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AGENCE FÉDÉRALE DE CONTRÔLE NUCLÉAIRE

Underground Research Laboratories, an Important Support to the Belgian Regulatory Body's R&D and the Management of Uncertainties

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What the Regulatory Body is responsible for?

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- FANC and Bel V form together the Belgian Regulatory Body
- Protection of the people and the environment from harmful effects of ionizing radiation
  - common objective with the operator
- Service to government and people
  - independent position
- More specifically in the context of radioactive waste management
  - establishment of safety requirements ➔ regulation
  - oversight of the of the waste management activities
    - Nuclear Operators & Waste Management Organisation
  - advices on proposals for national waste management policies
  - involvement in the decision making process
  - review of safety cases

How the regulator interacts with stakeholders?

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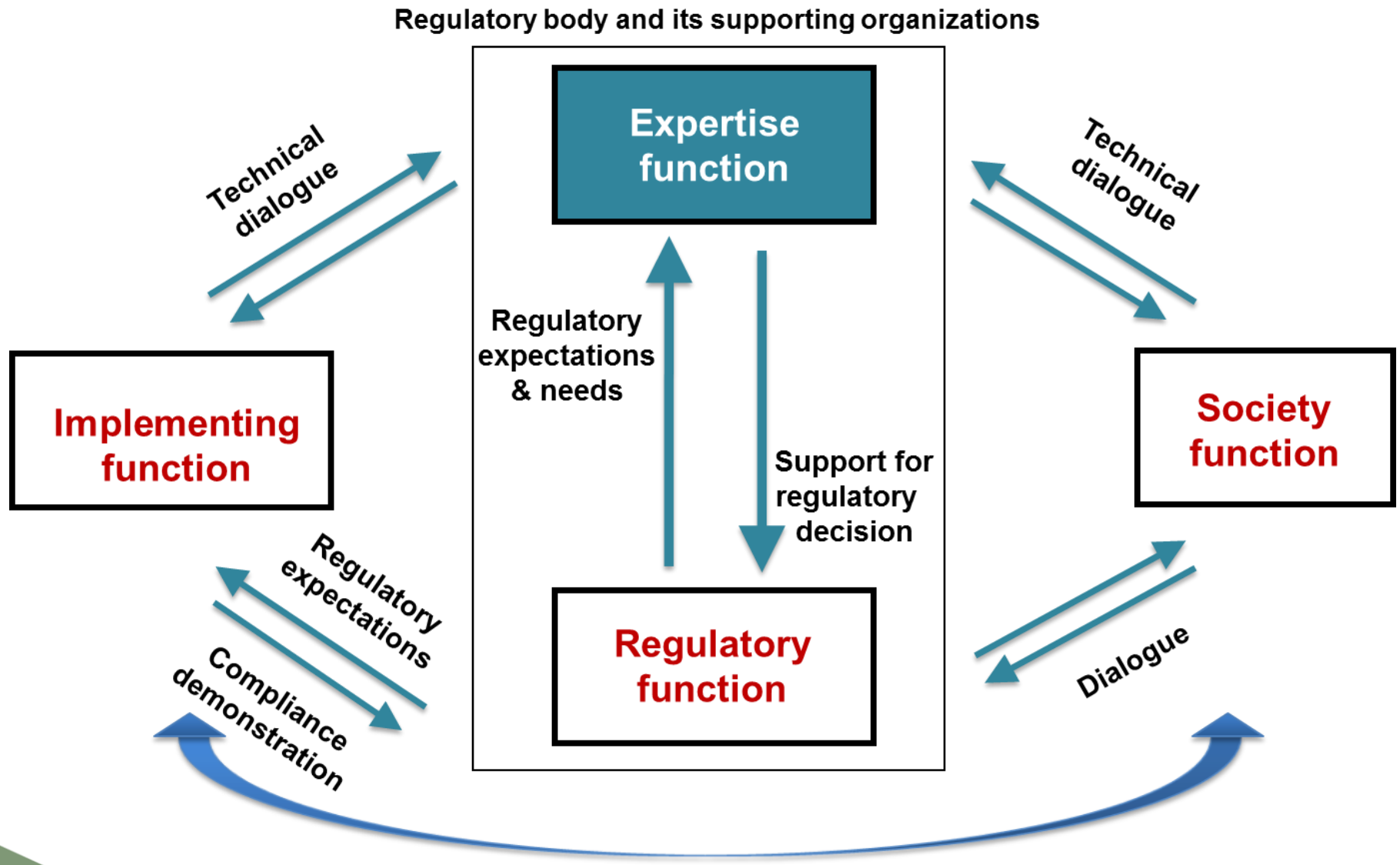

SITEX Network

Technical expertise is essential to support the regulatory function

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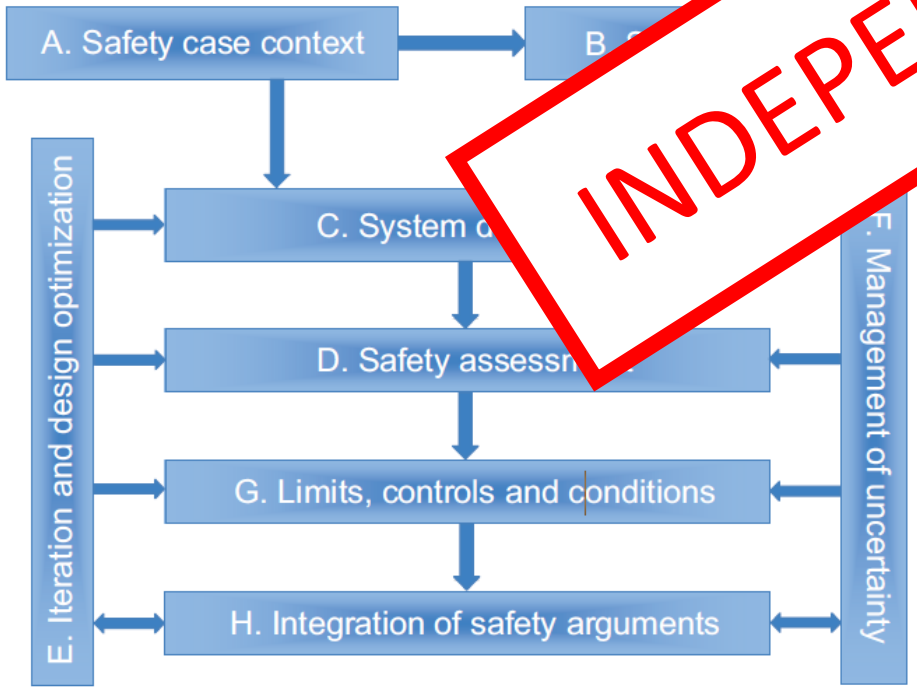
- Verification of the adequacy, completeness and justification of technical requirements and guidance
- Informed decisions with full knowled the facts
- Justification of advices and deci
- Capacities to understand a cases

INDEPENDENT



Completeness ?

Level of details ?

Approaches ?

Design ?

Compliance with requirements ?

FANC and Bel V are implementing a R&D program to develop their expertise in support to the regulatory function

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- Not a duplication of the WMO RD&D programme
  - focus on safety issues in order to
    - develop & maintain competent staff, to acquire capabilities for independent assessment
    - identify potential gaps in safety cases
    - support advices and decisions
  - not necessary to undertake independent research if the regulatory body is satisfied that the operator is undertaking appropriate research that is of sufficient quality (IAEA - SSG14)
- Evolves according to the decision-making process

The R&D programme is structured along 5 axes

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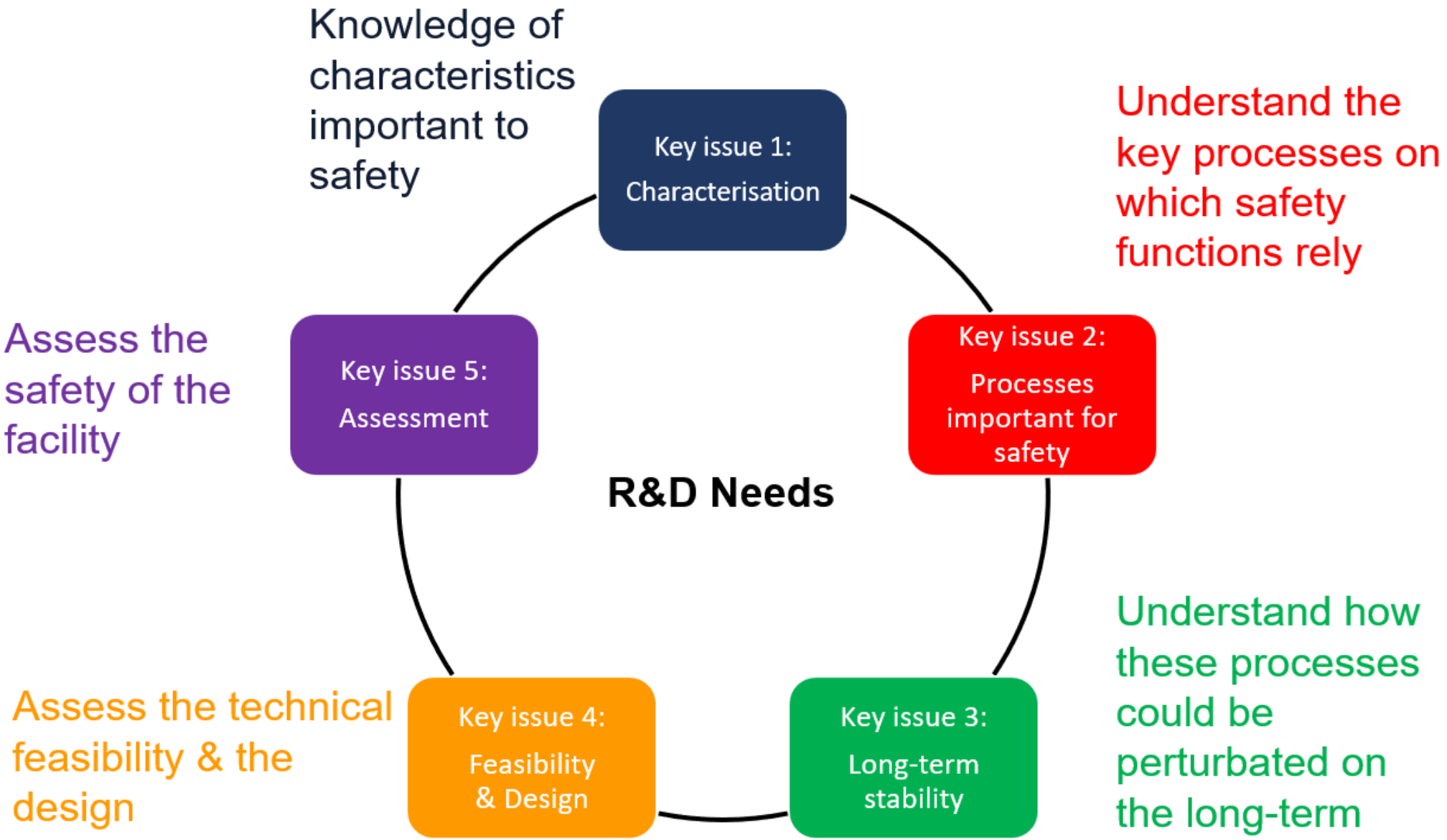

Participation in Tournemire and Mont-Terri

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- The participation in URL's is essential to develop a broad, coherent and <u>independent Regulatory Body's vision</u>
- Direct access to information and exchanges with internationally recognised experts allow to <u>save a significant amount of time and to increase the efficiency and credibility of the Regulatory Body</u>

Independent research includes the diffusion of radionuclides in a thermal gradient

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- While experiments have been carried out in surface laboratories (Van Loon & al.; 2005; Sánchez & al., 2008), there is a lack of experimental data regarding the effect of temperature on radionuclide diffusion under in situ conditions
- Case of premature canister failure
  - essential to estimate the possible increase in diffusion rates to better assess the possible contamination of the near-field – retrievability
- Stakeholders acceptance

Two in-situ experiments were launched at Tournemire and Mont-Terri

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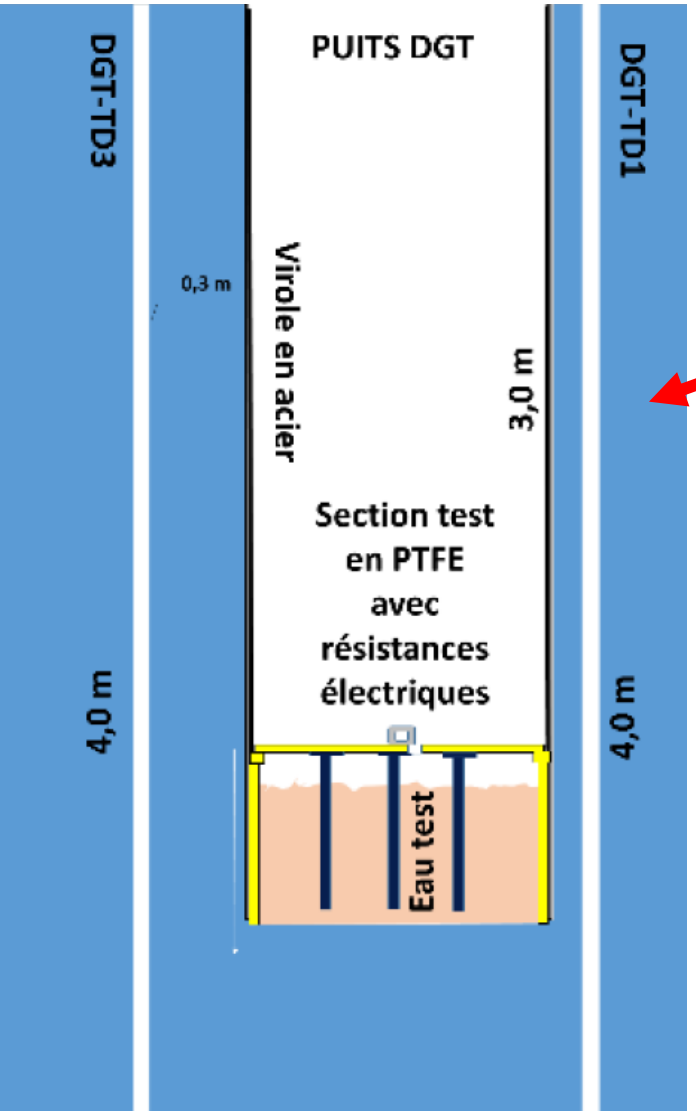
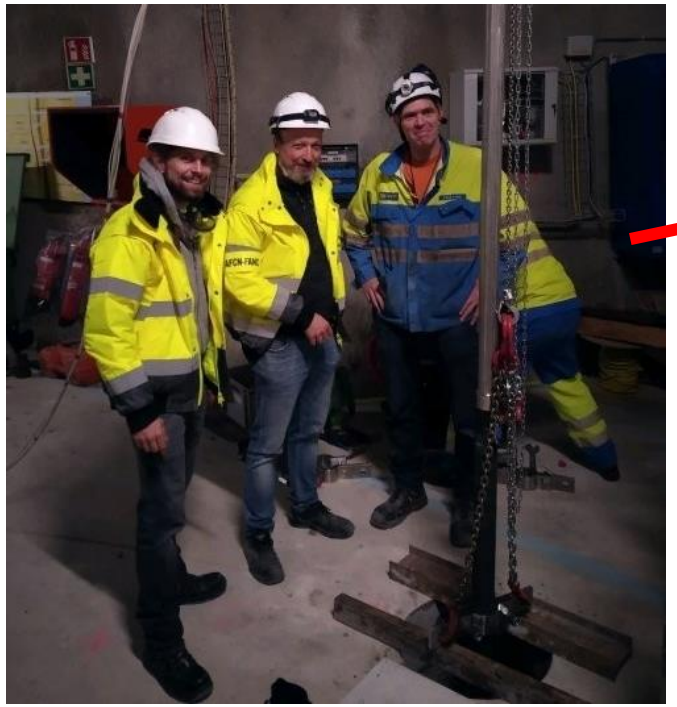
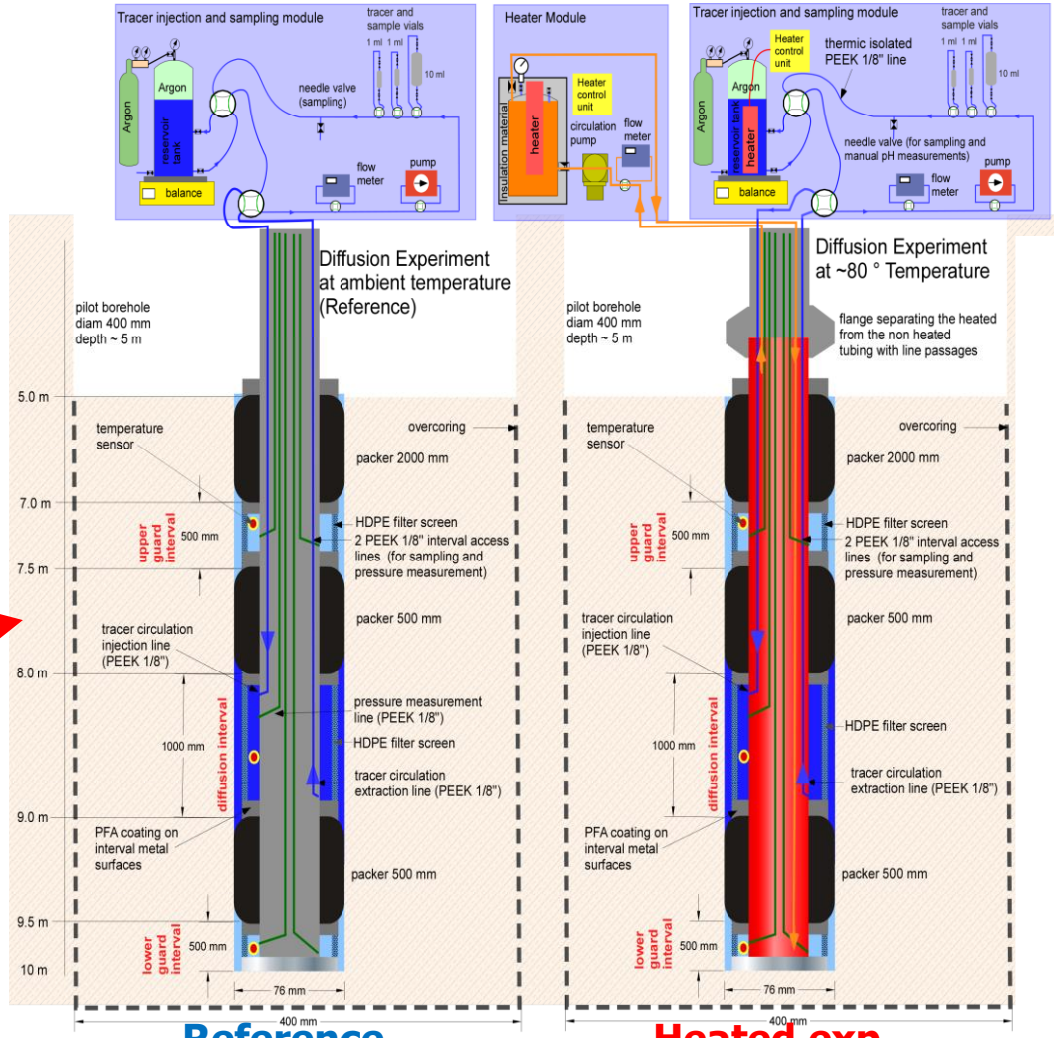
DIGIT experiment - Tournemire





DR-C experiment – Mont Terri



The scientific and technical survey of results from other URL's (HADES, Bure, …) also constitutes an important source of knowledge

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- The investigation of processes observed for different host rocks and engineered components, allows a better understanding of the phenomena at play and the relative importance of the associated parameters
- It contributes to the validation of the models obtained by comparing modelling results with experimental results
- The highlighting of similar processes observed in different laboratories is also of particular importance. Despite the differences in the host rocks some observed characteristics and processes present similarities building confidence in the understanding of geological disposal systems

URLs' in-situ experiments contribute to decrease uncertainties

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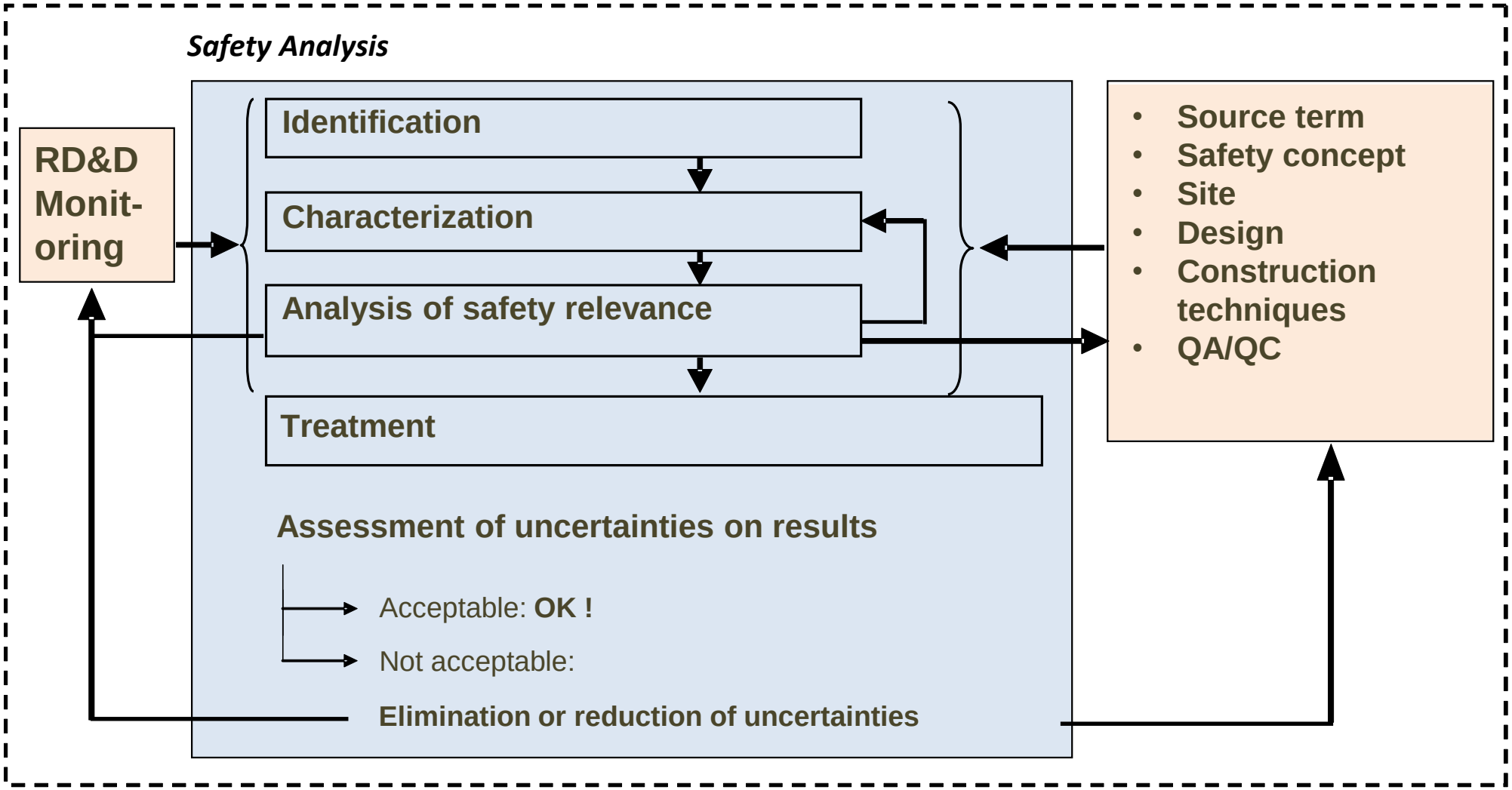
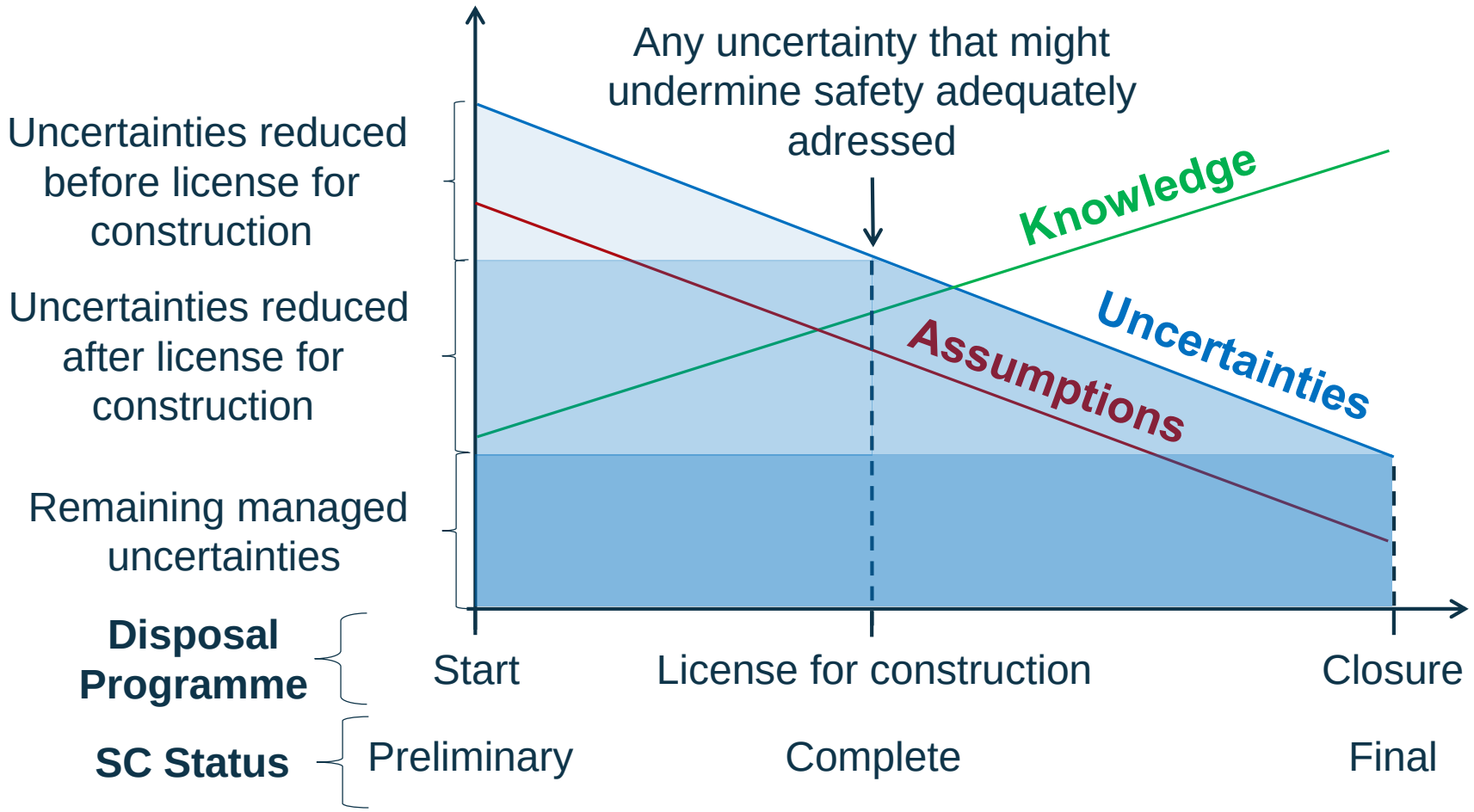
- barriers characteristics including the initial state and conditions
- understanding of Hydro-Mechanical processes
- radionuclide transport processes
- influence of the temperature
- hydration processes of engineered materials
- degradation processes (e.g. corrosion, alkaline front, …).

However such experiments lead sometimes to "new" uncertainties and processes that were not identified before

Uncertainty Management



Expectations according the decisions steps



Conclusions (1)

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- To support its missions, the Belgian Regulatory Body conducts its own independent Research and Development programme dedicated to the understanding of the disposal system and processes that can influence radionuclide transport
- The R&D programme includes in situ experiments supporting the identification and characterization of uncertainties. An important issue is the influence of a thermal gradient on the transport of radionuclides

Conclusions (2)

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- The participation in URL's experiments provides a unique opportunity to identify experimental challenges and to collaborate with internationally recognized experts in various disciplines relevant to the safety case
- The Research and Development objectives set by the Regulatory Body differ from those set by the WMO. The Regulatory Body will mostly investigate issues directly related to safety with the objective to verify the adequacy of the approaches followed by the WMO