



DOPAS

Training Workshop 2015



D1 1.2.3

Design basis workflow for Plugs and Seals

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Radioactive Waste Management



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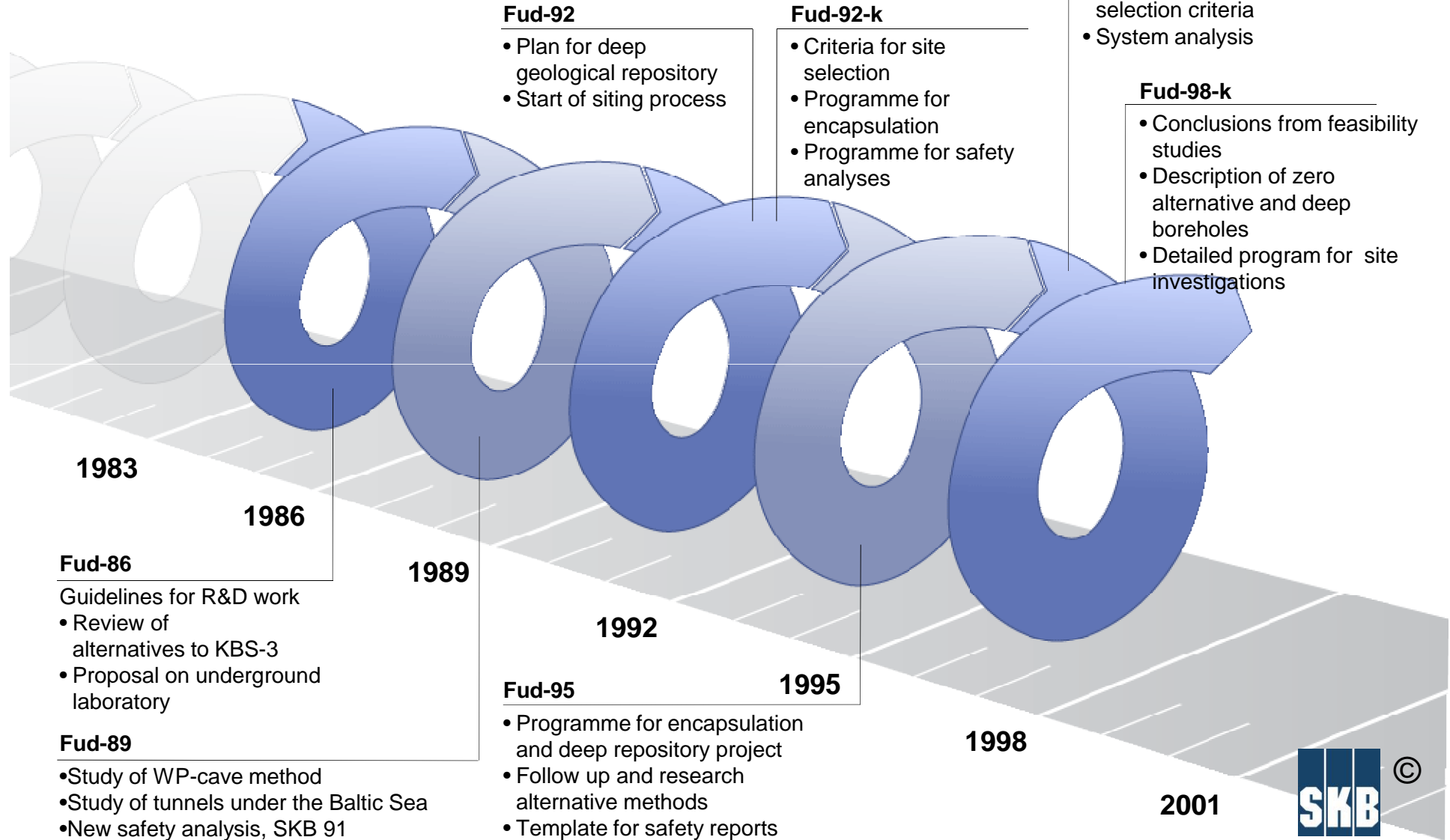


Outline of this lecture

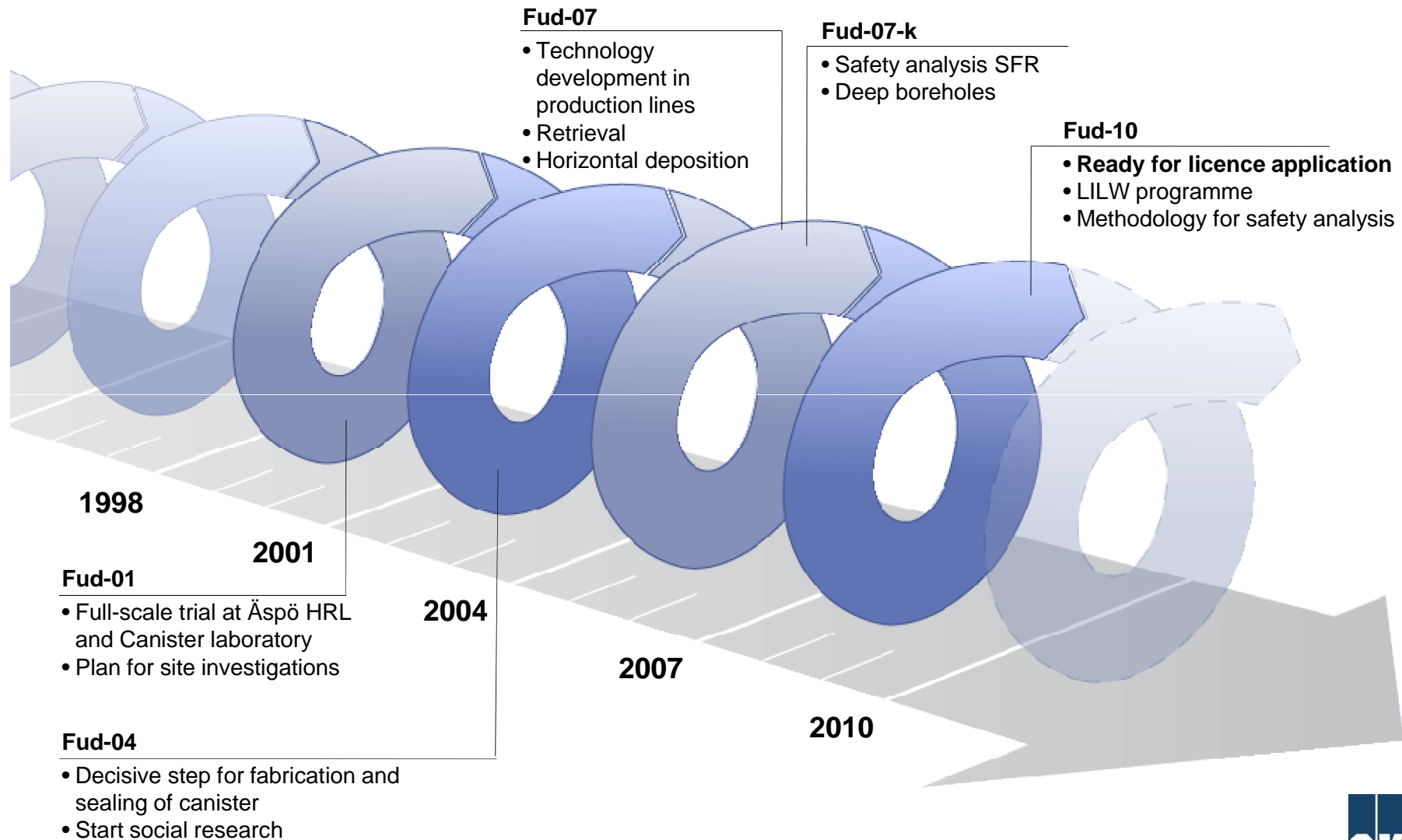
- From policy decisions to stakeholder requirements
- Constraints by waste types and host rocks
- Plug system requirements (KBS-3V example)
- Modelling and testing of performance, coming up with the conceptual design
- A Design Basis Workflow (as developed by DOPAS)



Continuous knowledge building



Continuous knowledge building



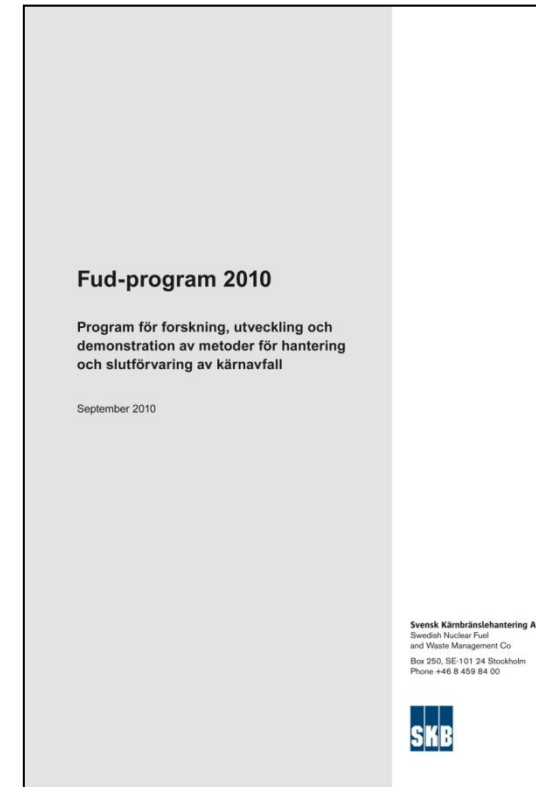
Research, technology and review



Research cooperation



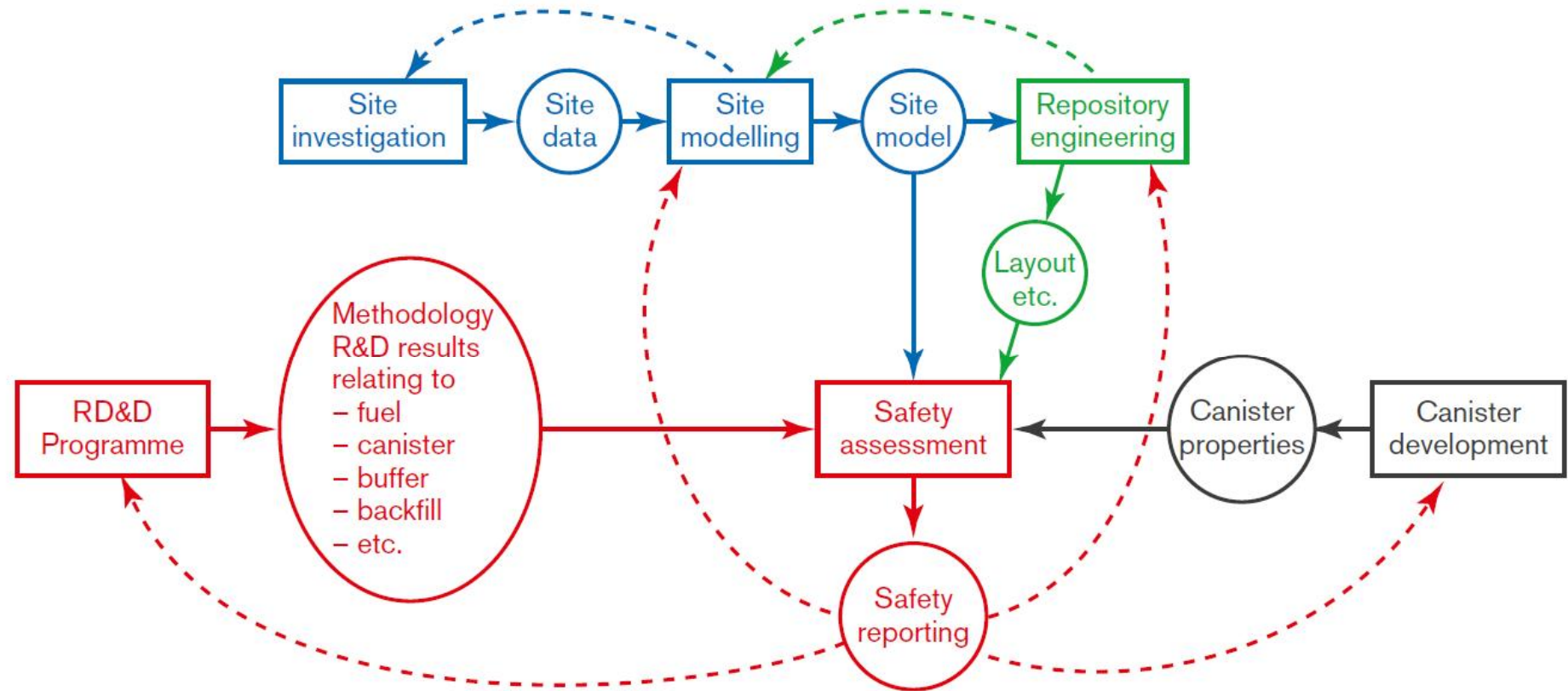
Technology development
and full scale tests



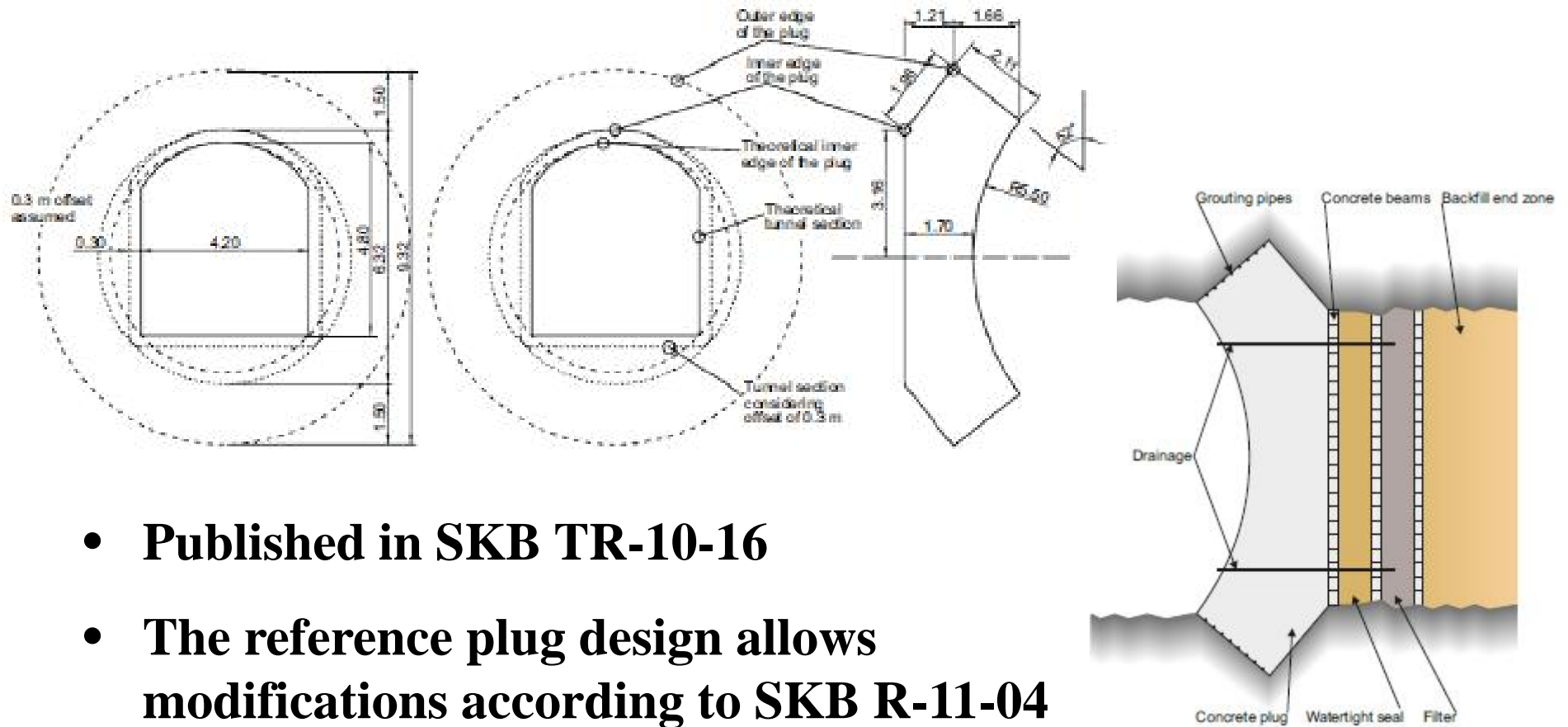
Regularly review



Iterative development of EBS design



The reference conceptual plug design



- Published in SKB TR-10-16
- The reference plug design allows modifications according to SKB R-11-04



Design requirements for KBS-3V plugs

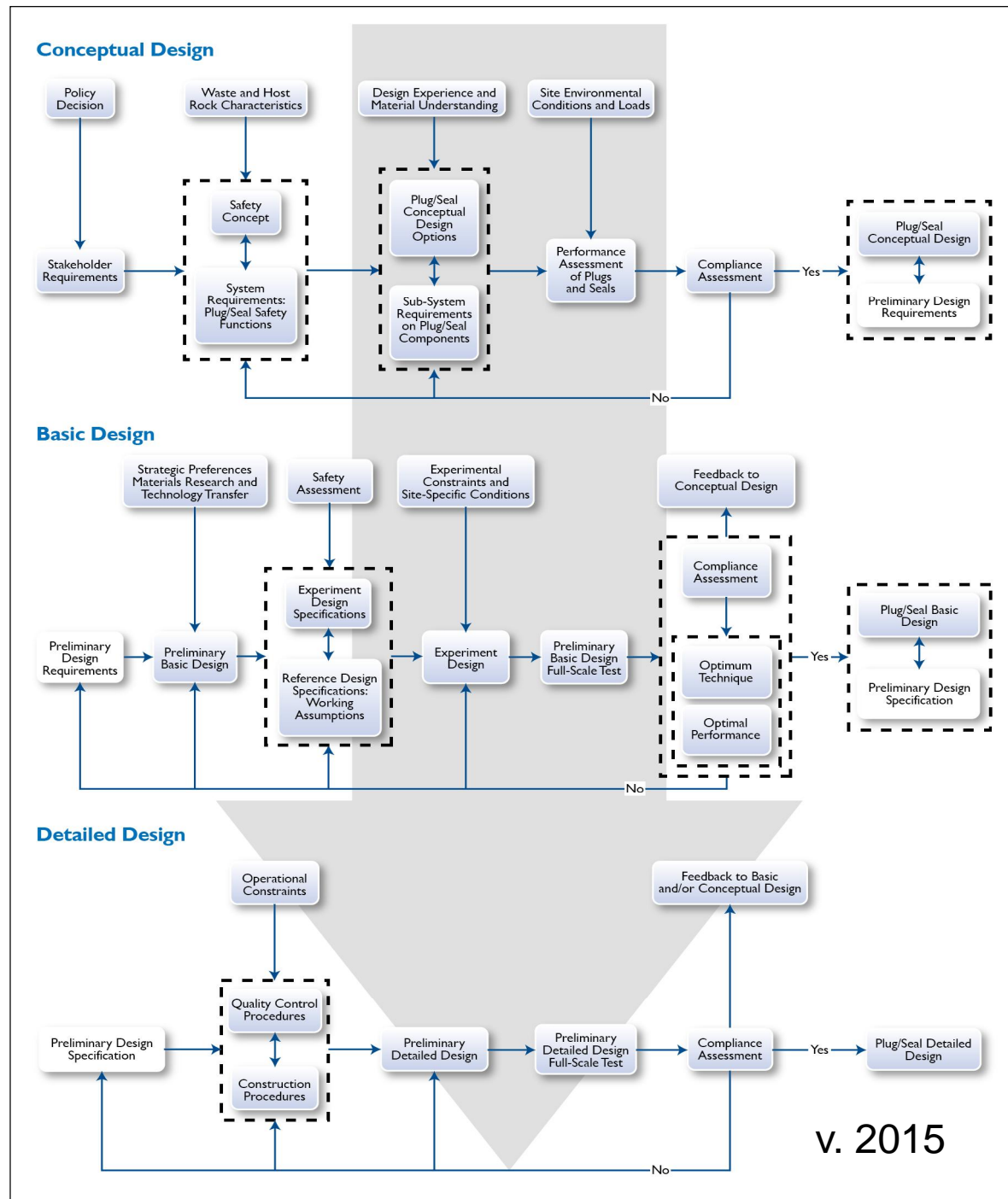
- The plug strength must be sufficient to withstand the pressure that occurs during the sealing phase (Requirement DRP22)
- The plug must withstand thermal loads caused by the rock and concrete expansion during the sealing phase (Requirement DRP30)
- The plug must be sufficiently tight to prevent erosion of the backfill and buffer materials out of the deposition tunnel (Requirement DRP26)
- The time until the plug is installed and can achieve its functions may not be longer than the time it takes for the pellet-filled part of the deposition tunnel volume to be filled with water (Requirement DRP21)
- The design working life is 100 years, therefore all requirements on the plug during the sealing phase shall be met for 100 years.
- The frequency of malfunction of the plug causing retrieval of installed backfill shall be 10^{-3} or less per installed plug.

Note. The list is not complete!



The DOPAS Design Basis Workflow

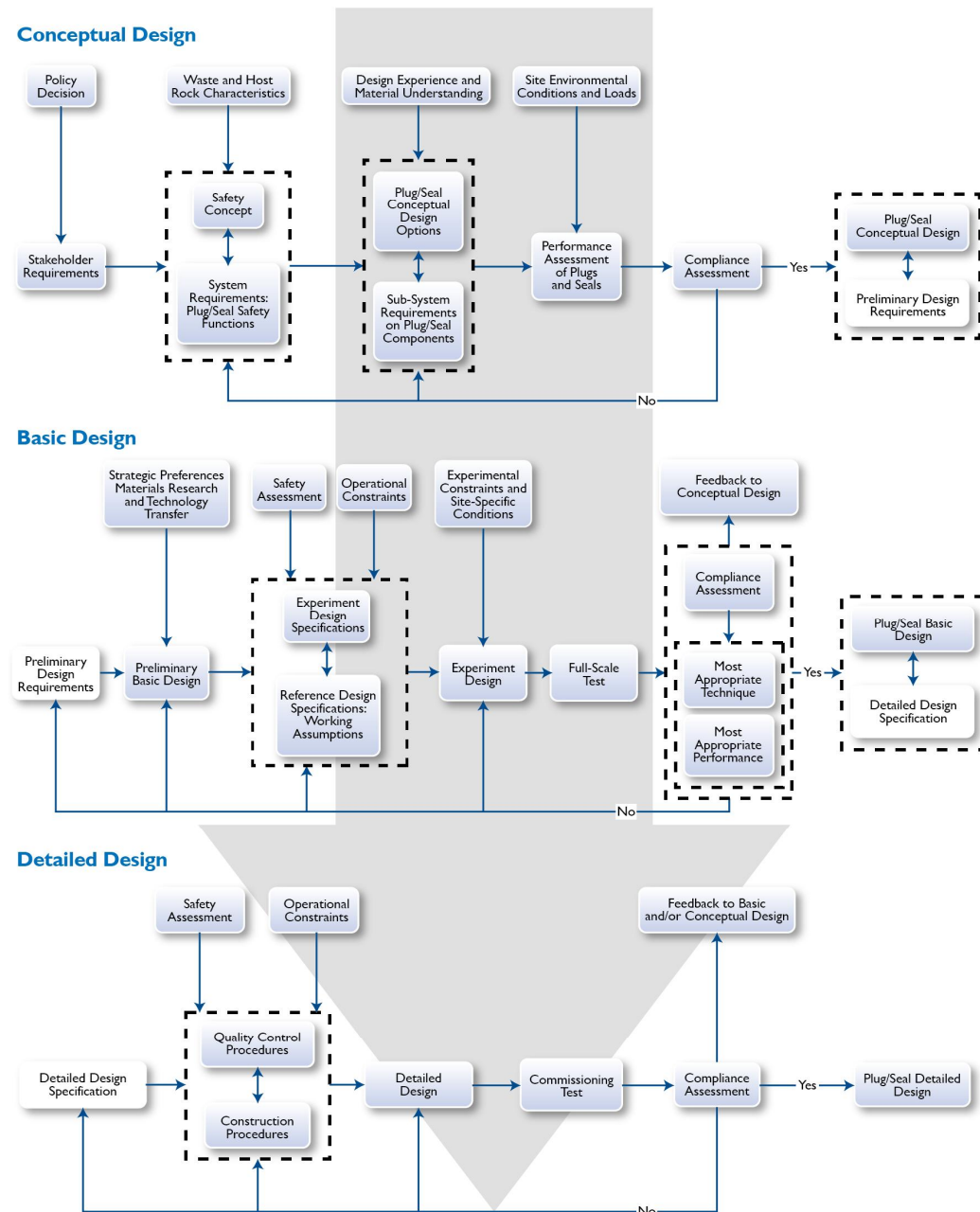
- Illustrates the iterative development of the design basis, undertaken in parallel with the development of conceptual, basic and detailed designs.
- Dashed boxes are used to show activities undertaken in parallel.



The DOPAS Design Basis Workflow

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- Dashed boxes are used to show activities undertaken in parallel.

This version of the work flow in 2016. This is the final version in Deliverable D2.4.



Conceptual design

- **Conceptual designs describe the general layout of a repository structure, including the different repository components and how they are arranged, and the type of material used for each component (e.g., concrete, bentonite, gravel). In a conceptual design, the environmental conditions (including rock characteristics) are presented in generic terms, for example by describing the nature of the processes occurring rather than quantifying the processes. The performance of the components and the overall structure are described qualitatively.**



Basic design

- In a basic design, the components in the conceptual design are described in more detail with an approximate quantitative specification of geometry and material parameters. The properties of the environmental conditions are presented in detail, which requires characterisation of the site or elaboration of the assumptions underpinning the design. Performance is described quantitatively.

Detailed Design

- In a detailed design, the concept is presented in such detail that it can be constructed, i.e. it provides precise information on all aspects of the structure's components.



Experiments in DOPAS

- The full-scale demonstration experiments undertaken in the DOPAS Project have addressed specific objectives, for example; technological feasibility (FSS), performance (DOMPLU), alternative design options (POPLU), and materials research in support of preliminary basic design (EPSP and ELSA).
- Results of full-scale tests provide further support to design decisions, especially optimisation issues.
- Design requirements may be revised based on learning from the experiments.
- The outcome of a satisfactory compliance assessment is selection of a basic design.





Thanks for listening!



www.posiva.fi/en/dopas

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