



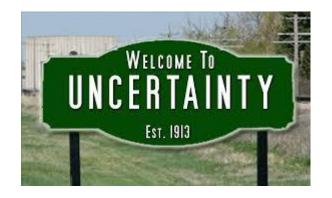
# SAFETY ANALYSIS & SAFETY CASE: IMPORTANCE OF UNCERTAINTY (& OF ITS MANAGEMENT)

September 14, 2020 • F. Lemy (Bel V - UMAN WP Leader)



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## "A situation in which something is not known, or something that is not known or certain"

Source: https://dictionary.cambridge.org



## « UNCERTAINTY » VS. « RISK »

- Uncertainty ≠ Risk!
- Risk
  - related to a scenario or sequence of events
  - = Probability x Consequences
  - can be interpreted as the measure of significance of an uncertainty
- The significance of uncertainties needs to be assessed





## « EPISTEMIC » VS. « ALEATORY » UNCERTAINTIES

## An uncertainty can be:

## • « epistemic »

- i.e. relating to knowledge or to the degree of its validation
- e.g. lack of knowledge about site characteristics
- can be reduced

## « aleatory »

- i.e. related to random variability
- e.g. uncertainty over the time of occurrence or magnitude of rare events
- cannot be reduced



## **UNCERTAINTY & DECISION-MAKING PROCESS**

- Disposal programme = "Stepwise decision-making process"
- Decisions are made:
  - in presence of irreducible and reducible uncertainties
  - considering that some uncertainties will **decrease as new information will become available** e.g. "as-built" properties, monitoring data, R&D results,...
- Choices made on the basis of limited information in early phases may have to be confirmed during subsequent phases
- Information about uncertainties and perspectives on how they can be managed form an important input for the decisions to be taken at each phase





## **ROLES OF THE SAFETY CASE**

- The safety case provides the basis for demonstration of safety and for licensing
- They assist and guide decisions made at each programme phase
- The safety case will also be the main basis on which:
  - dialogue with interested parties will be conducted
  - confidence in the safety of the disposal facility will be developed



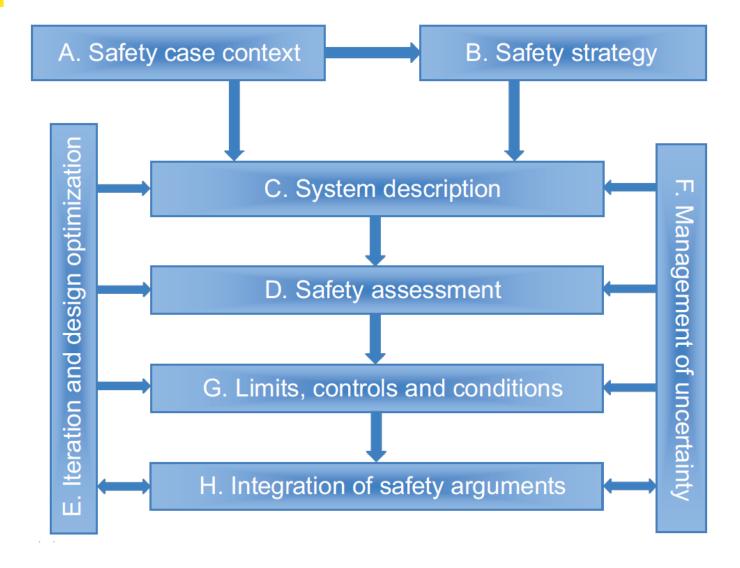
## **UNCERTAINTY & THE SAFETY CASE**

- => The safety case needs to:
- describe the approach to managing uncertainties
- acknowledge and identify significant uncertainties
- assess the impact of uncertainties
- show that **existing levels of uncertainty are acceptable** given the decision(s) to be taken
- show **how significant uncertainties will be managed** in subsequent phases
- be regularly updated so that it remains an adequate basis for making decisions





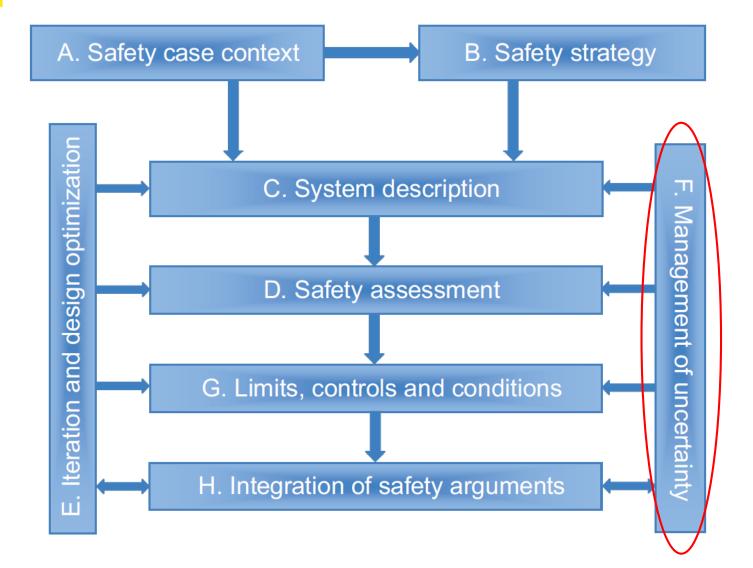
## **COMPONENTS OF THE SAFETY CASE**



Source: IAEA Safety Guide SSG-23



## **MANAGEMENT OF UNCERTAINTY**



 Uncertainty management is a cross-cutting element of the safety case



## TYPES OF UNCERTAINTIES THAT MAY HAVE TO BE MANAGED IN A DISPOSAL PROGRAMME

- **Programme uncertainties**, i.e. uncertainties associated with the national radioactive waste management programme and other prevailing circumstances (e.g. uncertainties relating to the types and volume of waste to be disposed of, stakeholder conditions, the regulatory framework, disposal concepts and schedule, available resources,...)
- Uncertainties associated with the **initial characteristics** of the waste, site and engineered components
- Uncertainties in the **evolution of the disposal system and its environment**, including those that may affect the initial characteristics of the disposal facility
- Uncertainties associated with the data, tools and methods used in the safety case
- Uncertainties associated with the completeness of the Features, Events & Processes (FEPs)
  considered in the safety case





## Prevailing circumstances

State of Knowledge

Waste inventory

Available resources

National Policies

Regulatory framework

Stakeholder conditions

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Return on experience

## Prevailing circumstances State of Regulatory Stakeholder Waste Available National Knowledge framework conditions inventory Policies resources *Programmatic activities* Return on Uncertainty identification, characterization & analysis of safety relevance experience **Uncertainty representation & evaluation in** the Safety Assessment

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## **KEY MESSAGES**

- "Uncertainty is the only certainty there is, and knowing how to live with insecurity is the only security" (John Allen Paulos)
- Uncertainty ≠ Risk
- Managing uncertainties is key when developing a disposal system and assessing its safety
- Various types of uncertainties need to be managed in a disposal programme
- Several options might be available to reduce, avoid or mitigate these uncertainties
- Uncertainty management is an iterative process associated with the stepwise implementation of the disposal programme



## THANK YOU FOR YOUR ATTENTION!

