

# Technical Working Group on Research Reactors (TWGRR)

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## Research Reactor Ageing

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**IAEA**

International Atomic Energy Agency

# The 'bathtub curve'

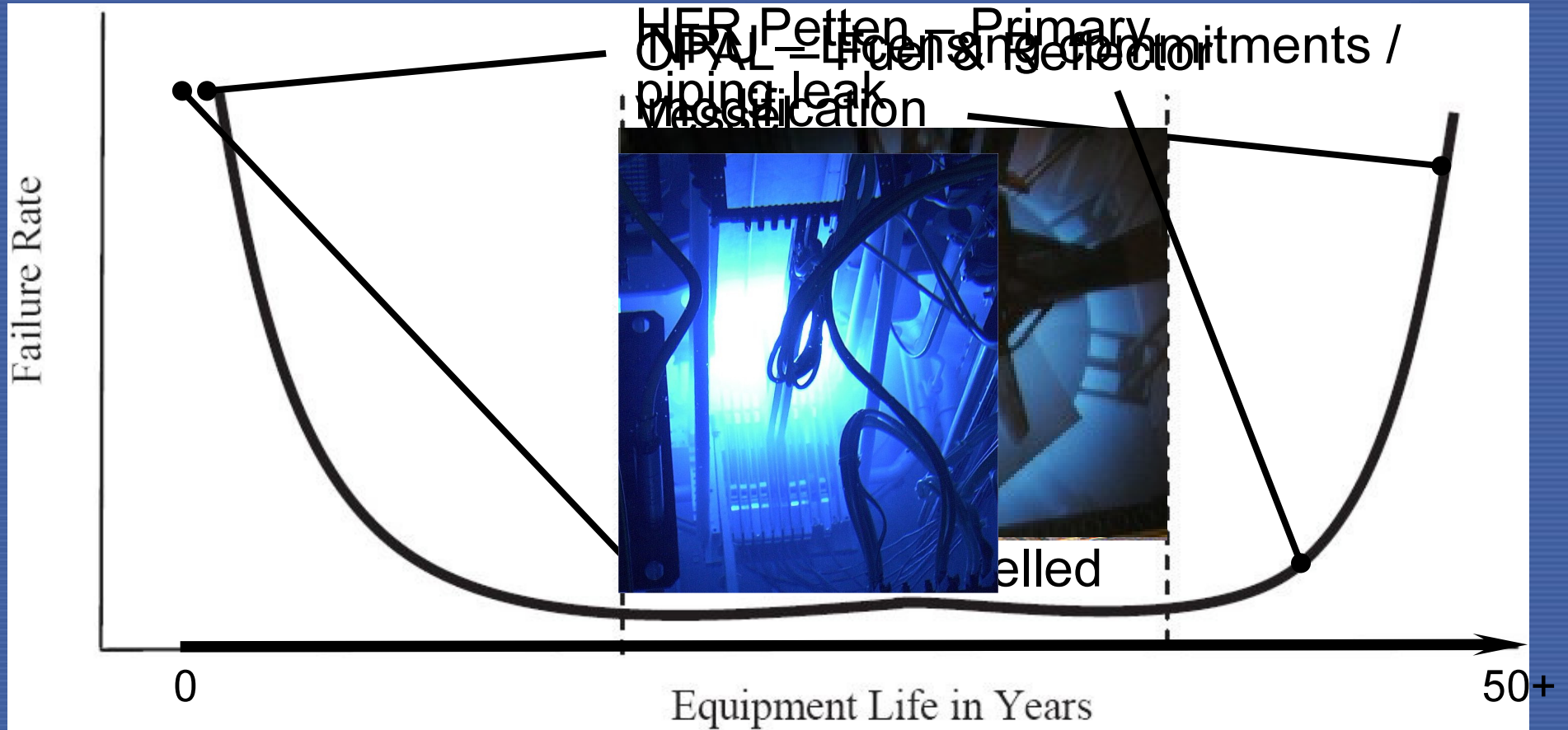
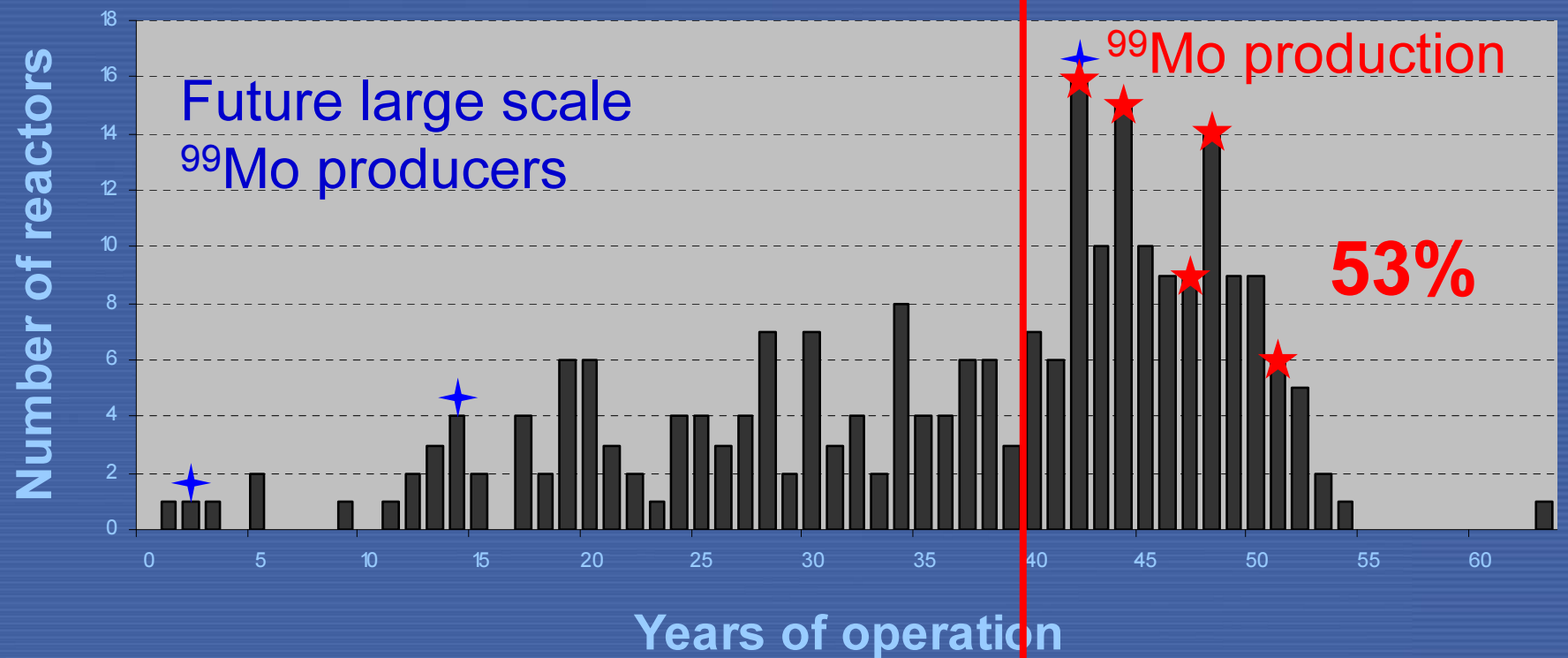


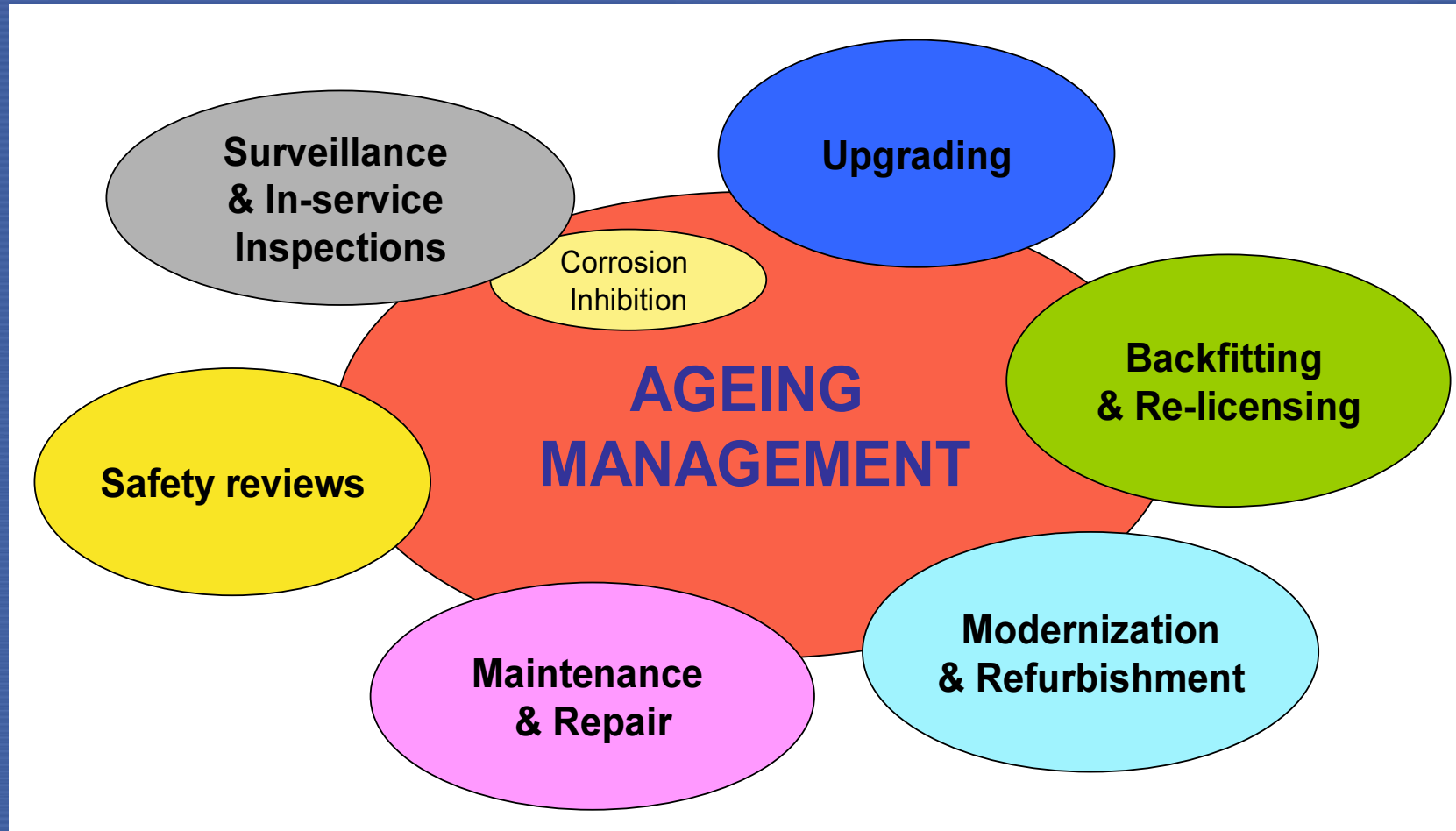
FIG. 1. Classic 'Bathtub' Reliability Curve.

# RR Ageing

RR Age distribution



# RR Ageing management



# Questionnaire responses

## Most frequently reported projects

- Reactor operation ~220 projects reported
  - 43 (19.5%) RPS, I&C, NI's (incl. console mods)
  - 22 (10.0%) Primary cooling
  - 21 (9.5%) Electrical power & distribution (incl. emergency power)
  - 19 (8.6%) Fuel / core design
  - 19 (8.6%) Secondary cooling (incl. cooling towers and chilled water systems)
  - 12 (5.5%) Ventilation / AC
  - 10 (4.5%) Control rods / drive system
  - 8 (3.6%) Reactor / SNF pool and pool support structure
  - 8 (3.6%) Radiation monitoring system
  - 7 (3.2%) ECCS
  - 7 (3.2%) Security / physical protection
  - 7 (2.3%) Fire detection / protection
  - 37 (16.8%) Other (general facility overhaul, water treatment, reflector, seismic upgrades, shielding, buildings / structures (incl. containment), documentation / management system (incl. SAR, license renewal, etc.), rad waste (solid, liquid and gaseous), compressed air, heavy water management system)

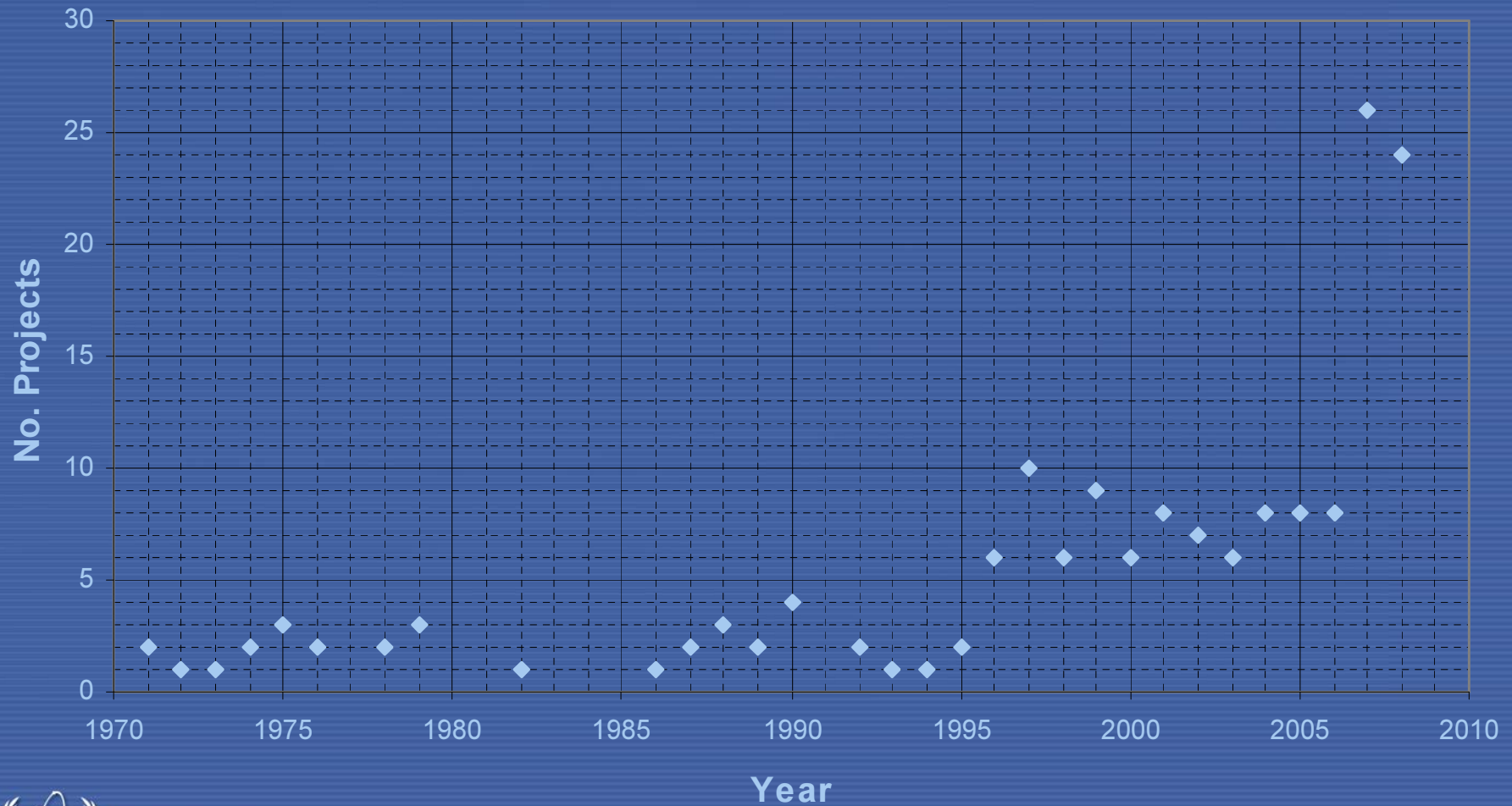
# Questionnaire responses

## Most frequently reported projects

- Utilization related systems ~ 19 projects reported
  - 13 Irradiation facilities
  - 4 Rabbit transfer / handling
  - 1 Neutron beams
  - 1 Cold neutron source

# Questionnaire responses

## Reactor Modification Projects

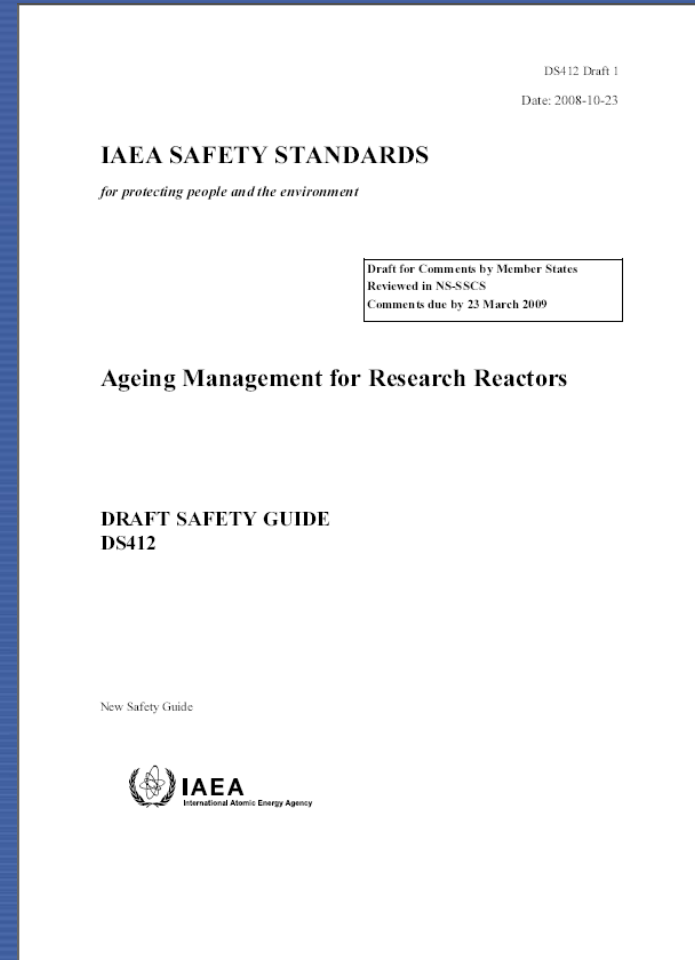


# IAEA RR Ageing Activities

## Safety Standard

- 2007 – initiation by splitting from NPP Ageing Management
- Current draft open for comments until March

<http://www-ns.iaea.org/downloads/standards/drafts/ds412.pdf>



# IAEA RR Ageing Activities

## Develop RR Ageing knowledge base

- Consultancy in Dec. 2008
- No need to 're-invent' foundation (definitions, descriptions, etc.) already covered in TECDOC-792 and DS-412.
- Build on this work by progressing recommendations of TECDOC-792 (gather, compile and share relevant experience)
- Combined meeting with M&R planned for October 2009
- Anticipated outputs – IAEA document and a simple database (searchable by system and ageing mechanism)

[http://www-pub.iaea.org/MTCD/publications/PDF/te\\_792\\_prn.pdf](http://www-pub.iaea.org/MTCD/publications/PDF/te_792_prn.pdf)

IAEA-TECDOC-792

## ***Management of research reactor ageing***

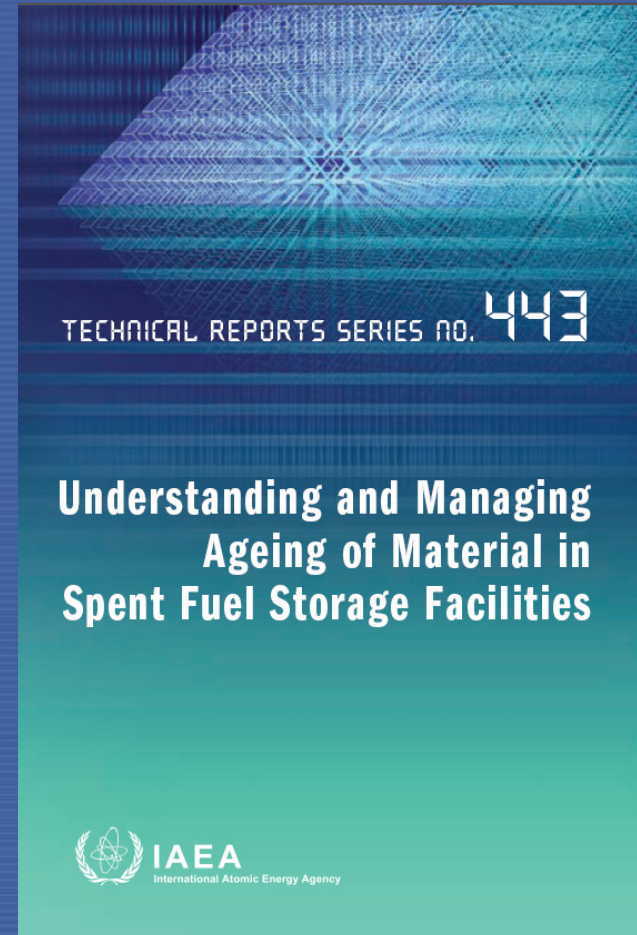


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# Related work (complete)

- Application of Non-Destructive Testing and In-service Inspection to Research Reactors, IAEA-TECDOC-1263, IAEA, Vienna (2001)
- Corrosion of Research Reactor Aluminium Clad Spent Fuel in Water, Technical Reports Series TRS-418, IAEA, Vienna (2004)
- Understanding and Managing Ageing of Material in Spent Fuel Storage Facilities, Technical Reports Series TRS-443, IAEA, Vienna (2006)
- Maintenance, Periodic Testing and Inspection of Research Reactors Safety Guide, Safety Standards Series No. NS-G-4.2, IAEA, Vienna (2006)
- Optimization of Research Reactor Availability and Reliability: Recommended Practices, Nuclear Energy Series No. NP-T-5.4, IAEA Vienna (2008)



# Thank You

For your attention

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