differs to much less an extent.”
  - Development of disposal facility and safety case: step-by-step with well-defined decision points, keep authorities and TSOs informed and involve them in major decisions (cf. previous slides on stages & required elements)
- The next step:  
A meeting of European Authorities and TSOs in Paris (19 April 2007) in order to ...
  - share experience with other European regulators / TSOs
  - discuss / decide on future steps