

# **Evaluation of Long-Term Safety of Spent Fuel Repository and Cost/Finance Issues Related to Spent Fuel Management**

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Seppo Vuori  
VTT Technical Research Centre of Finland

## Role of VTT in Finnish nuclear waste management research

- VTT is the leading research institute in Finland carrying out nuclear waste management research
  - Polytechnic own research
  - Good collaboration with other research institutes
- Work is done both for the industry, most notably the Finnish spent fuel management company Posiva, and for the authorities (STUK & TEM)
- VTT has been involved in numerous safety and materials studies around 30 years

## Nuclear Waste Management Research at VTT

### **Management and final disposal of spent nuclear fuel and other types of nuclear waste**

- Modeling of the physical and chemical processes in hard-rock repositories
- Experimental research on the behaviour of engineered barriers
- Technology development for engineered barriers (canister & bentonite backfill and buffer)
- Safety assessment of geological disposal of spent fuel
- Operational safety of waste treatment and disposal actions
- Safety of transportation of spent fuel

## VTT Nuclear R & D - continued competence building

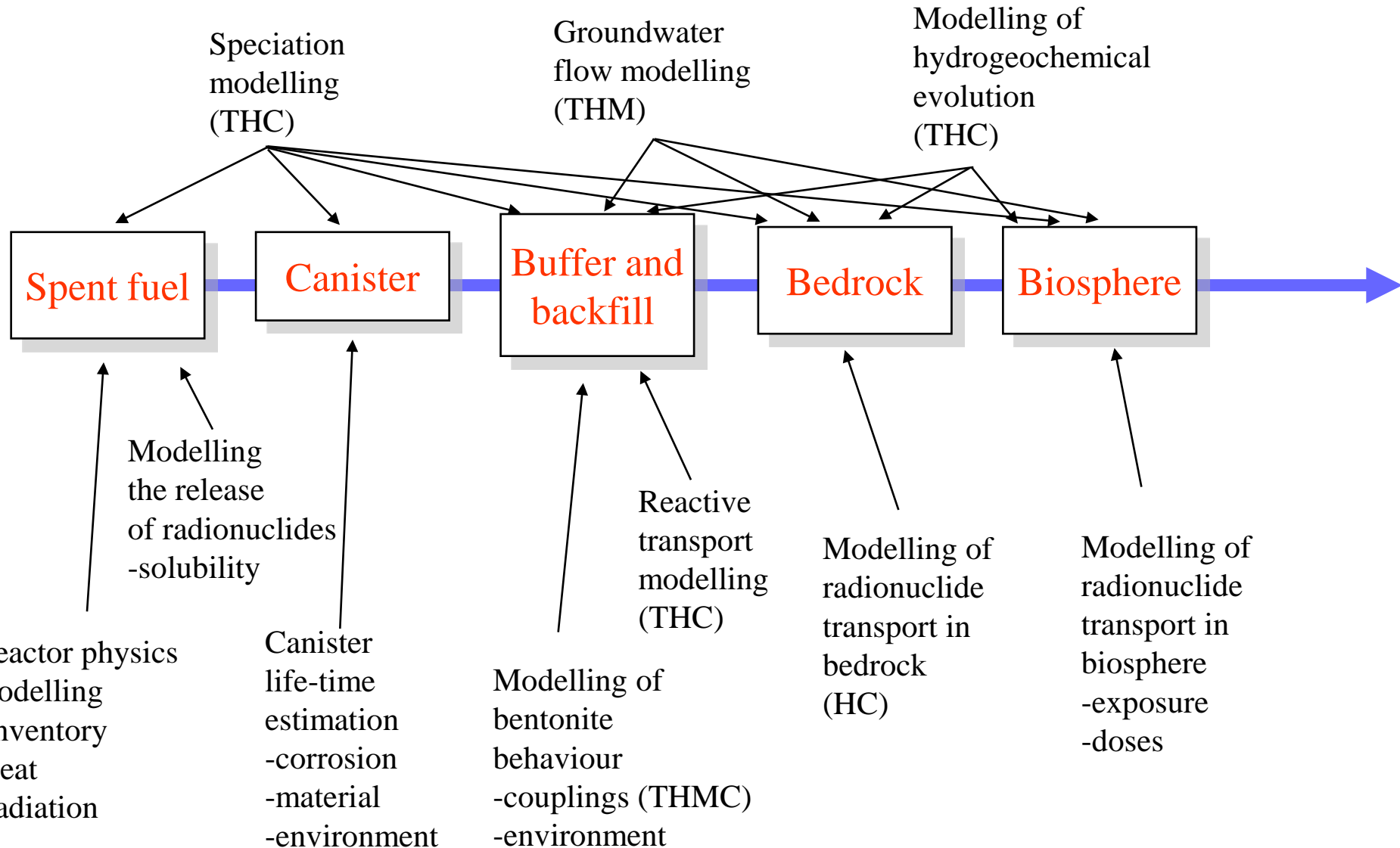
- VTT has coordinated the public sector's research programmes on nuclear waste management during 4 phases:
  - JYT: 1989-1993; JYT2: 1994-1996; JYT2001: 1997-2001
  - KYT: 2002-2006
- In the projects of the on-going phase, KYT2010 (1997-2010), VTT continues to have a key role
- Volume of KYT2010 is about 1.4 M€/year
- VTT will coordinate also the next phase of KYT programme from 2011 to 2014;



## Posiva's safety case for spent fuel disposal:

- Synthesis of evidence, analyses and arguments that quantify and substantiate the safety of the planned facility.
- Includes the quantitative safety analysis and possibly other safety indicators
  - "other safety indicators": less mathematical and more easily digestible safety indicators (for non-technical audiences)
- Assessment of remaining uncertainties and open issues, their potential effects, and ways to resolve them.
- In brief: Safety Case means everything the applicant presents to the authorities in support of an application to site, construct, operate or close a disposal facility:
  - Burden of proof lies with the applicant
- VTT has major role in carrying out research supporting Posiva's aims to present a comprehensive Safety Case.
- VTT also supports STUK in making judgements on the sufficiency and quality of the material provided by Posiva to STUK during different stages of the licensing process.
- Consequently high emphasis needs to be paid on avoiding any conflicts of interest between the studies performed for the implementing organization (Posiva) and the regulator (STUK).

# Analysing the safety of a spent fuel repository



## Research at VTT on advanced fuel cycle options

- VTT is also participating in international efforts dealing with possible future nuclear energy systems; for example within the Sustainable Nuclear Energy Technology Platform (SNETP)
- In the fuel cycle options studied the arrangements for nuclear waste management have key importance
  - The sufficiency of uranium reserves worldwide can better be guaranteed in advanced fuel cycles
  - Some benefits might be achieved also regarding the long-term safety of geological disposal (*the time frame requiring detailed long-term safety considerations can be reduced*)
- The present spent fuel management strategy in Finland continues to be based on direct disposal of spent fuel (*according to the Finnish Nuclear Energy Act*)

## Cost/Finance Issues Related to Spent Fuel Management

- VTT has participated in a study financed by the European Commission
  - *Comparison among different decommissioning funds methodologies for nuclear installations*  
[http://www.wupperinst.org/uploads/tx\\_wiprojekt/EUDecommFunds\\_FinalReport.pdf](http://www.wupperinst.org/uploads/tx_wiprojekt/EUDecommFunds_FinalReport.pdf)
  - *The study covered 16 members states having nuclear power programme*
- In Finland the funding system covers the whole nuclear waste management – including decommissioning
- The study concludes that in Finland and Sweden the funding systems are most advanced and fulfil most of the desired features
- In Finland the full undiscounted nuclear waste management costs have to be provided or to be guaranteed in the funding system from the beginning of the operation of a nuclear power plant.