EURAD – HITEC WP

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- Background:
  - HITEC: Aims to improved Thermal-Hydrogeological-Mechanical description of clay based materials at elevated temperatures – no Chemistry yet
  - HITEC links therefore to repository level understanding of temperature effects
    - For clay host large, but not full repository level, modelling is benchmarked
    - For bentonite small pilot scale experiments are carried out and modelled
  - Competences needed are
    - Capability to model repository behaviour during the high temperature phase
    - All the parameter and constitutive relations required for the above modelling task
- Tools or outcomes we are developing:
  - HITEC develops
    - Experimental methods for high temperature measurements
    - Modelling capability of full THM-modelling of repository
      - This included as a subtopic thermal dimensioning of the repository

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IMPACT AND CHALLENGES

- Impact of our WP to digital twins:
  - The modelling methods applied in HITEC can be utilised for full repository modelling, which requires in addition of model specific data full description of the repository
    - Design: geometry, materials,
    - Heat production of all waste canisters
  - Digital twins approach might make it easier to develop and use this kind of comprehensive integrated models
    - Much data is already collected – digital twins actually exist, but are they called thems
    - Especially useful digital twins might be during the operation period, when the structure of repository is changing, and empty and completed tunnels interact in a very different way with the bedrock
- Challenges to overcome, and needs for the future:
  - Feasibility studies including benefits and costs for this comprehensive integrated models should be carried out from the point of view of WMOs, regulators and other stakeholders
  - Analysis of the lacking components in comprehensive integrated models is needed, and how digital twins are able to help here
  - In EURAD2, digital twins (or charts) can form an essential part of repository modelling in addition of some multiscale modelling approach like molecular dynamics