Presentations at NEA IRT hearings
13 December, 13:30 – 15:00
15 December, 13:30 – 15:00

Safety assessment,
including biosphere and source term

Example question #17

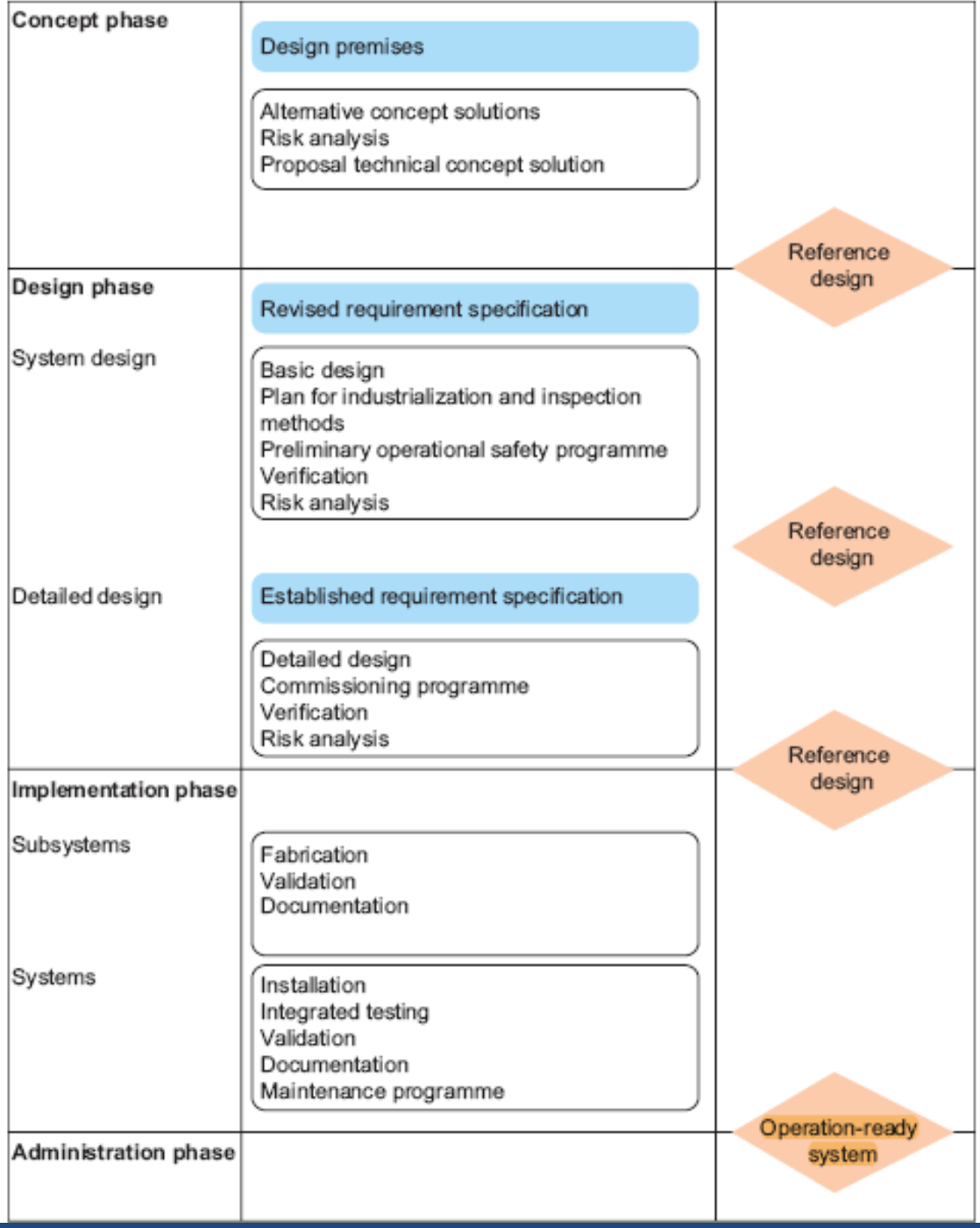
SKB recognizes that the design of the industrial facilities is neither detailed at this stage, nor well stabilized (e.g., canister production, plug design, bottom plate, etc.). However, the safety case presented must be capable of supporting a legal authorization to construct the facility, which is a crucial step, with irreversible implications. Thus, even if it is not realistic to demand a detailed design for the whole facility (given the current lack of information), can SKB assess under what conditions the design might be revised? Can SKB also assess the planning and realization of revisions and how the consequences of these revisions on the safety case will be taken into account?

When will designs be finalized?

- Designs will be finalized in good time, also considering time needed for review and approval, before they need to be implemented.
  - Given that the time for implementation differs between systems, the time left for finalizing the designs also differ.
- Repository access
  - Design will be finalized before construction work can start
  - Will be described in a special document describing how safety and radiation protection matters will be taken into account during construction.
  - This document needs to be reviewed and approved by SSM.
- Systems in the deposition area (deposition tunnels, backfill, buffer, canister, etc)
  - need to be finalized at least in time for the trial tests
  - will be reported in the Safety Assessment Report (SAR) to be reviewed and approved by SSM before operation can start.
- Later design changes
  - would need to be reviewed and approved by SSM in a manner similar to how this is handled in any other nuclear facility.
- SKB will only consider design changes leading to maintained or improved levels of safety.

What technology development remains?

- Major changes in conceptual design not foreseen
  - All subsystems have now passed concept stage, i.e. reference designs *fulfilling the design premises* are developed and feasible ways to production and inspection programmes have been found.
- Considerable design work remains for many subsystems before they are ready for implementation



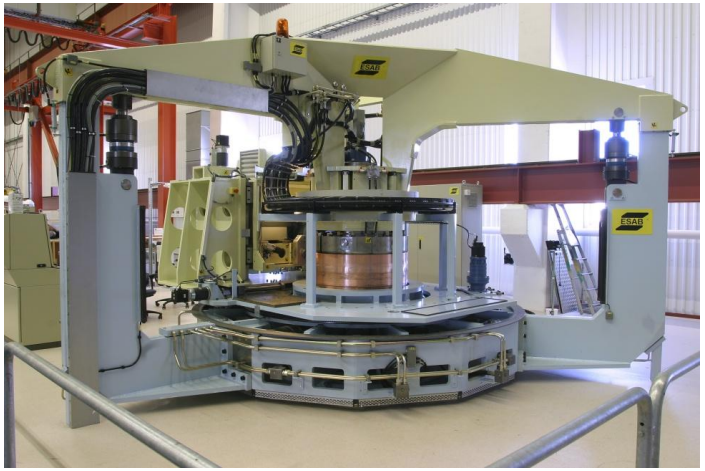
When are results needed?

Development need	Prior to start of construction	Prior to buildout of deposition areas – interconnection with Clink	Prior to integrated testing	Prior to start of operation
The backfilling line				
Further development of backfilling within the chosen reference design.	System design finished.	Detailed design finished.	Implementation in progress.	Implementation finished.
Plug for deposition tunnel.	System design finished.	Detailed design finished.	Implementation in progress.	Implementation finished.
The closure line				
Reference design and installation method for closure.	Requirements on rock excavation in accesses established.	System design started.	System design in progress.	System design finished.
The rock line				
Methodology for underground design.	Methodology for accesses ready for implementation.	Methodology for deposition area ready for implementation.	Administration and improvement.	Administration and improvement.
Tools for detailed characterization.	Instruments and methods for investigations in accesses ready to be implemented.	Instruments and methods for investigations in deposition area ready to be implemented.	Administration and improvement.	Administration and improvement.
Execution methods, building materials and special machines.	Methods etc. for accesses ready to be implemented.	Methods etc. for deposition area ready to be implemented.	Administration and improvement.	Administration and improvement.

Example

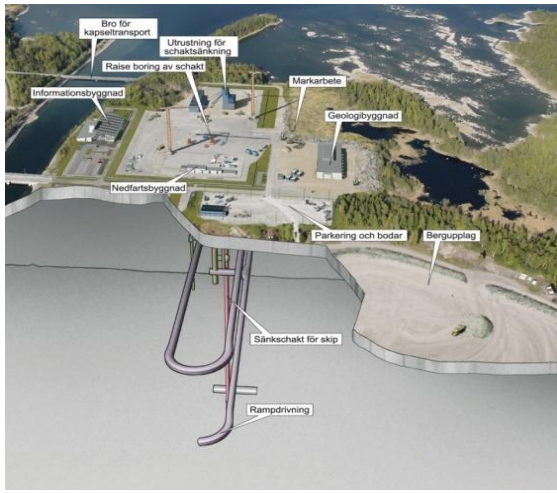
Canister

- Design analyses
  - further analyses of the loads that the canister can take
- Production Control and Inspection
  - Fabrication and testing of inserts
  - Verification of PWR-inserts
  - Fabrication and testing of copper components
  - Sealing and testing of the weld
  - Handling of the canister in the repository (ramp vehicle, deposition machine)
- Control programme



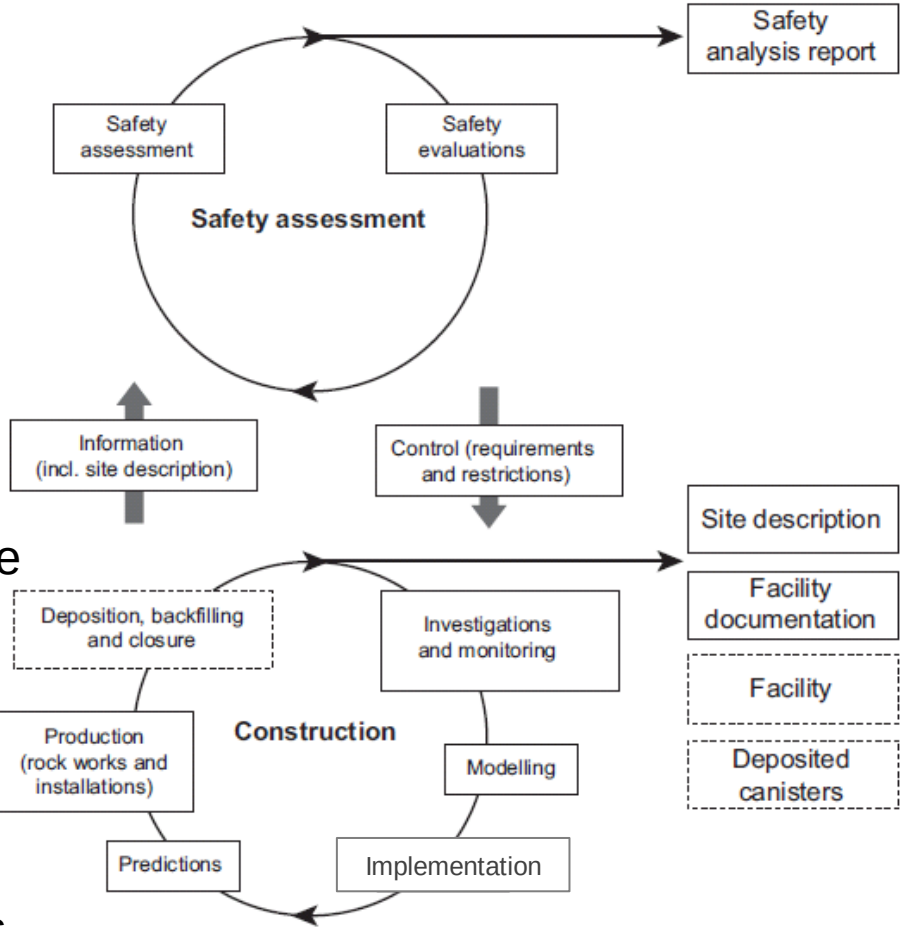
Planned additions to monitoring in Forsmark

- Local seismic monitoring
- Groundwater monitoring from new boreholes
  - Levels, pressures and flows
- Groundwater inflows to facility
- Hydrochemical monitoring from new boreholes



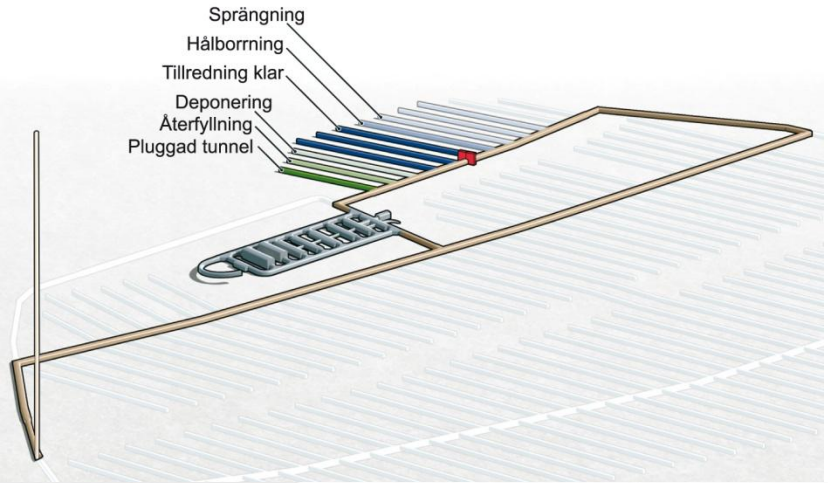
Main processes - Construction and Safety assessment

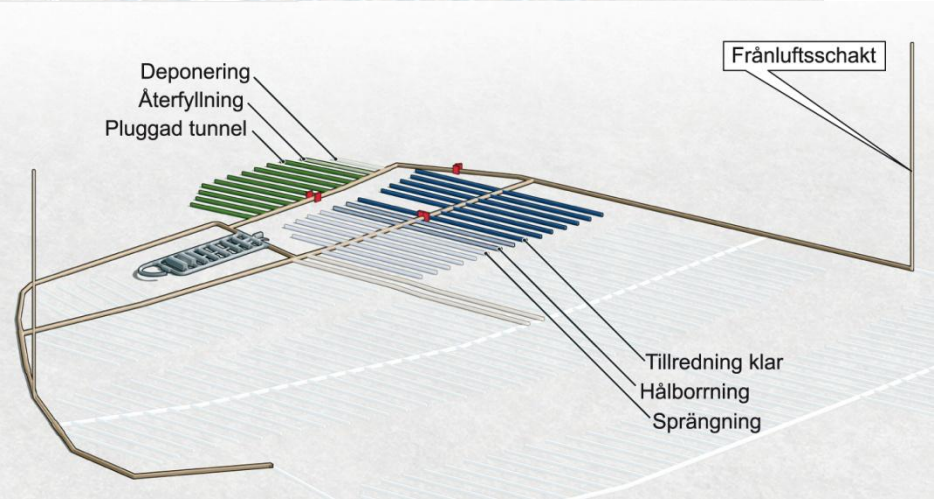
- The frequency and distribution of open water-bearing fractures and their potential influence on groundwater lowering (drawdown) in the vicinity of the shaft and ramp.
- Fracture size data
- In situ stress magnitudes and orientations at repository level.
- Spatial distribution of deformation zones that can impact the repository layout.
- Spatial distribution of amphibolite with lower thermal conductivity that can be of importance for the distance between deposition holes.

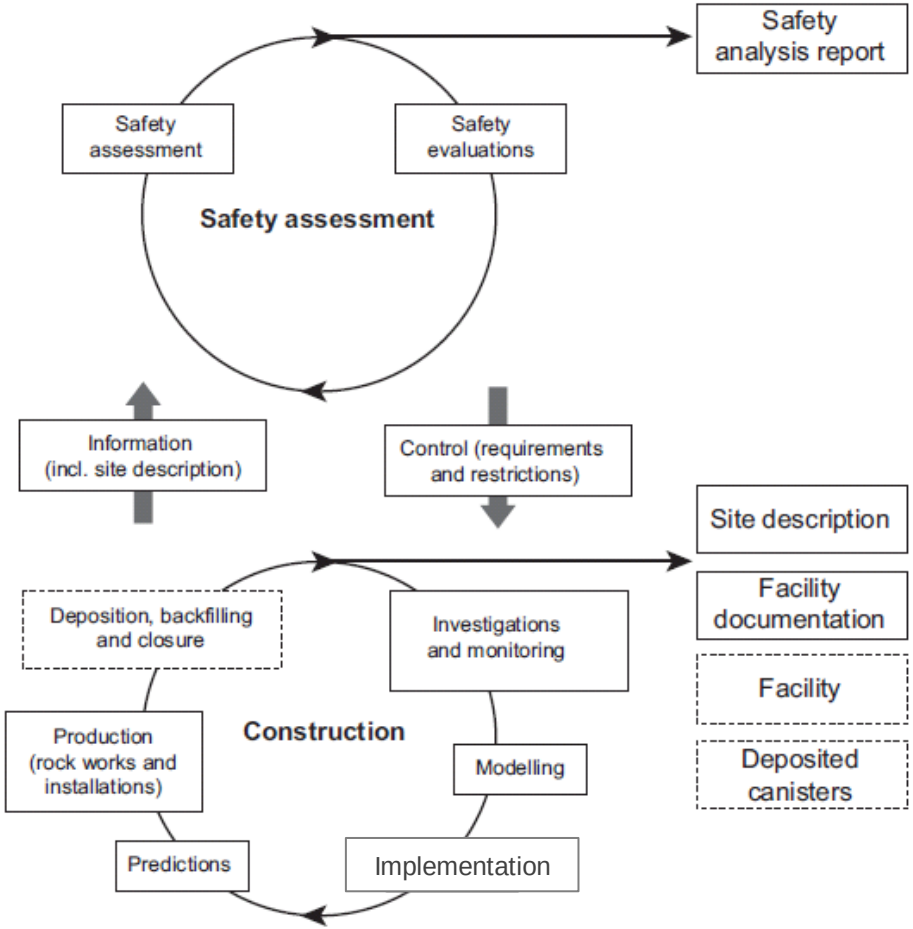


Safety in Project (SIP)
will exercise a continuous control of geoscientific conditions affecting the site adaptation. This control also includes assessing whether the conceptual site model is valid or would need a significant revision.

Main processes - Construction and Safety assessment

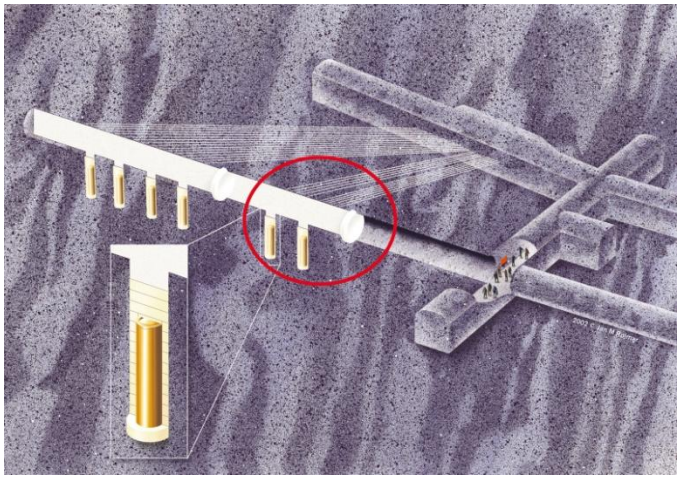


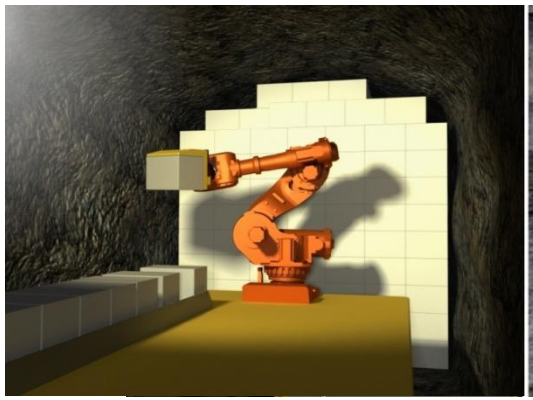


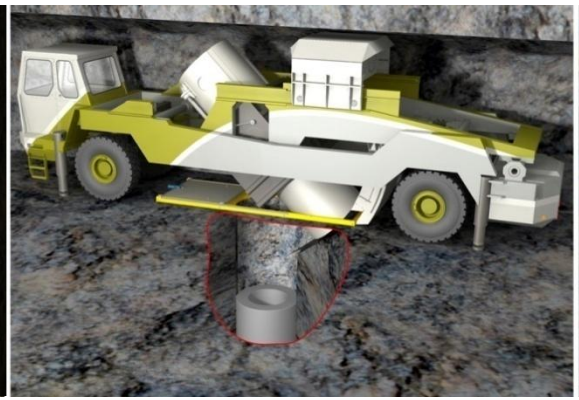


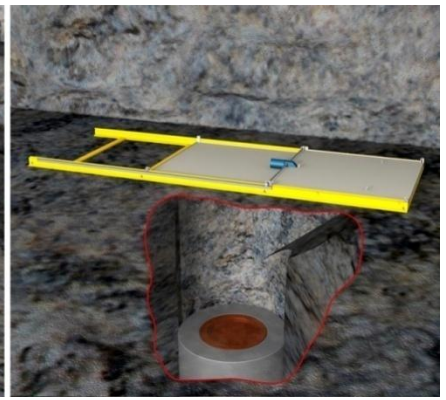
Testing and verification

- The testing that has been done during the last 30 years will continue
- Plans for full scale and long-term tests at Äspö
  - Excavation and investigations
  - Plug test
  - Backfill test
  - Integrated backfill, plug, deposition hole – equipment and installation process
- Tests at Forsmark (~2020-)
  - Detailed characterisation programme
  - Rock stress and spalling
  - Integrated system test (operation according to specs)



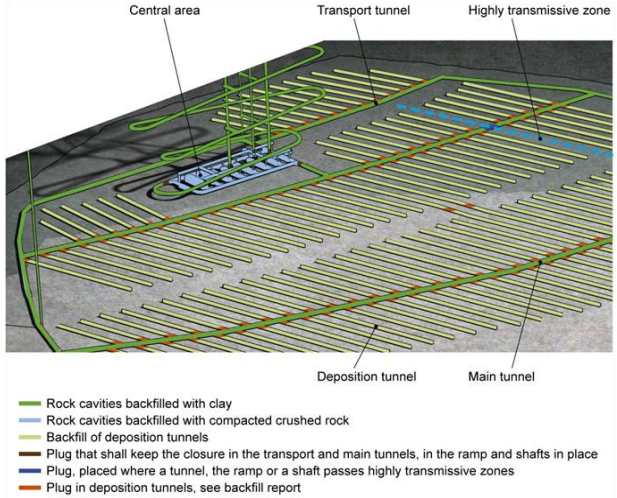






Verification and monitoring during operation

- Control programme for engineered barriers and underground openings
  - Verify conformity of deposition hole locations with design premises
- Continued monitoring of host rock conditions
  - Groundwater
  - Hydrochemistry
  - Seismic, deformations of underground openings
- Monitoring of engineered components
  - Plug performance



- Monitoring of barriers not required for long-term safety
- Monitoring should not have any detrimental impact on long-term safety
  - Monitoring equipment cannot be allowed within engineered barriers
  - Boreholes close to deposition positions should be avoided (minimized in host rock volume)
- Provision for long-term tests at Forsmark (during operation – ~ 50 years)
  - Instrumented canister-buffer-backfill system