NRG support in ageing management and LTO for nuclear power plants and research reactors

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Ing. Robert Krivanek, Ph.D.

He received his master and doctor degrees in mechanical and nuclear engineering. He has 29 years of experience in nuclear industry. Since 1994 he was with CEZ in the Czech Republic in various positions in operations, engineering and nuclear safety. His main focus was on ageing management and preparation of NPPs for long term operation (LTO).

Since 2012 he served for the International Atomic Energy Agency (IAEA) in Vienna, Austria as an ageing management and LTO programme manager.

Since 2021, he has been working for Nuclear Research and consultancy Group (NRG) in the Netherlands as a manager for international ageing management and LTO activities.

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Our focus

NRG focuses on two propositions:

Advancing Nuclear Medicine
We will grow our position in this exciting new market, by creating FIELD-LAB as a breeding ground for curative radiopharmaceuticals, by securing our position in molybdenum, by seizing the opportunity of iodine and radioembolisation and promote the use of lutetium.

Securing Nuclear Performance
We will consolidate and grow our existing business, by supporting new generation reactors, conduct materials and fuel research, implement measures to safely extend the lifetime of existing operations. We perform certifications and define safety protocols, measurement and compliance, performance optimization, implement smart software solutions, support decommissioning, decontamination, waste management, and medical safety.

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Nuclear Research and consultancy Group (NRG) sites in the Netherlands

Petten

Arnhem

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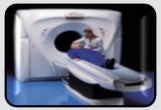
NRG Strategy and focus areas

1. Fuel management

2. Nuclear Compliance & Projects

3. Radiation protection

4. Decommissioning & Services



5. Nuclear Medical

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NRG Nuclear Compliance and Projects Cluster

Main project areas:

- Safety studies and analysis (PSR, PSA, etc.)
- Asset integrity (TLAAs, fatigue)
- Licensing
- **Ageing management and LTO of NPPs and research reactors (under TULIP)**

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NRG provides services in ageing management and LTO under brand name

TULIP LTO covers:

- Ageing management and LTO project management/ overall support
- Methodologies development
- Scope setting
- Ageing management reviews
- Development, implementation and improvement of AMPs
- Identification and revalidation of TLAAs
- PSR preparation and conduct
- Data management
- All in line with IAEA safety standards

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IAEA safety standards – sound basis

IAEA safety standards:

- Reflect an international consensus on what constitutes a high level of safety
- Reviewed and updated regularly
- Represent approach to ageing management and LTO assessment generally accepted by operators and regulators
- US NRC experience (e.g. NRC regulations, GALL, GALL-SLR) considered and fully incorporated
- Used by IAEA as a basis for services (e.g. SALTO, OSART)

IAEA safety reports provide state-of-the-art information and good practices in implementation of safety standards

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Main IAEA publications on AM and LTO

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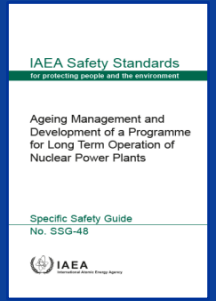
SAFETY REQUIREMENTS

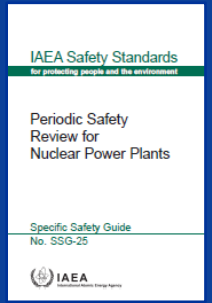
SSR-2/1, Rev.1
Safety of NPPs: Design

SSR-2/2, Rev.1
Safety of NPPs: Commissioning and Operation

SAFETY GUIDES



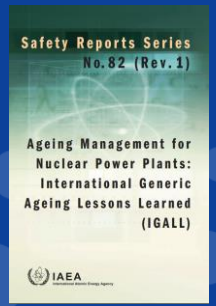
SSG-48
Ageing Management and LTO



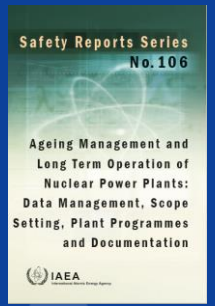
SSG-25
Periodic Safety Review

SSG-69
Equipment Qualification

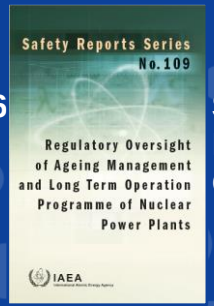
SAFETY REPORTS



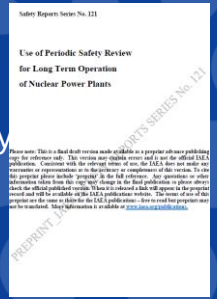
SRS 82
IGALL Rev.1 (Rev.2)



SRS 106
Scope setting



SRS 109
Regulatory Oversight



SRS 121
Use of PSR fro LTO

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EU DuC = N

NRG TULIP AM and LTO components

- Ageing management and LTO project management/ overall support
- Scope setting
- Ageing management review
- Ageing management programmes
- Time limited ageing analyses
- Review of plant programnes
- Development of documentation

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Ageing management and LTO project management and overall support

- Support in NPP ageing management or LTO project initiation, definition and execution
- Support in establishment of NPP organization
- Data collection and record keeping
- Support of NPP in communication with regulator
- Support of NPP in SALTO missions preparation
- Safety case risk assessment
- Prioritization of LTO corrective actions based on risk significance

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Scope setting of SSCs for ageing management and LTO assessment

- Development of methodology and criteria
- Safety classification
- Performance of scope setting
- Walk-downs to identify in-scope SSCs
- Commodity groups development
- Data management
- Use of PSA for scope setting

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Ageing management review (AMR)

- Development of methodologies – general, mechanical SSCs, electrical and I&C SSCs and civil SSCs
- Assessment of in-scope SSCs current conditions for all technical domains
- Identification of ageing effects and degradation mechanisms for all technical domains
- Identification of the appropriate programme for ageing management for all technical domains
- Reporting results

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Ageing management programmes (AMPs)

- Development of methodology
- Review of existing AMPs for mechanical, electrical, I&C and civil SSCs
- Development or improvement of AMPs for mechanical, electrical, I&C and civil SSCs based on AMR results
- Implementation of AMPs for mechanical, electrical, I&C and civil SSCs
- Reporting results

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Time limited ageing analyses (TLAAs)

- Development of methodology
- Identification of TLAAs in NPP documentation (design basis documentation, Safety Analyses Report, technical specifications)
- Revalidation of TLAAs for mechanical, electrical, I&C and civil SSCs
- Reporting results

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Review of plant programmes

- Review of existing plant programmes for LTO:
  - maintenance
  - in service inspection
  - surveillance and monitoring
  - equipment qualification
  - water chemistry
  - corrective actions programme
- Improvement of existing plant programmes for LTO

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Development of documentation

- Development and improvement of NPP procedures and processes based on results of ageing management and LTO assessment
- Update of Safety Analysis Report
- Development of safety case for regulator
- Development of licensing renewal application

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Other related NRG support areas

- Technological obsolescence management
- Equipment qualification
- Periodic Safety Review (PSR) preparation and conduct
- Deterministic safety analyses
- Probabilistic safety analyses (full scope)
- Environment impact assessment (EIA)

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NRG ageing management and LTO projects and activities

- Borssele NPP, the Netherlands
- Ringhals NPP, Sweden
- Olkiluoto NPP, Finland
- Atucha NPP, Argentina
- Oskarhamn NPP, Sweden
- Trillo NPP, Spain
- Koeberg NPP, South Africa
- Mihama NPP, Japan
- Doel and Tihange NPPs, Belgium
- HFR, the Netherlands
- NRG national R&D program (PIONIER)
- IAEA SALTO missions
- IAEA IGALL programme

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NRG ageing management and LTO support

Focus areas

1. Capacity building in ageing management, LTO and PSR
2. Technical support, calculations, analyses, project management support
3. Preparation of facilities personnel for review missions such as SALTO, OSART
4. Support in resolution of missions findings

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ageing management and LTO support

Our clients

Operators and regulators of NPPs and research reactors:

- In early phase of operation
- Preparing for LTO
- In LTO period improving ageing management to further operate

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Why use support of NRG in ageing management and LTO preparation?

- Knowledgeable and motivated team
- Significant experience accumulated since 2006
- Successful LTO projects in multiple countries
- Deep knowledge of IAEA safety standards and other guidance

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Recent NRG events

- 8-9 June 2022 – Nuclear Innovation Conference (NIC) with ageing management and LTO session in Amsterdam
- 19-22 September 2022 – hosted IAEA IGALL WG1 meeting in Petten
- 8 November 2022 – webinar on effectiveness of AMPs and plant level AMP
- 15-17 November 2022 – hosted IAEA IGALL training workshop in Alkmaar
- 18-19 January 2023 – international workshop on effectiveness of AMPs and plant level AMP in Petten
- 14 September 2023 – webinar on LTO Beyond 60

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Upcoming NRG events

- 27-28 February 2024 – workshop in cooperation with OECD/NEA on ‘LTO beyond 60’ in Petten, the Netherlands
- 5-6 June 2024 – NRG in cooperation with IAEA 2nd Nuclear Innovation Conference (NIC) with ageing management and LTO session in Amsterdam, the Netherlands

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More information?

https://www.ensuringnuclearperformance.com/en/products/safe-operations/long-term-operation

Contact our LTO team

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