

# TWG 1 – Safety Case: Handling of uncertainties

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# Safety assessment for disposal of higher-activity waste: background

25 years since initial European collaborative projects (EC PAGIS)

- Calculations demonstrated feasibility of meeting safety criteria for clay, salt, crystalline host rock

EC Pamina (2006-2009) and recent NEA IGSC and IAEA projects are part of ongoing dialogue on good practice

WHAT'S CHANGED: Site-specific licensing assessments underway (Finland, Sweden), based on methods developed over 30 years

- Safety case being prepared for a GDF in France (2016)
- Site-specific work underway in Switzerland and other countries

# Changing needs and interests

Need to combine needs and interests of:

- Advanced programmes with specific sites
- Less advanced programmes in generic or research phase

## A Programmes at site-specific licensing stage

- Data rich
- Sufficient research for current licensing stage
- Methodology refinement and optimisation

## B Programmes without specific sites

- Data hungry
- Focus on research / safety case methods / trial calculations

# Integrating themes

Previous EC collaborative work focused on the detail of PA calculations and treating uncertainties in PA

- ...there are wider issues in managing uncertainty in a safety case

Main areas of need

- Integrating PA and wider use of the safety case in national programmes
- Refinements to PA approaches in selected areas
- Building experience of working with site-specific data for those countries without a site

Can integrate the interests of A and B in these areas

# Collaboration themes IGD-TP JA8

## Managing uncertainties in the safety case

- Review learning from recent safety cases
- Holistic approach to treating uncertainty in a safety case
  - Propagation of uncertainties through different parts of a safety case
  - Linking analysis of uncertainty between detailed sub-system performance models or research models and integrated total system models
- Structured approaches to presenting how uncertainties are treated in a safety case
  - Communicating about treatment of uncertainty in a safety case to kinds of stakeholder (internal, external)
  - Different kinds of uncertainty (quantifiable, unquantifiable)
  - Treatment of uncertainties at different assessment timescales (e.g. glaciation)
- “Complementary arguments” in support of safety
  - Different types of argument needed for different assessment timeframes
    - Complementary indicators to dose and risk
    - Natural system studies / natural analogues
  - Information in different projects and national programmes – would be useful to review and assemble

# Collaboration themes IGD-TP JA8

## Uncertainty identification & quantification

- Review of learning from recent safety cases
- Different approaches for formal use of expert judgement to quantify uncertainty
  - PDF derivation
  - treatment of parameter dependencies
- Adaption of advanced approaches to improve calculational efficiency and application to safety assessment modelling
- Testing of existing guidance on sensitivity analysis and development of improved guidance
- Improved understanding of value of sensitivity analysis in a safety case (e.g. meaning of SA in a conservative calculation? Use in confidence building)

# Continued international collaboration

## Approach

- Review application in national programmes
- Methodological thinking
- Worked examples
- Synthesis

*Aim is to compare viewpoints...*

- *for different disposal concepts and environments*
- *for programmes at different stages of development*

*...and integrate to build confidence in current approaches, to advance the state of the art where useful, and to build competency*

## The right forum - Benefits of a dedicated project

A good time (2016-) to stand back and look collectively in some detail at application of methods to handle uncertainties in recent safety cases (France, Finland, Sweden, UK), across a wide range of areas  
...but review is only a first step

Areas where improvements are possible have been identified  
...a project will help bring these to fruition so they are ready for use in next update to safety cases in ~2020...  
...leading to a significant contribution to achieving IGD-TP vision for first repositories by 2025  
....and better safety cases (when produced) by the countries with less advanced disposal programmes (still in generic or early siting phases)

A dedicated project will allow for more intensive collaboration and co-ordinated, hands-on learning from experience and methodology refinement....  
.... much more powerful means of learning and improving than a simple talking shop





## Natural Analogue Working Group

Running continuously for 30 years

Increasing interest

- In the beginning oversold....
- Where can natural analogues build confidence in different kinds of safety argument? – top-down approach
- Natural (along with archaeological, anthropogenic, industrial, operational, social and self) analogues
- Now being increasingly factored into complementary arguments in support of safety (e.g. Finland, UK)

Interest in integration of NA into TP's research area portfolio and recommend interaction with the international Natural Analogue Working Group

