REGULATORY OVERSIGHT OF SAFETY CULTURE IN FINLAND – A SYSTEMIC APPROACH TO SAFETY

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STUK

Nuclear energy in Finland: Four operating units

- **Olkiluoto 1&2**
  - In commercial operation since 1979 and 1982
  - Operating licence valid until 2018, will apply renewal in 2016

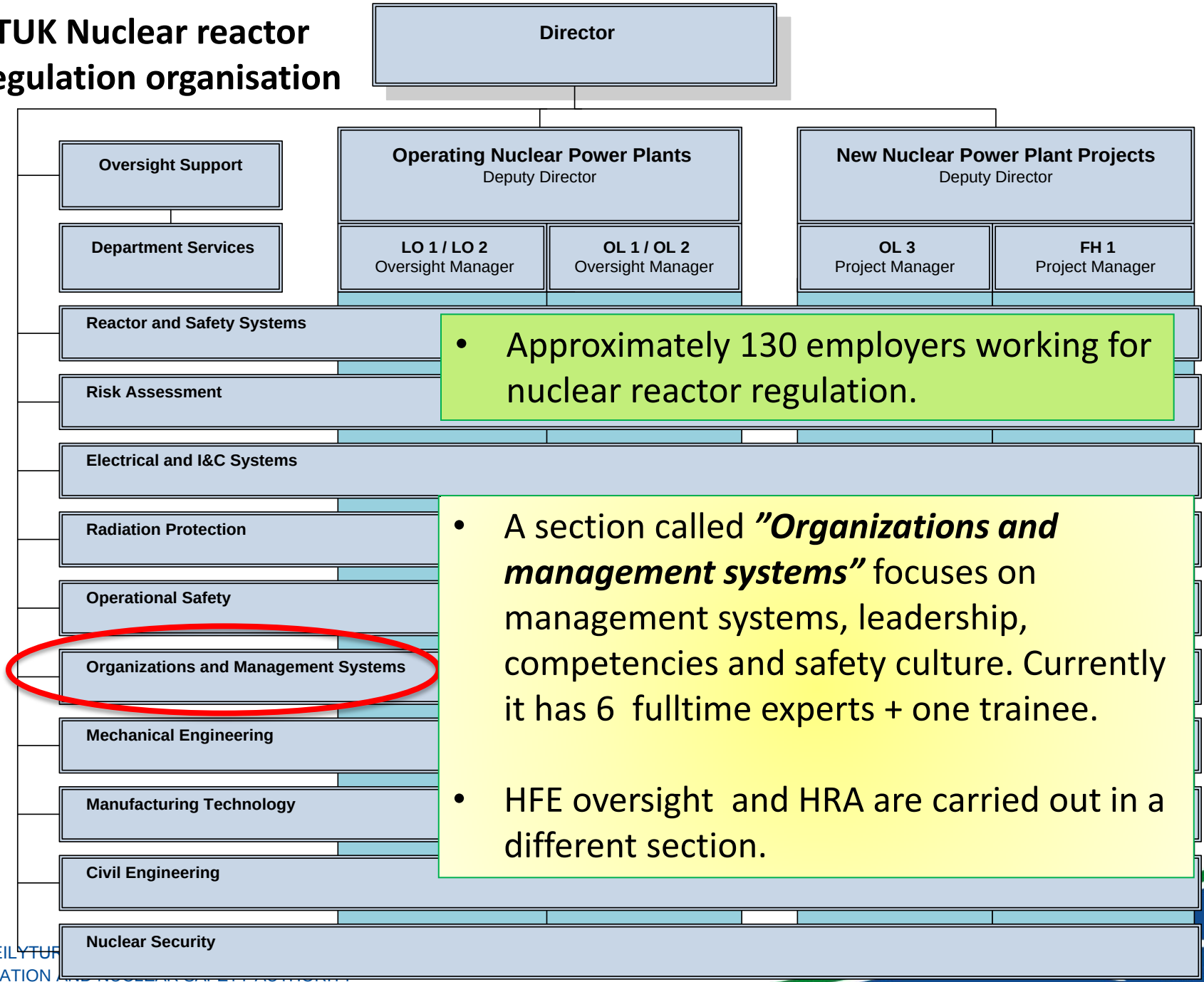
- **Loviisa 1&2**
  - In commercial operation since 1977 and 1981
  - Operating license valid until 2027 and 2030

Two new build projects

- **Olkiluoto 3**
  - Plant supplier Areva-Siemens consortium
  - Construction started in 2005
  - Operating license application is expected during 2016 and commercial operation 2018.

- **Hanhikivi 1**
  - Plant supplier Rosatom
  - Construction license application in 6/2015

STUK Nuclear reactor regulation organisation



- Approximately 130 employers working for nuclear reactor regulation.

- A section called ***"Organizations and management systems"*** focuses on management systems, leadership, competencies and safety culture. Currently it has 6 fulltime experts + one trainee.

- HFE oversight and HRA are carried out in a different section.

We aim at employing a systemic approach to safety

"The assurance of safety presupposes high quality operation from nuclear facility systems, structures, components, and organisations […] .

Safety, factors affecting safety, and ***the interconnections between the different factors form a system where changing of one factor may have extensive consequences.*** *Safety shall therefore be considered as a whole."*

(from the Regulatory Guide YVL A.3)

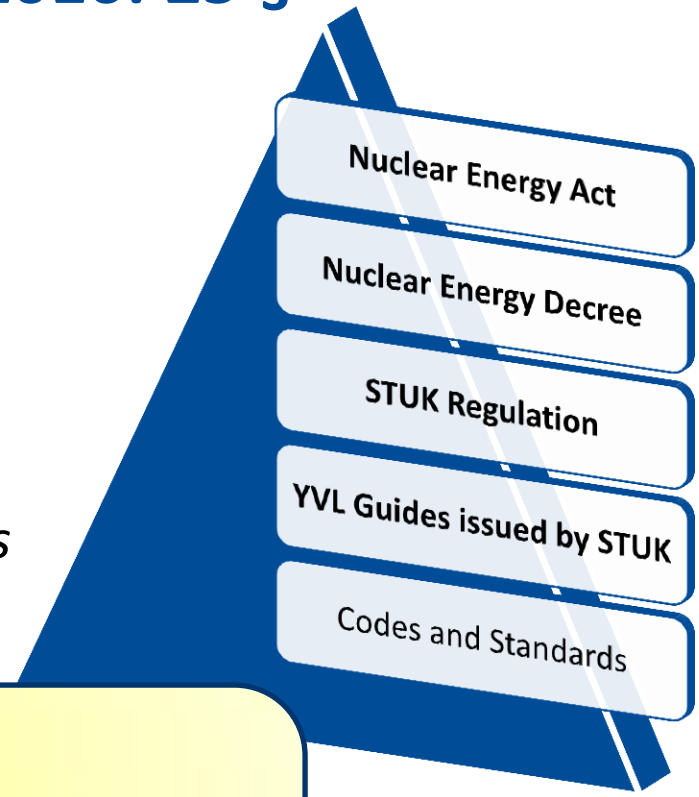
Figure by IAEA

Understanding safety of complex sociotechnical systems

- The outcome is not merely the sum of the parts – ***we cannot understand safety by decomposing the sociotechnical system into components*** and by analysing their safety independently of each other e.g. analysing human reliability independent from the technology used
- The ***complex and contextual interactions*** between I, T, O phenomena ***are present in all phases*** of nuclear plant lifecycle and in all activities carried out. Multidisciplinary expertise is needed everywhere.
- Challenge: ***we cannot assume linear causal relationships*** e.g. we cannot say that certain type of management competence always results in good operational decisions at the plant
- Sociotechnical ***systems adapt their responses, they learn***, thus the I, T, O relations change all the time, but not in a random manner
- ***Outcomes are not proportional to the inputs***: small problems can result in major effects, thus it is dangerous to say that certain phenomena do not have safety effects
- We need to understand and analyse phenomena for which ***we have little control over***. The organizations are not closed systems, they are affected by the environment; politics, power, public opinions, national culture, which are sensitive issues and for which the power companies have little control over

Good safety culture is emphasised in the Finnish Legislation: STUK Regulation Y/1/2016: 25 §

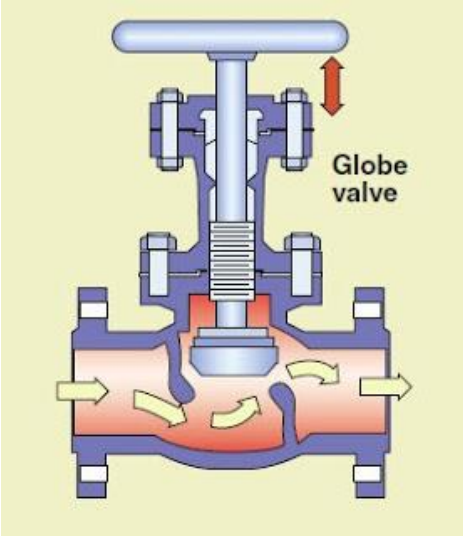
*"**When designing, constructing, operating and decommissioning a nuclear power plant, a good safety culture shall be maintained.** Nuclear safety shall take priority in all operations. The decisions and activities of the management of **each organisation** participating in the abovementioned activities shall reflect its commitment to operational practices and solutions that promote safety. Pe re el sh th*



Binding requirements concerning safety culture for the licensees, plant suppliers and the subcontractors working with safety significant systems

STUK´s oversight on safety culture in practice (1)

1. **“Technical” oversight activities provide rich data concerning the licensee safety culture**
   - Inspection activities on site and off-site
   - Review of licensee documents
   - Interactions with the licensee (meetings, audits..)
   - Operating experience, event reports



⇒ ***Technical issues are never purely technical***

⇒ ***“Technical “ inspectors collect weak signals to a database which is analysed from organisational performance perspective***

⇒ ***“Organisational” inspectors participate in supplier audits, review of LERs etc.***

⇒ ***Contextual analysis of the I, T and O***

STUK´s oversight on safety culture in practice (2)

2. Specific inspections on safety culture

- Periodic inspections for operating NPPs‘ safety culture
- Periodic inspections for the new build projects’ safety culture

⇒ ***The focus is <u>not</u> merely to check that the licensees have safety culture improvement programs or valid safety culture assessment tools***

⇒ ***Rather, the aim is to verify that the culture of the organisation fulfills the expectations for a good safety culture***

⇒ ***Requires expertise on organisational culture***

STUK´s oversight on safety culture in practice (3)

3. **STUK orders independent, in-depth safety culture assessments from a TSO (VTT)**
   - To support STUK's assessment e.g. when operating license application is reviewed
   - The safety culture assessment provide recommendations to all relevant parties, including STUK

   => Regulatory body is part of the system, thus an outsider view is important

4. **STUK can carry out their own event investigations**
   - E.g. investigations concerning the OL3 quality issues 2006 and 2011

   => Understanding of complex problems require a thorough, interdisciplinary analysis

Safety culture can be seen as a holistic concept to grasp the overall safety capability of the sociotechnical system!

Read more

- The VTT approach to safety culture assessment:
  - Oedewald, P., Gotcheva, N., Viitanen, K., Wahlström, M. (2015). *Safety culture and organisational resilience in the nuclear industry throughout the different lifecycle phases.* VTT technology 222. http://www.vtt.fi/inf/pdf/technology/2015/T222.pdf
  - Oedewald, P., Pietikäinen, E. & Reiman, T. (2011). *A guidebook for evaluating organizations in the nuclear industry – an example of safety culture evaluation.* Swedish Radiation Safety Authority, Research Report 2011:20. http://www.stralsakerhetsmyndigheten.se/Publikationer/Rapport/Sakerhat-vid-karnkraftverken/2009/200912/
  - Reiman, T. & Oedewald, P. (2009). *Evaluating safety critical organizations. Focus on the nuclear industry.* Swedish Radiation Safety Authority, Research Report 2009:12.
- STUK YVL Guides http://www.stuk.fi/julkaisut_maaraykset/viranomaisohjeet/en_GB/yvl/