Risk Informed Decision Making at STUK – Experience and Thoughts for the Future

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STUK

THE RADIATION AND NUCLEAR SAFETY AUTHORITY'S STRATEGY FOR 2018–2022

TARGETS RELATED TO STUK'S RESOURCES

1. THE HAPPIEST CIVIL SERVANTS IN THE WORLD
2. ABILITY TO UNDERSTAND COMPLEX ENTITIES
3. COST-AWARE OPERATIONS

EFFECTIVENESS TARGETS

4. RISK-INFORMED AND COMMENSURABLE OVERSIGHT
5. FLEXIBLE AND EFFICIENT WORKING METHODS
6. EFFECTIVE NATIONAL RADIATION SAFETY RESEARCH

SOCIETAL TARGETS

7. EMPHASISING THE RESPONSIBILITY OF THE OPERATORS
8. PEOPLE UNDERSTAND THE RISKS OF RADIATION
9. SOCIETY IS RESILIENT TO DISTURBANCES

OUR VALUES:

EXPERTISE

OPENNESS

COURAGE

CO-OPERATION

Risk Informed Regulation and Safety Management

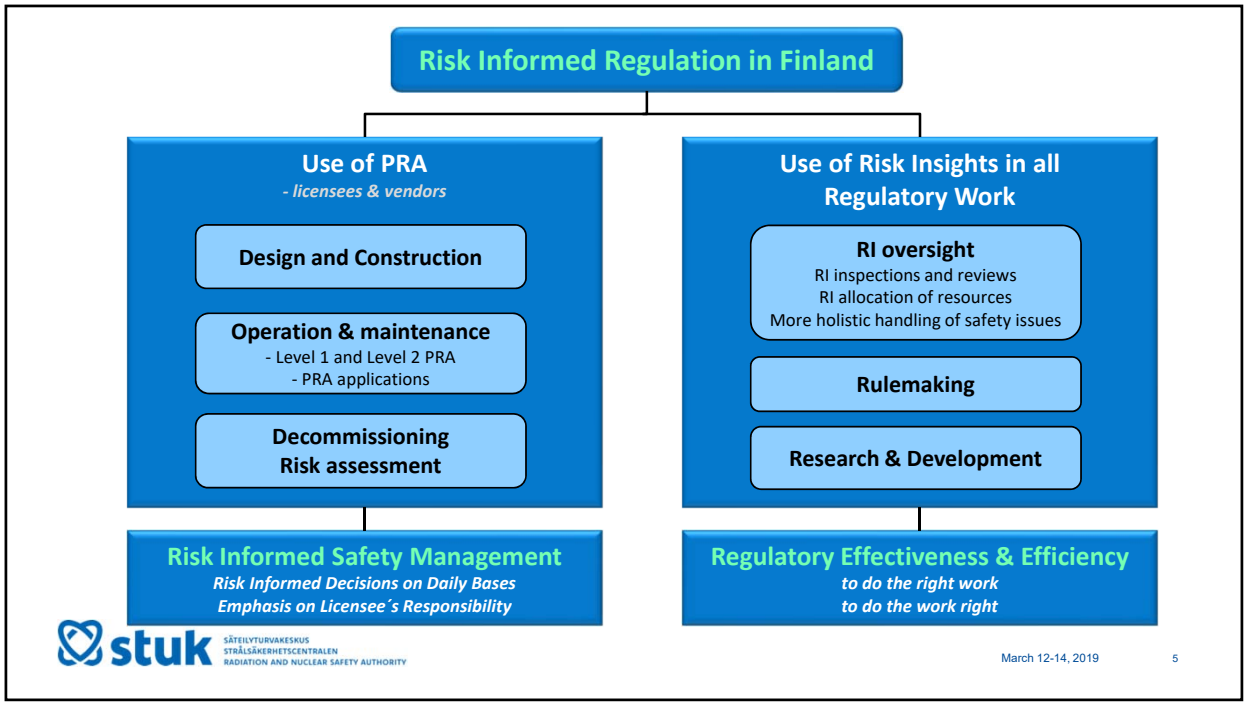
- "Risk informed" (RI) in Finland combines both the deterministic and probabilistic insights
- PRA is an official licensing document as stated in the nuclear safety legislation
- Use of PRA in RI safety management required in Regulatory Guides issued by STUK
- PRA has been used in RI *safety management* for more than 30 years
  - Development of Level 1 and Level 2 PRAs required in 1984
- In recent years, STUK has increased the use of risk insights in *oversight activities*

PRA Requirements in Brief

- PRA shall
  - be applied all through the plant life time
  - be plant specific, full scope Level 1 and 2 PRA, incl. internal events, internal & external hazards
  - include all operating modes
  - be up-to-date
  - demonstrate the fulfillment acceptance criteria: CDF < 1E-05 /a and LRF < 5E-07/a
- Several PRA applications required as a condition for licensing and operation

PRA Applications required by Reg. Guides

- **Plant modifications (identification of need and risk impact)**
- **RI Pre- and In-Service Inspections - RI-PSI/ISI**
- **RI In-Service (Periodic) Testing - RI-IST/RI-PT**
- **RI Operational Limits and Conditions RI-OLC**
- **RI Preventive Maintenance, RI-PM**
- **Training of Operators (and other staff)**
- **Procedures Development**
- **Safety Classification of SSCs**
- **Outage specific risk assessment for outage planning**
- **Assessment of the coverage and balance of the commissioning test programmes, and reduction commissioning risks**
- **"Security" PRA – vital area identification**


Risk Informed Regulation in Finland
Use of PRA
- licensees & vendors
Design and Construction
Operation & maintenance
- Level 1 and Level 2 PRA
- PRA applications
Decommissioning
Risk assessment
Use of Risk Insights in all Regulatory Work
RI oversight
RI inspections and reviews
RI allocation of resources
More holistic handling of safety issues
Rulemaking
Research & Development
Risk Informed Safety Management
Risk Informed Decisions on Daily Bases
Emphasis on Licensee´s Responsibility
Regulatory Effectiveness & Efficiency
to do the right work
to do the work right
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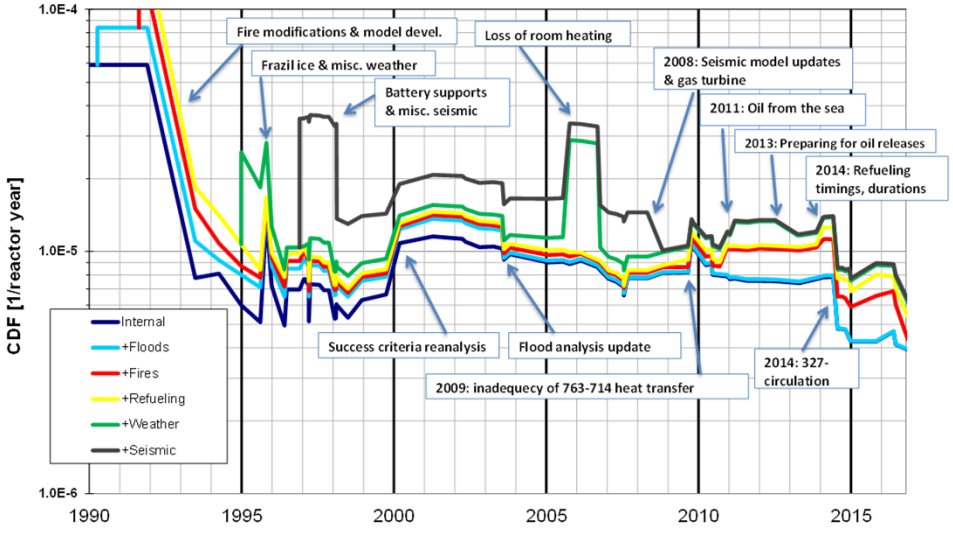
Benefits of Risk Informed Approach

- PRA forms a common communication platform between RB and the licensees
  - Plant specific state-of-the-art PRAs, peer review & thorough regulatory review
- Enhanced safety and operation of the NPP (plant improvements)
  - Less disturbances & ”unnecessary” plant shutdown → better capacity factors
- RI allocation of resources
- Transparent, well-justified insights/rationale to support decision making (Licensees and RB)
- More consistent regulatory decisions
  - e.g. exemptions from certain requirements, if safety preserved
- Timely identification of potential design issues → more cost-benefit resolutions
  - e.g, licensing phase of new NPPs
- Balanced OLC → e.g. less forced shutdowns due to ”Overly strict” LCOs
- More efficient regulatory reviews (RI grading of focus, details and resources)
- Balanced maintenance management (on-line preventive maintenance and annual outages)
- Increased staff´s risk awareness and common risk concept (Licensees and RB)

Major PRA and Plant improvements (Level 1)



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RI Licensing of New NPPs

- OL3 NPP (EPR-1600 MWe)
  - PRA used to support the design of EPR NPP starting from the conceptual design phase
  - PRA used by STUK and the licensee to support risk/safety evaluation throughout the whole licensing process
    - several PRA and application updates during construction phase
  - PRA identified design vulnerabilities and led to design and procedural changes e.g. in process systems, electrical systems, I&C systems and in fire protection systems
  - Risk Informed Pre- and In-Service Inspection (RI-PSI/ISI) Methodology applied for a new NPP for the first time (in the world)
    - All piping included (all safety classes and non-safety classified pipings)
- Similar approach required also for the Hanhikivi NPP (FH-1, AES-2006, 1200MWe)
  - The project is currently in construction license application phase
  - STUK is awaiting the submittal of technical plant documentation

Recent PRA Development

- OL3 Commissioning risk assessment
- Security PRA - vital area identification
  - Analysis of brute force sabotages (explosion) already required and applied PRA application
  - Protection strategy assessment against insider threat: tool under development
- Intermediate Spent fuel storage PRAs
- Encapsulation plant PRA
- Use of PRA in practical elimination of early or large releases
- More systematic use of PRA to support regulatory decision making
  - Development project ongoing to explore methods and tools for RIDM

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Summary and Conclusions

- PRA programs at the licensees are well developed and the use of PRA applications is an integrated part of safety management
- For more than 30 yrs, PRA has provided valuable insights to decision making in nuclear safety
- STUK's implementation of risk informed regulation has also progressed fairly well
  - Included in STUK´s long term strategy 2018-2022
  - Management is committed to increase the use of PRA insights
  - Staff is open towards more formal application of RI methods and concepts
- Risk Informed Graded Approach development project ongoing at STUK
  - Formalization of Graded Approach Process
  - Development of tools, risk metrics and procedures to support RIDM

→ **Enhanced Regulatory Effectiveness & Efficiency → Enhanced Nuclear Safety**