Karlsruhe Institute of Technology

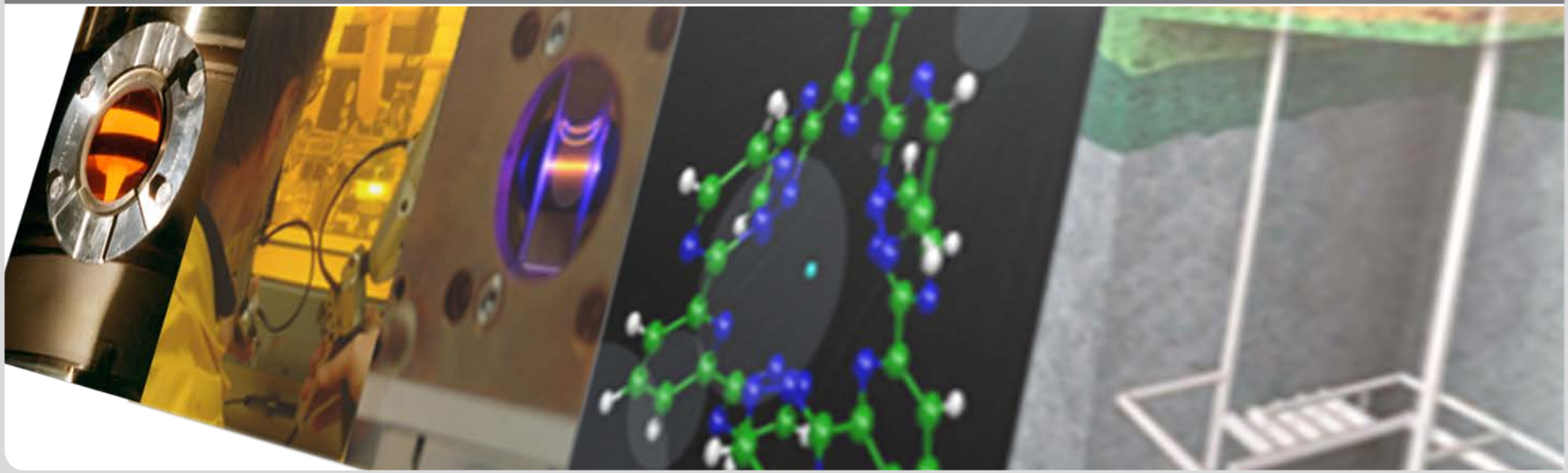
DAEF
Deutsche Arbeitsgemeinschaft Endlagerforschung
German Association for
Repository Research

Progress in Dealing with the World's Stockpile of Used Nuclear Fuel – how can Consolidated Interim Storage and Reprocessing Help?

- the German case -

Horst Geckeis

INSTITUTE FOR NUCLEAR WASTE DISPOSAL (INE)

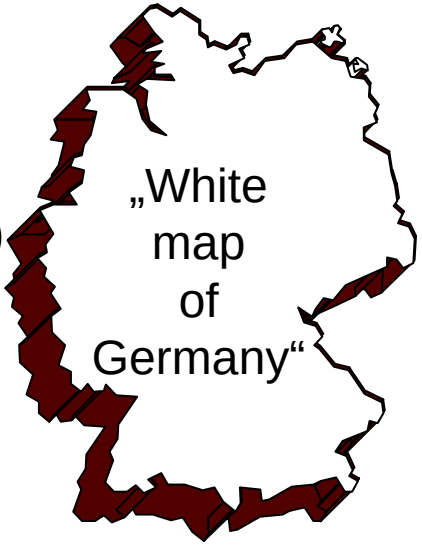


Situation in Germany I

- 2005 decision to stop reprocessing
- 2011 Nuclear phase-out decision

  Waste volume forecast: non heat producing 300,000 m³
  (incl. decommissioning waste)
  heat producing 29,000 m³
  (Spent fuel, HLW-glass, technological waste)

- 2013 Repository site selection act ("Standortauswahlgesetz")
  - Commission for defining selection criteria (until 2015)
  - Foundation of a new department (regulator) "Federal institute for nuclear waste disposal (BfE)"
  - Public participation
  - Site selection until **2031**



No host rock formation excluded

Situation in Germany II

- Spent Nuclear Fuel (SNF) stored in intermediate (dry) storage facilities
- Central:

  Gorleben (1995 – 2034): capacity 420 Castor positions / occupied: 5 (+ 108 HLW)
  Ahaus (1997 – 2036): capacity 370 Castor positions / occupied: 329
- Decentral (13):

  capacity: 1450 Castor positions (licensed) / occupied: 316

  total demand: 1009 positions
  Start of operation: 2002-2007
  Licensing period: 40 a
- Local: (almost excl. for spent fuel from former GDR NPPs)

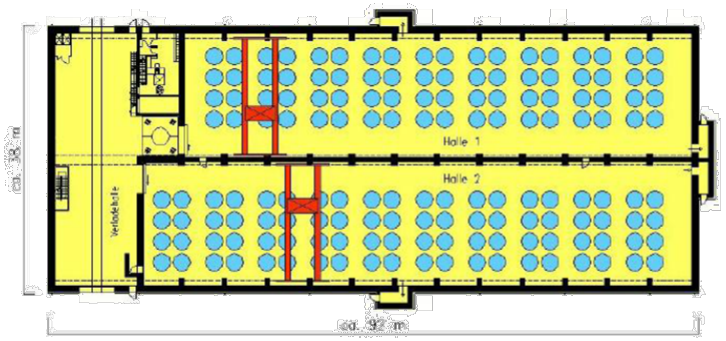
  Lubmin (1999 – 2039): occupied: 69 (+ 5 HLW)

(BFS, 2014)

Intermediate storage facilities in Germany

WTI-concept:

- wall thickness: 70/85 cm
- roof thickness: 55 cm
- double-naved hall
- natural draft cooling

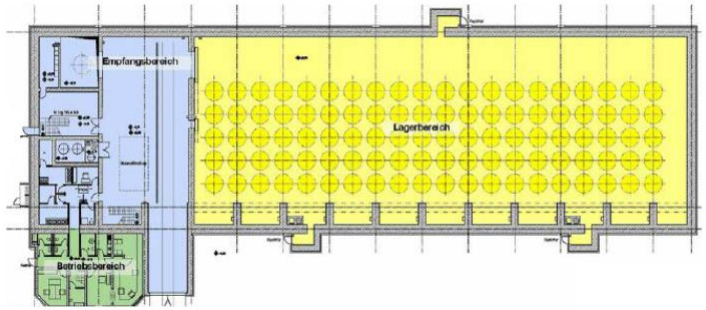


WTI

(5 sites)

STEAG-concept:

- wall thickness: 120 cm
- roof thickness: 130 cm
- single-naved hall
- natural draft cooling

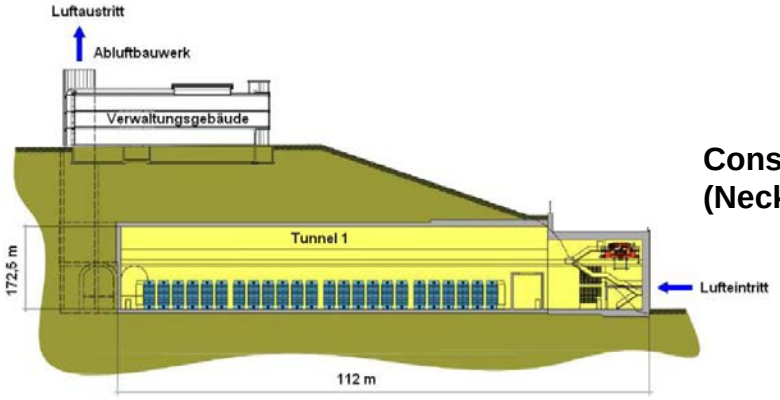


STEAG

(6 (+1) sites)

Consolidated storage facility
(Neckarwestheim)

- 2 tunnels underground
- natural draft cooling



Consolidated ISF (Neckarwestheim)

- Primary safety function provided by thick wall container -

GRS, 3597, 2010

Solutions for ultimate nuclear waste disposal heavily disputed and controversially discussed

Frankfurter Allgemeine
Wissen

Radioaktiver Abfall

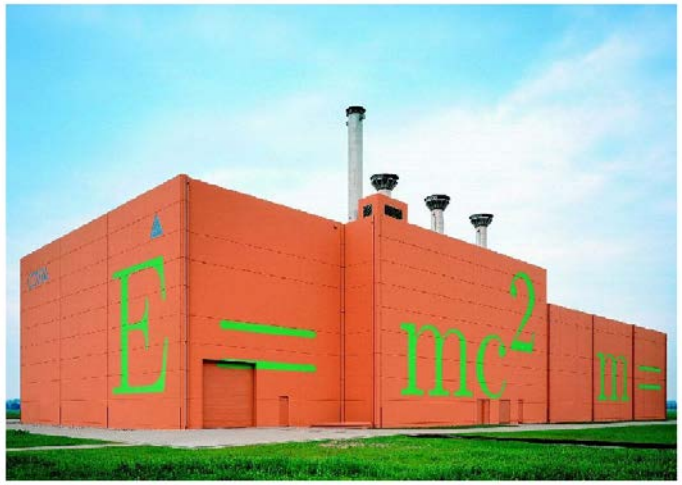
Schluss mit dem Selbstbetrug

11.10.2011 · Die Suche nach einem endlos sicheren „Endlager“ ist die reine Illusion. Die Geologie wird politisch missbraucht. Suchen wir einfach erstmal ein Lager.

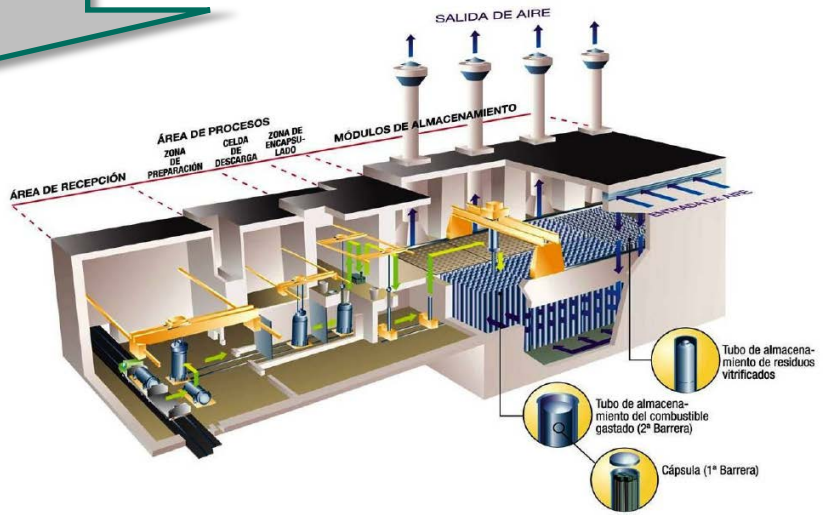
Von GREGOR MARKL

Radioactive Waste
Stop self-deception

.. Search for a long-term safe „final repository“ is an illusion… Let‘s go for a storage facility first.



Long term intermediate storage facility HABOG, NL



Planned long term intermediate storage facility (CTS) in Spain

Partitioning & Transmutation
- an option for Germany?

Chances:

- Appears to be technically feasible within the next decades
- has the potential to reduce the actinide content in high-level nuclear waste significantly.
- can potentially reduce HLW volume in Germany to 1/3
- reduction of repository „footprint“ by max. 50%

Risks:

- doubts for public acceptance
- doubts for gain in safety for a repository (actinides have low mobility)
- increase of secondary waste volume (LILW) by ~ 30%
- proliferation risks

Renn et al., 2013

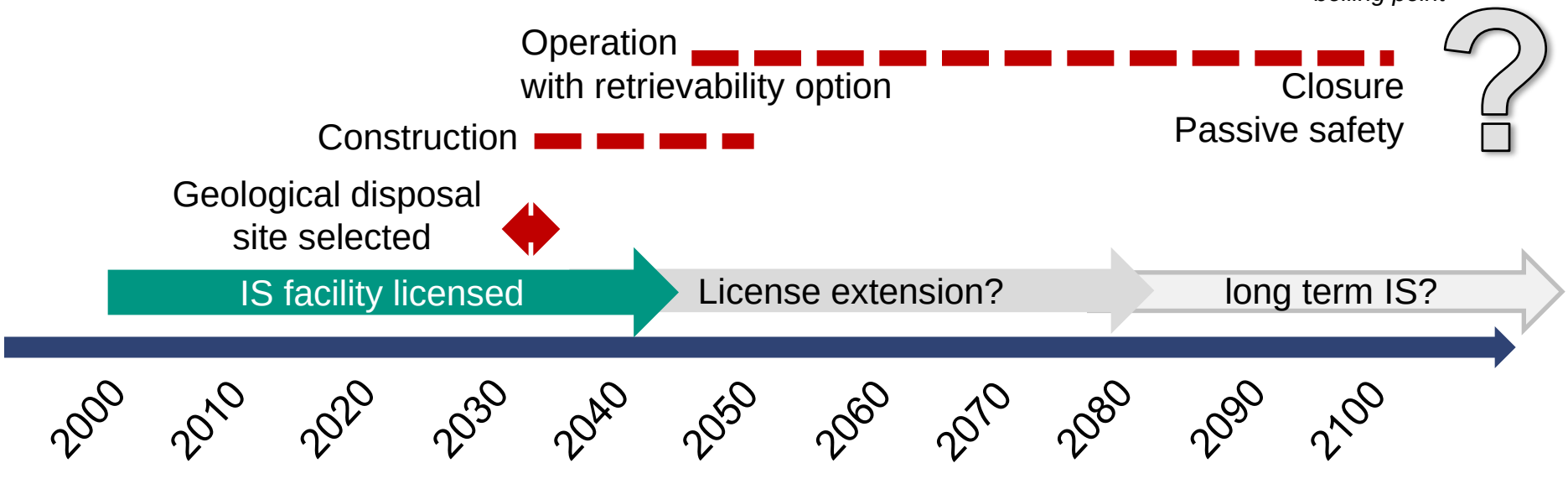
The problem with the time scale:

How to demonstrate (active) safety of long-term intermediate storage facilities for more than a century?

Chances:
- new technologies
- improved concepts

Risks:
- economic risks
- technical uncertainties
  (used nuclear fuel degradation?)
- societal changes
- Loss of competences (Know-how)

European economic crisis reaches boiling point



Theses:

- Intermediate storage of SNF over time scales up to 100 a needs development of:
  - respective (new) requirements,
  - monitoring concepts,
  - ageing management programs,
  - long term R&D/E&T programs

- Safety of long-term intermediate storage facilities (≥ 100 a) will be extremely difficult (if not impossible) to be demonstrated.

- **In any case:** final disposal concepts (deep geological repository) need to be implemented as soon as possible.

- Extended intermediate storage ***does not mean*** to delay the decision on repository concepts and site selection to a later stage.

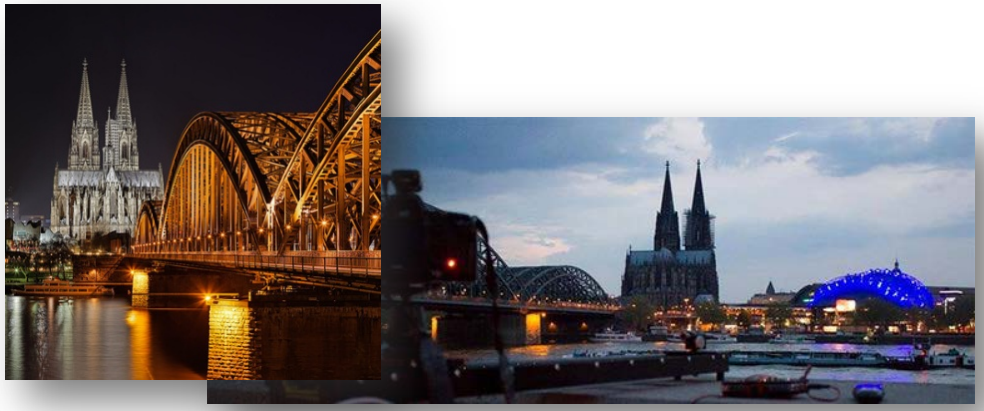
Key topics in deep geological disposal

Cologne, 24.-26. September, 2014

www.daef2014.org

TOPICS:

- Repository concepts in different host rocks and safety analyses
- Governance and participation
- Interdisciplinary aspects of nuclear waste disposal
- Aspects of operational safety related to nuclear waste disposal
- Construction of technical barriers and
- All scientific aspects of the nuclear waste disposal safety case



Cologne – City of the „dome“
Site with more than 2000 years history