

German boundary conditions affecting decommissioning technology



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IAEA

International Atomic Energy Agency

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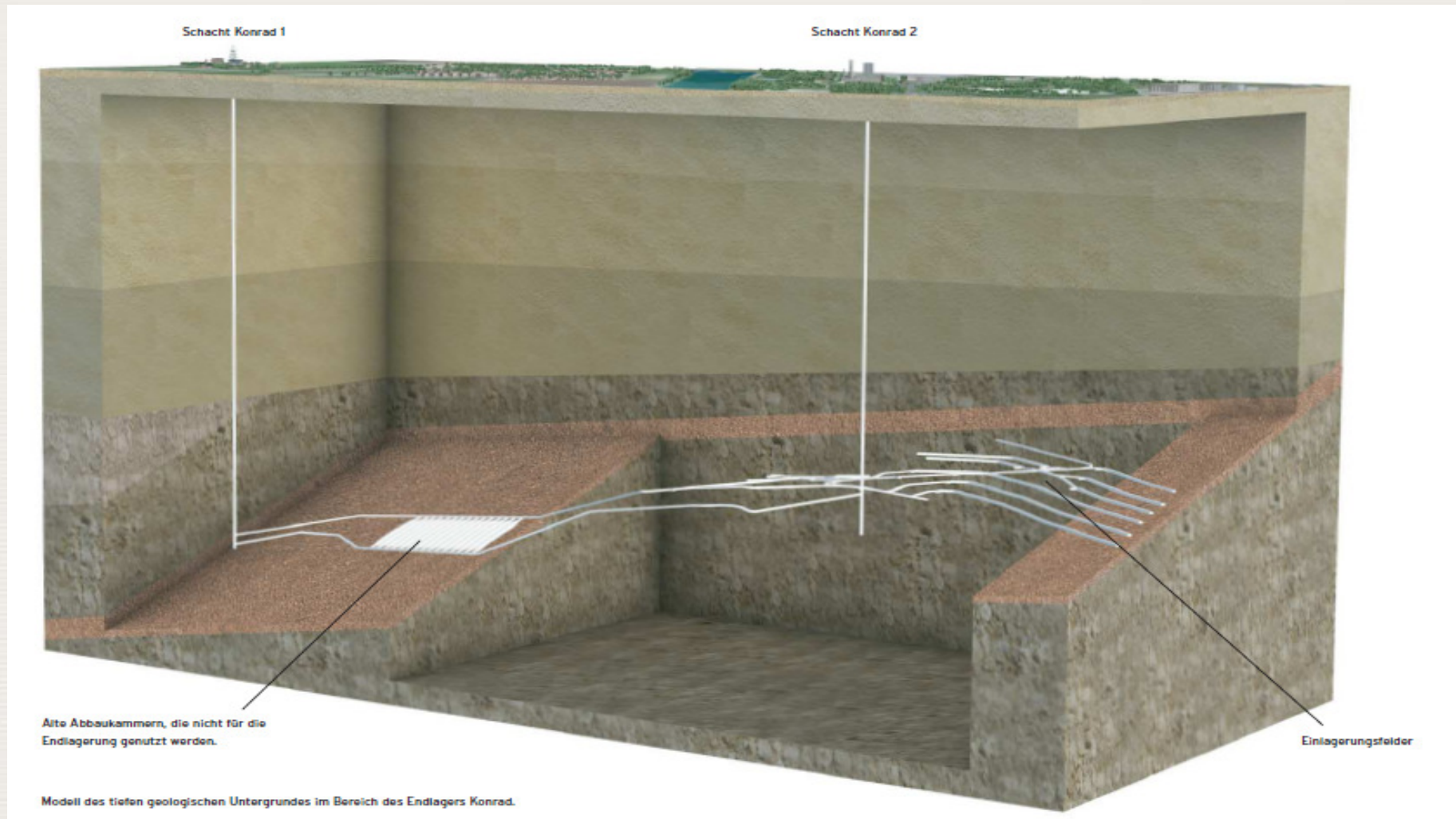
Disposal of radioactive waste (I)

- Geological disposal only
 - Policy decision from the very beginning
 - Near surface disposal: not a part of German policy
 - Distinction between heat generating waste and non heat generating waste
- Konrad Repository (~800-1300 m deep)
 - For non heat generating waste incl. long lived waste
 - Licensed in 2002; licensing process lasted 20 years
 - License was challenged at court
 - Final court decision: rejection of objections, 26 March 2007
 - Valid 'waste acceptance requirements' (WAR)
 - Waste packages (forms and containers) specified
 - Limits for radionuclide inventories established

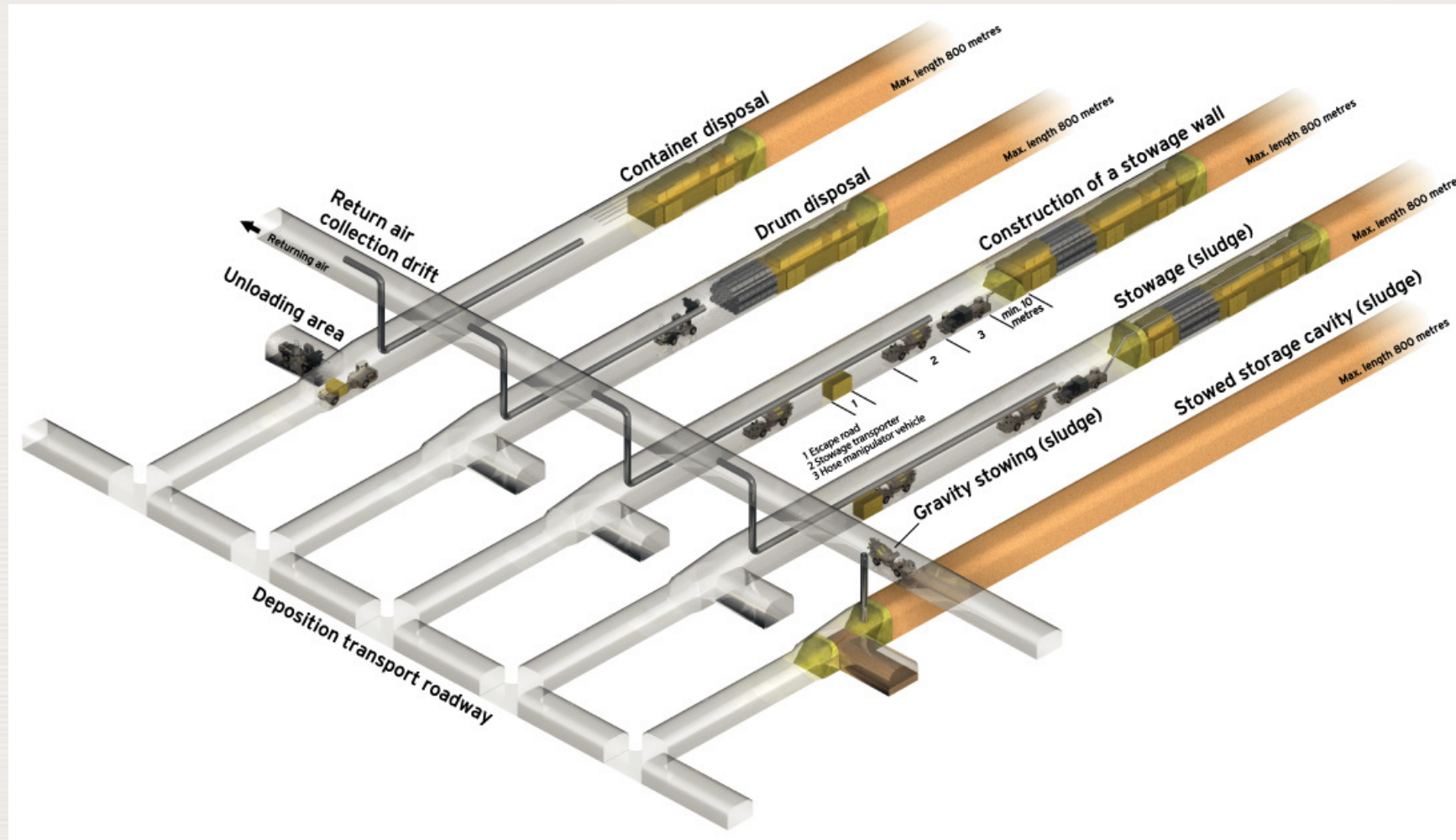
Konrad repository: Shaft 1



Konrad repository: Underground model



Konrad repository: Waste emplacement

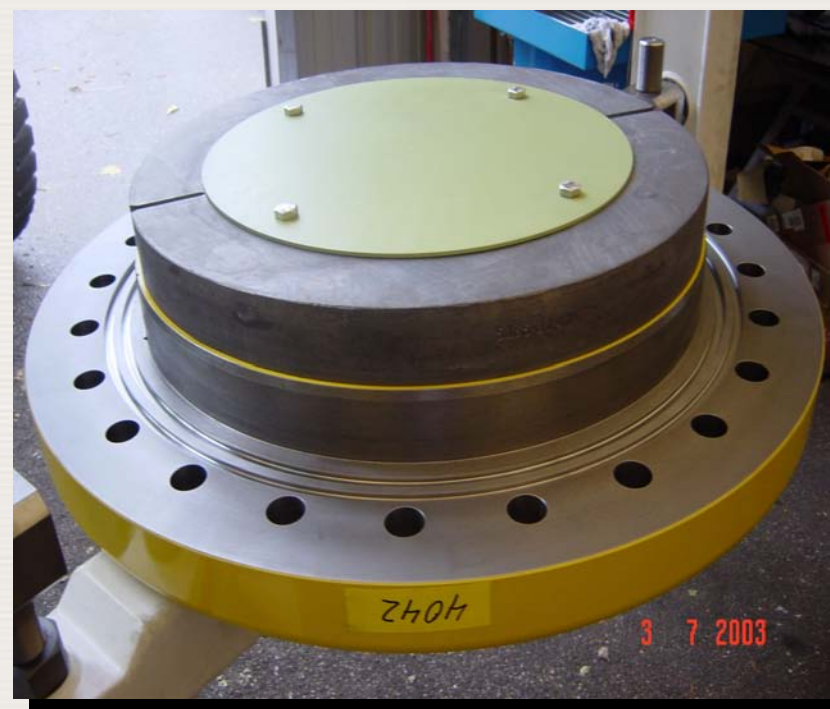


Cylindrical cast iron disposal containers



Cylindrical cast iron disposal container

with 60 / 80 mm lead shielding



Cylindrical concrete containers



Konrad container type IV (sheet steel)

(Loading with drums / closed container / container handling)



Konrad container type IV (concrete) and type II (sheet steel + concrete shielding)



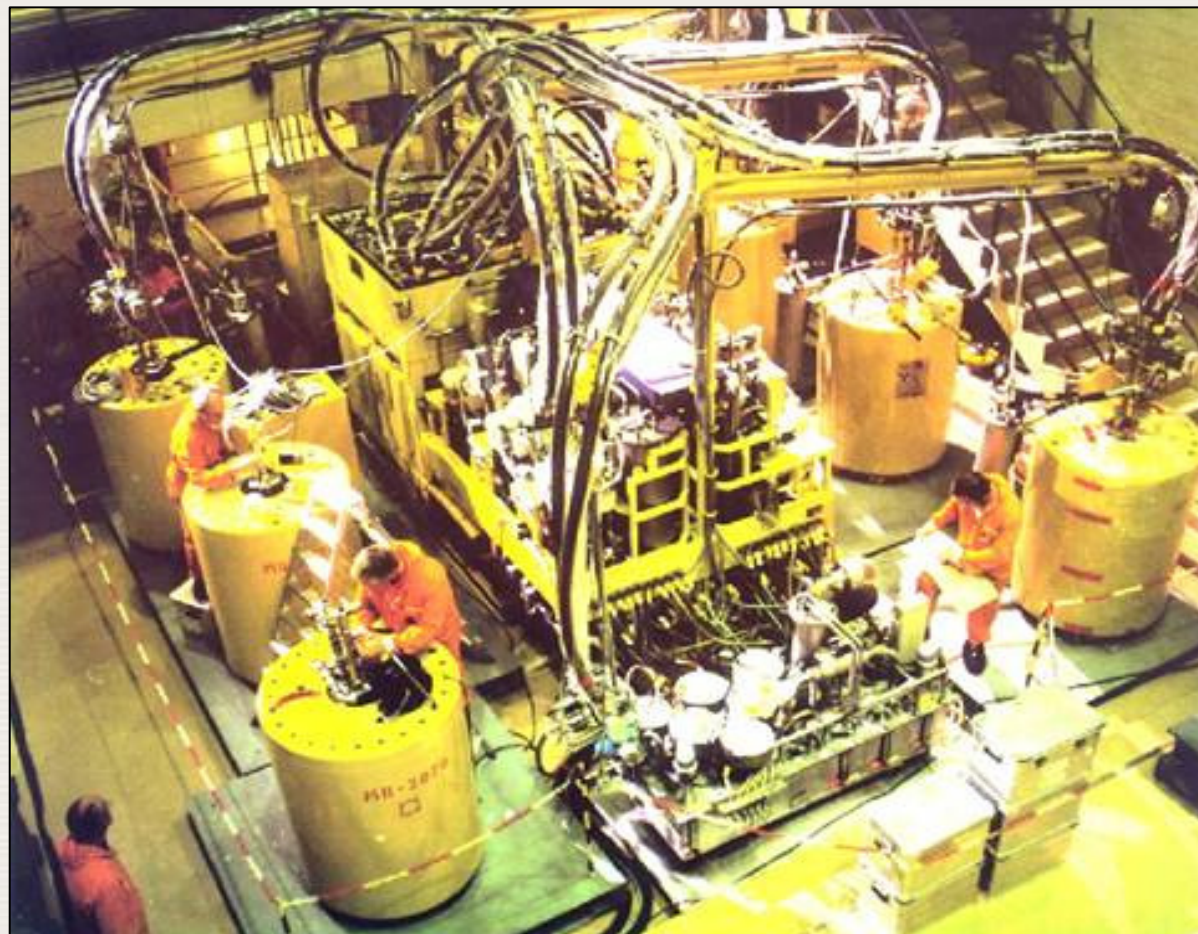
Disposal of radioactive waste (II)

- Control to demonstrate compliance with WAR
- Compliance is to be demonstrated (process control)
- Compliance is certified by Konrad operator (BfS)
- Disposal costs/Release from regulatory control
 - High disposal costs: 10 000 to 25 000 Euro/m³
http://www.endlager-konrad.de/clin_115/nn_1072978/sid_88F33455BD440F7261BEFA1AB588004C/nsc_true/DE/Themen/Konditionierung/__node.html?__nnn=true
 - Reminder: Austria charges 30 000 Euro/m³
 - Release of materials from nuclear regulatory control (clearance) is essential to reduce disposal costs
 - Clearance levels stipulated in Rad. Prot. Ordinance
 - Clearance is almost irreversible → Proper control
 - Release needs regulatory approval

Conditioning of radioactive waste (I)

- Conditioning for compliance with Konrad WAR
- 'Minimisation' of radioactive waste
 - Avoid generation of radioactive waste, e.g. bring no unnecessary objects into the controlled area
 - Decontamination of materials for 'clearance'
 - Use of advanced waste processing schemes, e.g.
 - + Drying of liquids in cast iron containers / no cementation
 - + Super compaction of solid waste, incl. ashes
 - + Incineration of burnable waste (solid and liquid)
 - + Melting of metals (e.g. for cast iron disposal containers)
 - Routine use of mobile conditioning plants at NPPs
 - Waste generation of a large NPP: ~45 m³/a
http://www.bfs.de/en/endlager/abf_progn_laufz.html

Processing of liquid waste (mobile)



Super-compaction of solid waste (mobile)



Conditioning of radioactive waste (II)

- Documentation of data
 - Clearance and waste disposal need a complete and traceable declaration of radionuclides
 - Measurement of a full set of radionuclides is much too tedious and expensive
 - Development of radionuclide relations (vectors) for clearance AND waste processing / disposal
 - Application of radionuclide relations for declaration
 - Documentation of radionuclide inventories and all other relevant data: 'cradle to grave' approach
 - Sophisticated electronic data documentation system

Large scale / small scale operations

- HDB: Hauptabteilung Dekontaminationsbetriebe is the FZK's central facility for processing and storage of radioactive waste
- HDB developed during the operation of FZK's nuclear facilities and continued to process decommissioning waste (with modifications / adaptations)
- Large facility: Main radioactive waste generator in D
- HDB also contracts work from customers outside FZK
- Most R²D²P countries have small sized facilities
- Small / large sized facilities need to do the same work
- Specific adaptations will be necessary
- Lecturers were requested to discuss 'downsizing'

Summary / Conclusions (I)

- Germany has a licensed geological disposal facility with quantitative WAR
- WAR must be fulfilled when radioactive waste is conditioned
- Compliance with WAR is controlled routinely
- Disposal costs are high
- Minimisation of radioactive waste is essential
- The technology applied for decommissioning of nuclear facilities and for the management of decommissioning waste is in accordance to these boundary conditions

Summary / Conclusions (II)

- Other countries apply other approaches, e.g. near surface disposal and / or no clearance
- The FZK is the largest German waste generator with a central waste management facility (HDB)
- HDB also contracts work outside FZK
- Most of the countries represented in the R²D²P have small nuclear facilities and waste amounts
- ‘Downsizing’ is an issue to many participants
- The ‘Discussions’ should be used to address downsizing and other technological issues

THANK YOU

