5th Review Meeting of the Convention on Nuclear Safety

Finland

Country Group VI

April 7, 2011

Head of Delegation	**Jukka Laaksonen, Director General, STUK**
	Hannu Koponen, Deputy Director General, STUK
	Petteri Tiippana, Director, STUK
	Kirsi Alm-Lytz, Assistant Director, STUK
	Ilari Aro, Principle Advicer, STUK
	Heikki Reponen, Section Head, STUK
	Pekka Salminen, Senior Adviser, STUK
	Pekka Viitanen, Head of Radiation Safety, TVO
	Reko Rantamäki, Manager, Fortum
	Thomas Buddas, Manager, Fortum

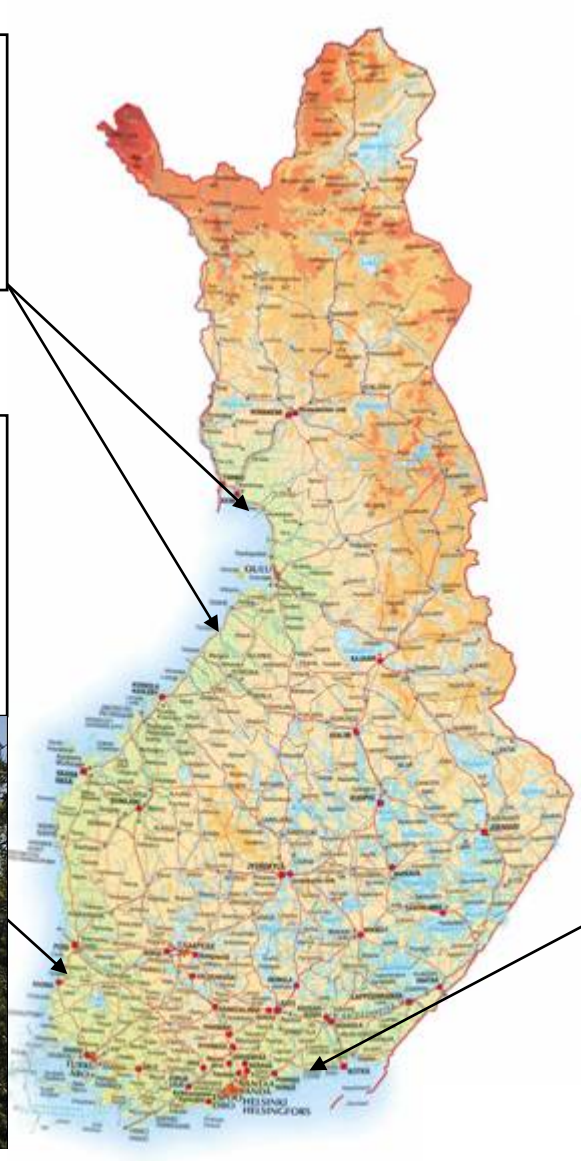
Presentation Outline

- Selected highlights
  - recent nuclear activities in Finland
  - regulation of nuclear facilities
- Updates to national report to 5th Review Meeting
- Follow-up from 4th Review Meeting
- Planned measures to improve safety - achievements
- Planned measures to improve safety - challenges
- Questions raised from peer review of National Report
- Conclusions

Nuclear power plants in Finland

Fennovoima Ltd

- New utility, no operating reactors, DiP approved for FV1 (2 alternative sites)



Olkiluoto NPP (TVO)

- 2 operating units - ABB BWRs
- OL3 (EPR) under construction
- DiP approved for OL4

Photo: TVO

Loviisa NPP (Fortum)

- 2 operating units - VVERs

Photo: Fortum

Three licensing steps of nuclear facilities

1. Decision in Principle (DiP) – “political”
   - DiP opens the way for a new nuclear facility; different sites are still possible
2. Construction License (CL) – “technical”
   - main design features are assessed and fixed at this stage; the site is fixed
3. Operating License (OL) – “technical”
   - OL is granted after the regulator has verified implementation of construction according to plans, which were approved during the safety assessment for the CL
   - OL is given for a limited time and has to be renewed after that, pending on results of PSR.

Main parties involved in licensing and regulation of nuclear facilities in Finland

All licenses for nuclear facilities are issued by the Government

- Ministry of Employment and the Economy (TEM) provides administrative support for processing license applications

STUK is the nuclear regulatory body and has following duties:

- preparation of national nuclear safety regulations
- safety evaluation (necessary prerequisite for issuing a license)
- inspections and oversight needed to verify the safety of the facility and the compliance with safety requirements over the plant lifetime
- inspections on nuclear waste management and nuclear material safeguards as well as security
- binding orders to the licensees as needed to ensure nuclear safety (based on expert judgment made at STUK).

Licensing status of the existing Finnish NPPs

Relicensing of the operation of a NPP involves a comprehensive safety review, latest renewals were done taking into account the IAEA PSR guidelines (NS-G-2.10, previously 50-SG-O12)

Loviisa NPP Terms of licenses		**Olkiluoto NPP Terms of licenses**	
LO1	**LO 2**	**OL1**	**OL2**
1977 - 1983	**1980 - 1983**	**1978 - 1983**	**1982 - 1983**
1984 - 1989	**1984 - 1988**	**1984 - 1988**	**1984 - 1988**
1989 - 1998	**1989 - 1998**	**1989 - 1998**	**1989 - 1998**
1999 - 2007	**1999 - 2007**	**1999 - 2018**	**1999 - 2018**
2007 - 2027	**2007 - 2030**	**PSR in 2008**	**PSR in 2008**
PSR in 2015 and 2023	**PSR in 2015 and 2023**		

Relicensing of Loviisa 1 and 2

- Loviisa 1 and 2 relicensed 2007
  - new licenses valid up to 2027 and 2030, respectively
  - Periodic Safety Reviews in 2015 and 2023.
  - The lifetime of both units will be 50 years; e.g. safety and strength analysis were updated to correspond the continued operation
- Key issues in future:
  - maintaining competence and high level of safety culture
  - effective lifetime management
  - follow-up of RPV material embrittlement
  - renewal of I&C systems,
  - operating experience feedback, and
  - use of risk-informed methods to further develop the plant safety.

Periodic Safety review of Olkiluoto 1 and 2

- Current operating licenses of Olkiluoto 1/2 are valid until end of 2018 (PSR performed in 2008)
- Updated Finnish nuclear safety legislation in end of 2008 - changes:
  - Changes in classification of accidents (including DEC cases) and public dose limits
  - Air plane crash protection
  - Emergency control room
  - Security requirements updated
- Assessment/modifications based on Nuclear Energy Act 7a § (continuous improvement), e.g.:
  - diversification of safety functions (e.g. Residual Heat removal, RPV level measurement), assessment of the plant diversity as a whole by end of 2010.

Probabilistic Risk Analysis (PRA)

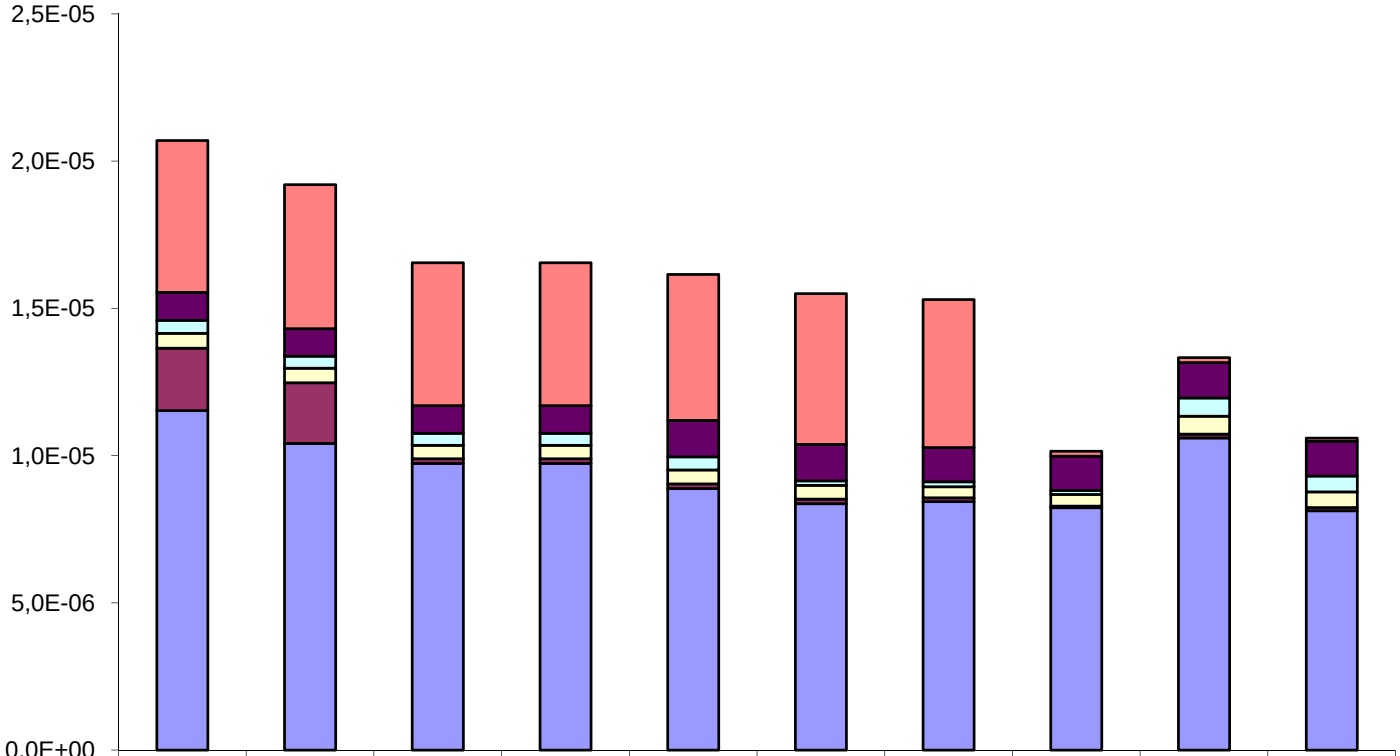
- PRA is a licensing document according to nuclear safety legislation
  - Preliminary PRA required in Construction License phase
  - Final PRA required in Operating License phase
  - During operation PRA has to be updated reflecting the actual plant configuration.
- The requirements for conducting the PRA and use of PRA applications are set forth in regulatory guides issued by STUK
  - Full scope Level 1 and Level 2 PRA, internal events, internal & external hazards
  - All operating modes
  - Quantitative criteria for new NPPs
    - Core Damage Frequency (CDF) < 1E-5 /a
    - Large Release Frequency (LRF) < 5E-7 /a.

Probabilistic Risk Analysis (PRA)

- Risk informed PRA applications
  - Plant modifications
  - In-service inspection program (RI-ISI)
  - In-service Testing (RI-IST)
  - Tech Specs (RI-TS)
  - Preventive maintenance during power operation (RI-PM)
  - Event Analysis (risk follow-up)
  - Safety classification
  - Staff training (incl. simulator training)
  - Development of EOPs and other procedures.

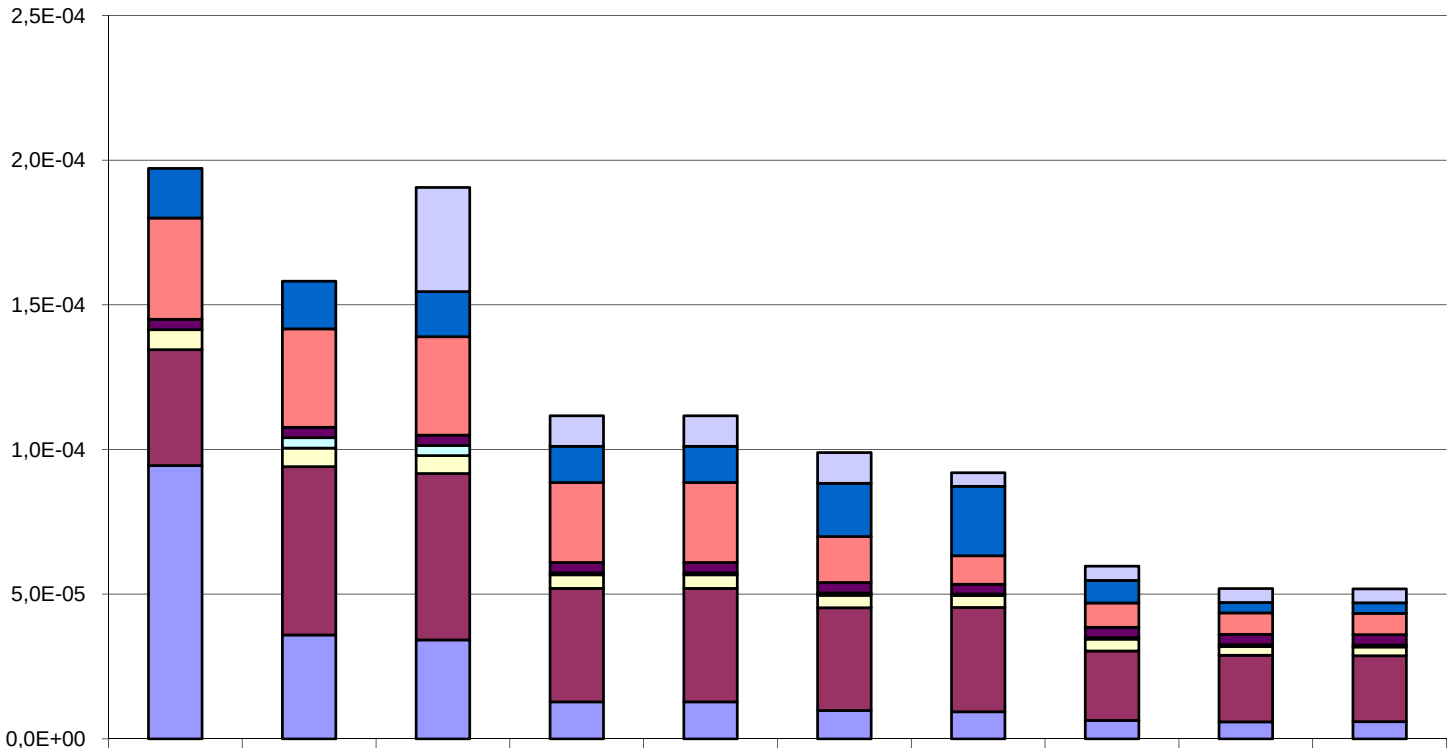
- Several risk informed plant modifications have been implemented in both Loviisa and Olkiluoto NPPs.

Olkiluoto NPP CDF History



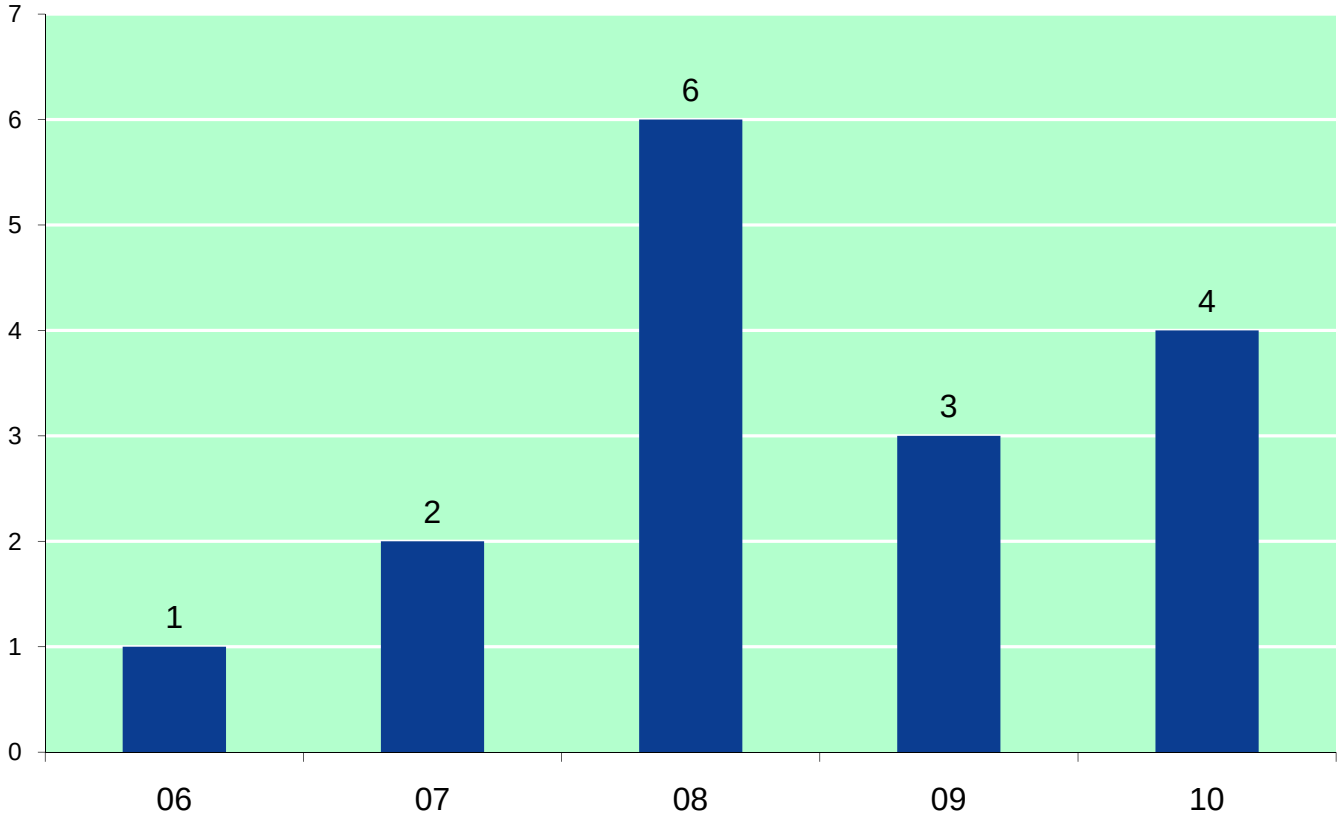
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Seismic	5,16E-0	4,89E-0	4,85E-0	4,85E-0	4,95E-0	5,12E-0	5,03E-0	1,70E-0	1,70E-0	1,07E-0
Weather	9,50E-0	9,31E-0	9,40E-0	9,40E-0	1,24E-0	1,24E-0	1,16E-0	1,16E-0	1,20E-0	1,18E-0
Low power	4,39E-0	4,09E-0	4,06E-0	4,06E-0	4,42E-0	1,55E-0	1,71E-0	1,38E-0	6,20E-0	5,35E-0
Fires	5,09E-0	4,95E-0	4,56E-0	4,56E-0	4,71E-0	4,65E-0	3,75E-0	3,93E-0	6,10E-0	5,35E-0
Flood	2,12E-0	2,06E-0	1,58E-0	1,58E-0	1,62E-0	1,55E-0	1,27E-0	5,86E-0	1,30E-0	1,07E-0
Internal	1,15E-0	1,04E-0	9,74E-0	9,74E-0	8,88E-0	8,37E-0	8,44E-0	8,23E-0	1,06E-0	8,13E-0

Loviisa NPP CDF History



	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Weather (at shutdown)			3,60E-05	1,06E-05	1,06E-05	1,06E-05	4,70E-06	4,90E-06	4,80E-06	4,82E-06
Weather (at power)	1,71E-05	1,65E-05	1,56E-05	1,25E-05	1,25E-05	1,84E-05	2,40E-05	7,80E-06	3,60E-06	3,64E-06
Fire (at power)	3,50E-05	3,40E-05	3,40E-05	2,76E-05	2,76E-05	1,59E-05	9,80E-06	8,40E-06	7,40E-06	7,38E-06
Seismic	3,60E-06	3,60E-06	3,60E-06	3,60E-06	3,60E-06	3,60E-06	3,40E-06	3,60E-06	3,60E-06	3,60E-06
Flood (at shutdown)		3,59E-06	3,49E-06	6,95E-07	6,95E-07	7,98E-07	4,60E-07	4,70E-07	6,40E-07	6,43E-07
Flood (at power)	6,94E-06	6,40E-06	6,20E-06	4,69E-06	4,69E-06	4,34E-06	4,20E-06	4,10E-06	3,00E-06	3,04E-06
Internal (at shutdown)	4,00E-05	5,82E-05	5,75E-05	3,92E-05	3,92E-05	3,55E-05	3,60E-05	2,40E-05	2,30E-05	2,28E-05
Internal (at power)	9,45E-05	3,59E-05	3,42E-05	1,28E-05	1,28E-05	9,80E-06	9,40E-06	6,40E-06	5,90E-06	5,94E-06

Number of events at INES Level 1 at the four Finnish plant units

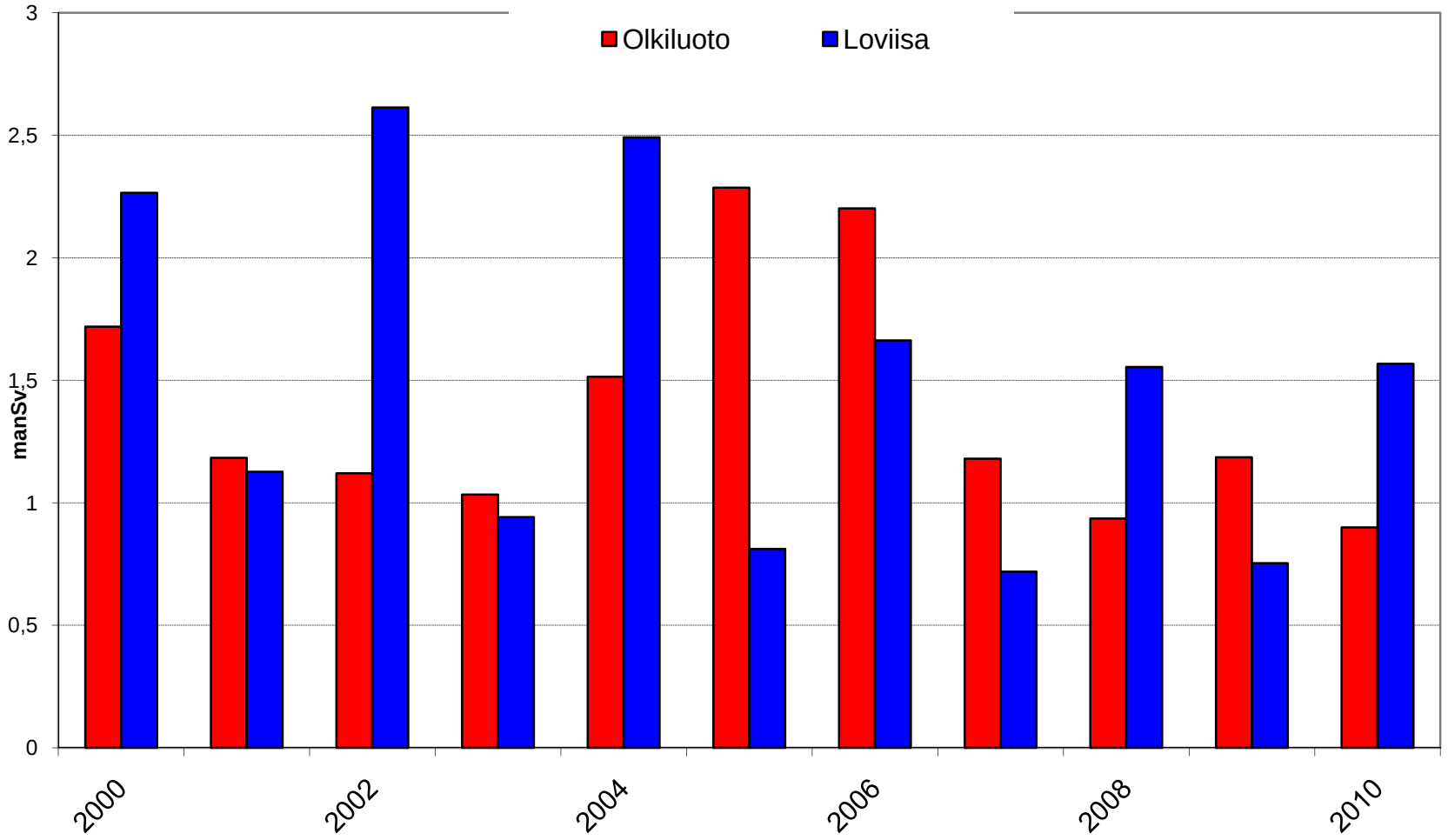


No INES Level 2 events after 1992, never INES Level 3 or higher

INES 1 rated events from 2008 - until today

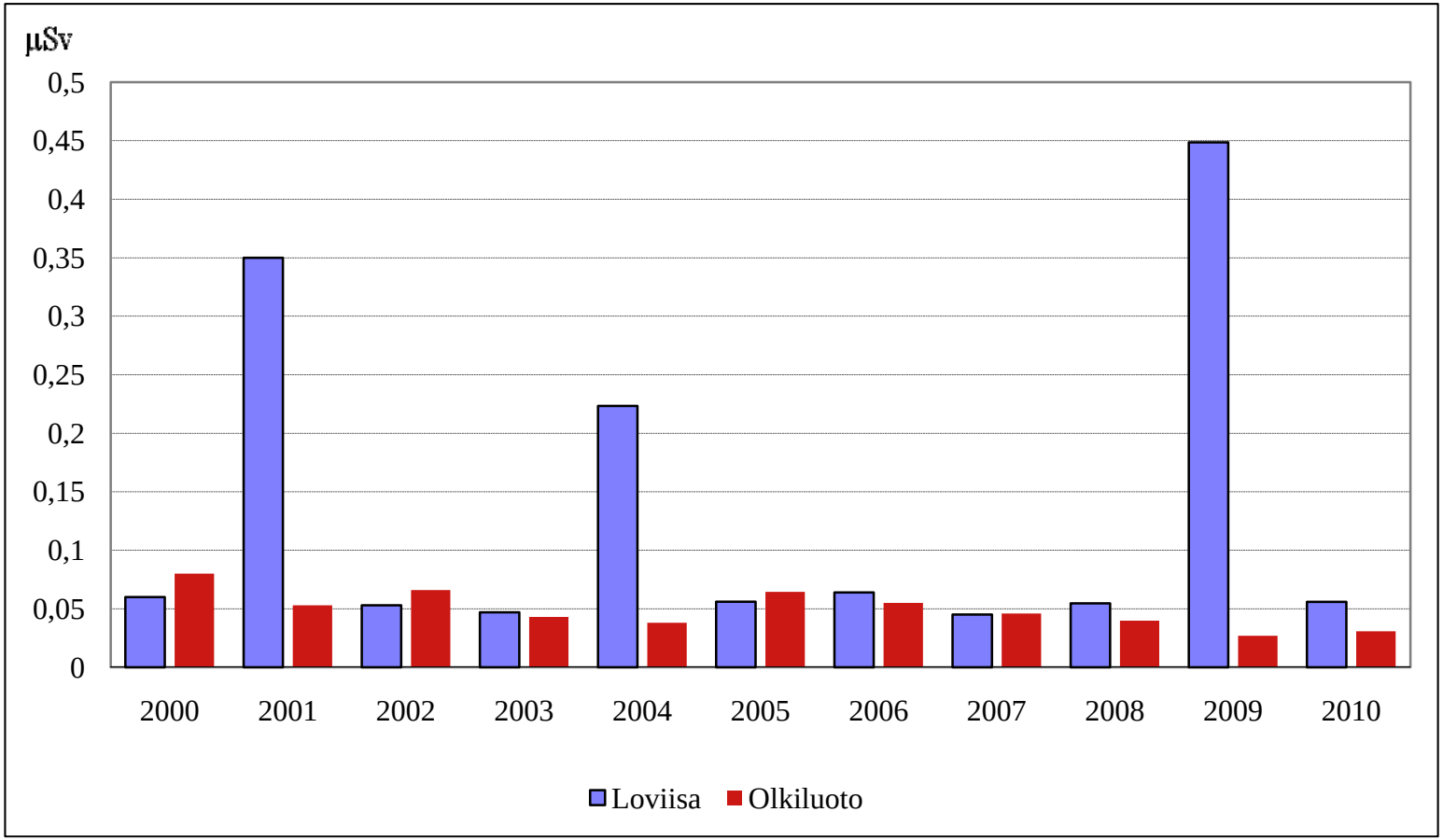
- year 2008
  - OL: Rod operation in non-compliance with Technical Specifications at Olkiluoto 1
  - OL: Failures of seals in the pneumatic starter motors of diesel generators at Olkiluoto 1 and 2 (IRS 7935)
  - OL: Reactor trip at Olkiluoto 1 as a result of a generator voltage regulator failure (IRS 7932)
  - OL: Deficient leaktightness of of piping penetrations at Olkiluoto 1 and 2 (IRS 7997)
  - OL: Omission of periodic testing of the radiation measurement systems at Olkiluoto 1
  - LO: Incorrect simulations in the reactor protection system of Loviisa 2
- year 2009
  - OL: Malfunctions of the outer isolation valves of main steam lines at Olkiluoto 1 (IRS 8029)
  - OL: Jamming of the fuel transfer machine during transfers of spent fuel at Olkiluoto 2
  - OL: Stoppage of the pump of the shutdown service water system as a result of signal lamp failure at Olkiluoto 1
- year 2010
  - LO: Radioactive resin found in ventilation system (IRS 8088)
  - OL: Olkiluoto 1 & 2 Failure of Safety System Components due to inadequate qualification of slightly modified replacement parts (IRS 8150)
  - OL: Wrong lot of the fresh nuclear fuel was transported from the dry storage to the Olkiluoto 1 pool
  - LO: radioactive particles found after spent fuel container transfer.

Collective occupational doses at Finnish NPPs



Regulatory targets (two years' average): Loviisa 1,22 manSv, Olkiluoto 2,10 manSv

Calculated annual dose estimates of most exposed individuals in the vicinity of the Finnish NPPs



Regulatory limit: 100 microSv - note: 2001, 2004 and 2009 peaks followed through controlled releases of low activity level evaporation liquid waste

OL3 Project - General

Photos: TVO

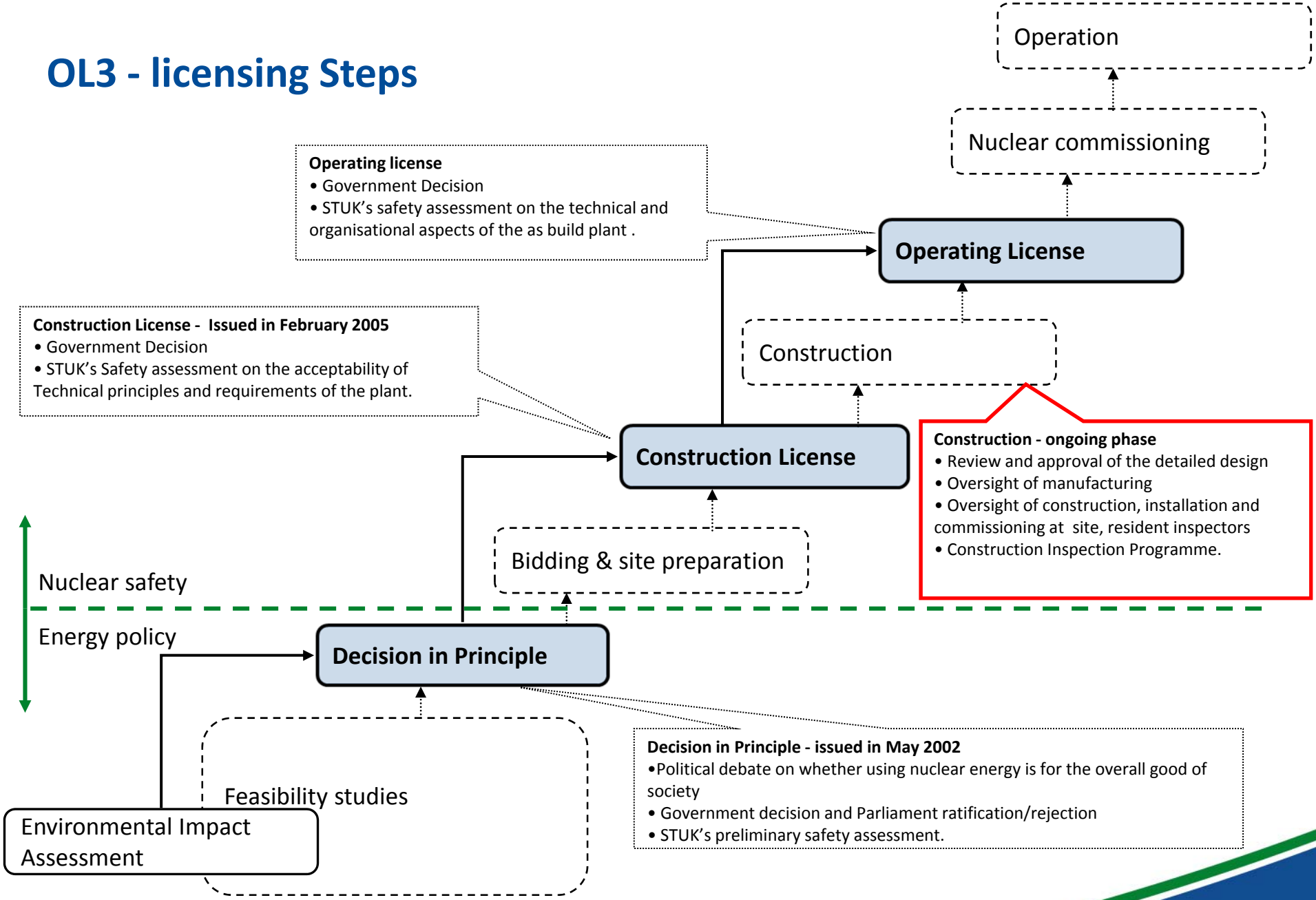
- Project is progressing but is about four years behind the original schedule
  - Start of commercial operation in 2013
  - Fuel load by the end of 2012
  - Operating license application in 2011.

- Status of the project
  - Design ongoing - open design issues on I&C
  - Final civil construction activities ongoing
  - Manufacturing slowing down but still ongoing
  - Installation activities in progress at site
  - Commissioning activities to start

OL3 project - Constant issues

- Competence and training of subcontractors
- Interaction with, guidance and oversight of subcontractors
- Compliance with QA programme
- Adequacy of oversight resources at site (vendor, licensee)
- Safety culture of organisations, personnel.

OL3 - licensing Steps



New Reactor Projects - Teollisuuden Voima Ltd – OL4

- Environmental Impact Assessment procedure for OL4 (1000-1800 MWe) has been completed by the statement of the Ministry of Employment and the Economy (TEM) in June 2008
- Application for Decision in Principle (DiP) was submitted to the Ministry (TEM) in April 2008
- Feasibility studies with potential vendors ongoing
  - ABWR, Toshiba Westinghouse
  - APWR, Mitsubishi Heavy Industry
  - AP1400, KHNP (Korea)
  - EPR, Areva
  - ESBWR, GE Hitachi
- STUK's preliminary safety assessment was issued in May 2009: see http://www.stuk.fi/

Olkiluoto, photo TVO

New Reactor Projects - Fennovoima Ltd - FV1

- Fennovoima is a new utility that was established in 2007 to construct a nuclear power plant with one or two 1000–1800 MW units in Finland.
- Feasibility studies with potential vendors are ongoing:
  - ABWR, Toshiba Westinghouse
  - EPR, Areva
  - SWR-1000, Kerena (“German BWR”), Areva
- Environmental Impact Assessment procedure for FV1 (1000-1800 MWe) has been completed by the statement of the Ministry of Employment and the Economy (TEM) February 2009
- Application for Decision in Principle submitted in January 2009
- STUK’s preliminary safety assessment was issued in October 2009: see http://www.stuk.fi/

Simo, Karsikko

Pyhäjoki, Hanhikivi

Photo: Fennovoima

Future steps in STUK with possible new NPP's

- The Government has granted two DiP's to TVO and Fennovoima (for single reactor). Fortum's application was rejected.
  - The Parliament ratified both granted applications 1.7.2010.
- STUK has continued discussions with license applicants on construction licence application requirements
  - some principal design issues under review (see next slides)
- The applicants shall send nuclear safety related bid requirements to STUK for information
  - That is the first step for STUK to prepare regulatory project for construction license review.

Fukushima NPP accident – Response in Finland

- STUK followed event progress 24/7 for the first two weeks, and continues to monitor
  - Status of plant units, possible accident progress scenarios
  - Radiation measurements and release estimates
- Information to media and Finnish citizens
  - Press releases
  - Media requests
  - Questions and Answers
- Co-operation with
  - Foreign Ministry (travel recommendations, evacuation, iodine)
  - Customs (measurement of travellers, gargo)
  - Finnish industry (recommendations to workers, import/export from Japan)
  - Airline company (safety of workers, contamination of airplanes)
  - others

Measures taken in Finland in the aftermath of Fukushima NPP accident

- Request from the Ministry to STUK to evaluate safety of Finnish NPPs (operating, under construction and planned) by mid May 2011
- STUK's letter to utilities in Finland to assess safety of their NPPs by mid April 2011 – Areas to be covered in the assessment
  - Re-evaluation of external threats - emphasis in threats to AC power supply, coincident events / threats, damage to external infrastructure (roads, information transfer).
  - On-site AC power supply and contingency measures
  - Available heat sinks: designed systems and contingencies
  - Decay heat removal possibilities - reactor core, spent fuel pools, Containment.
  - Availability of qualified people to handle accident in long-term.
- Further actions based on the results of evaluation and more accurate information on the accident, international co-operation and information exchange

Fukushima NPP accident and Finnish NPPs

- NPP design against external events;
  - Finland is not seismically active area, possible tsunamis at the Baltic sea are small
  - External events to be taken into account in the design – exceptional weather phenomena, low and high sea water level, loss of (blockage) ultimate heat sink, Seismicity, Air craft crash, electromagnetic phenomena, explosions, toxic gases, oil spill, and security events
- Offsite response to emergency situations (eg: station blackout);
  - Independent supplies from external grid (400 kV and 110 kV)
  - Emergency Diesel Generators (4*100 %), and Station Blackout Diesels at OL3 (2*100 %)
  - Cross connections between units
  - Gas turbine supply
  - Supply from hydro power plant
  - House load operation

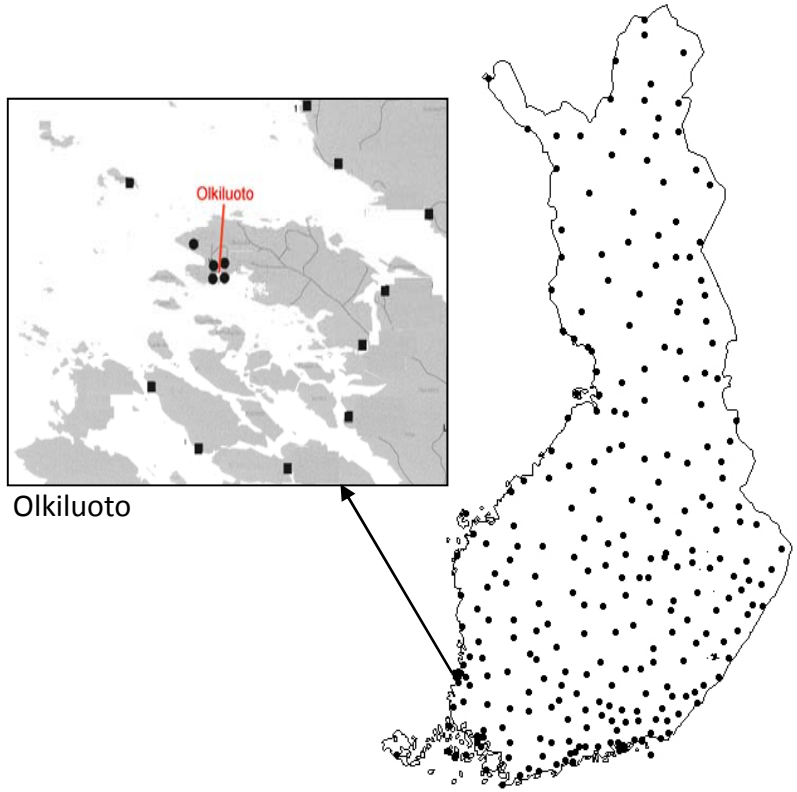
Fukushima NPP accident and Finnish NPPs

- Emergency management actions and preparedness following worst case accident scenarios;
  - Loviisa 1 and 2 as well as Olkiluoto 1 and 2 have been upgraded to be able to cope with severe accidents
  - Olkiluoto 3 has been designed to be able to withstand severe accidents without large releases to the environment
- Cooling of spent fuel storage in severe accident scenarios;
  - Supply of water from external sources considered for emergency purposes
- Training of NPP operators for severe accident scenarios;
  - Operators are trained to manage severe accidents, severe accident management guidelines

Fukushima NPP accident and Finnish NPPs

- Radiological monitoring following NPP accident involving radiological releases;
  - Finland has an online radiation monitoring network with a good coverage
  - Environmental surveillance programme includes analyses of radioactive substances present in the environment

    (~ 300 samples/year/site during normal plant operation)



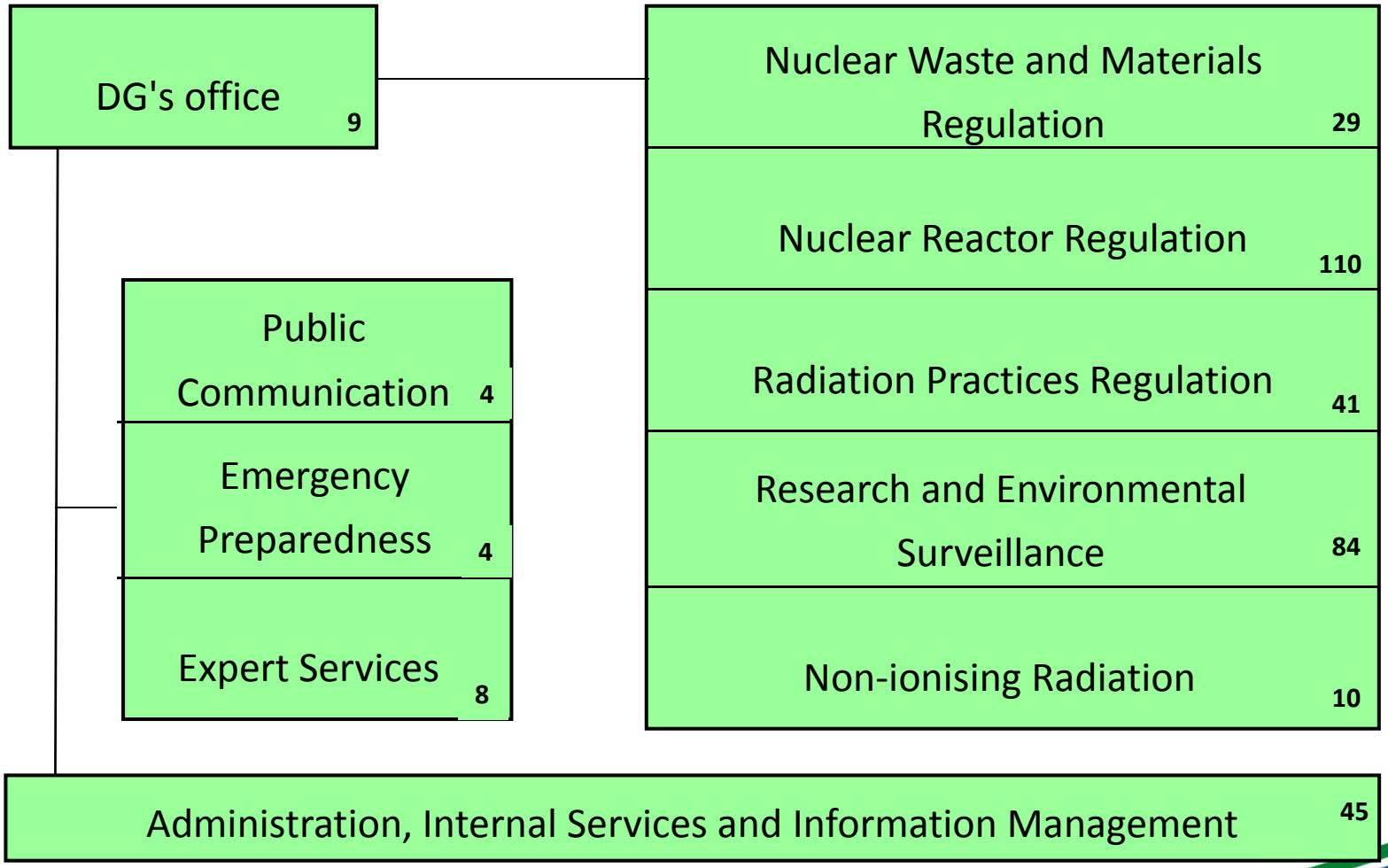
Measurement data is transferred to STUK

Fukushima NPP accident and Finnish NPPs

- Public protection during emergencies;
  - Requirements established
  - Protection and Exclusion zones around the sites
  - Emergency exercises organized annually between STUK and Licensee
  - Public protection activities performed in co-operation between STUK, Rescue services and other governmental authorities (large co-operation exercise every third year /site)
- Communications in emergency situations
  - Trained in annual exercises
  - Government authorities have own communication network

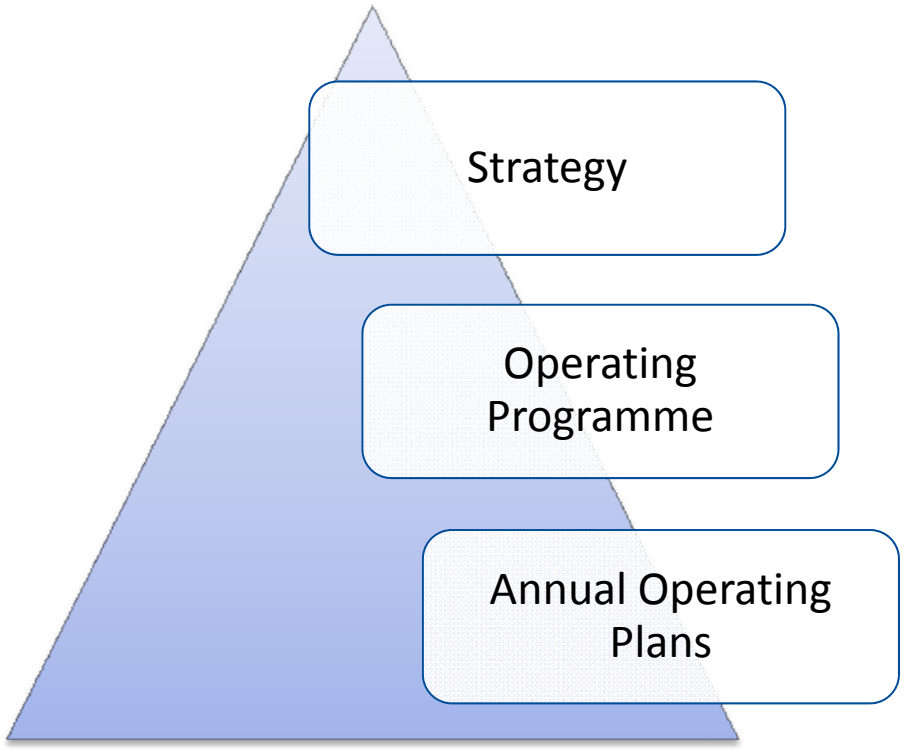
Organisation of STUK

Figures indicate staff number (344) at the end of 2010.



STUK's strategy for 2007 - 2011

- **STUK's mission: Protecting people, society, environment, and future generations from harmful effects of radiation**
- Strategy is done using the Balanced Score Card approach
- The strategy
  - provides management policies for ensuring the success
  - sets priorities and expected outcomes
- Implementation of strategy
  - an operating programme provides practical measures for each core process
  - annual operating plans



Effectiveness

- our impact on maintenance and improvement of radiation and nuclear safety is effective and risk informed
- our safety regulations are in line with good international practice
- our research work is of high quality and focused on key issues of radiation protection
- our public communication builds up confidence

Resources and financing

- our staff resources are correctly optimized and targeted
- our financial situation, work conditions and tools are in a good shape

Success factors derived from mission and vision

Processes and structures

- our work processes are consistent, cost effective and well defined
- availability, quality, and timeliness of our services meet the legitimate expectations of our customers and partners

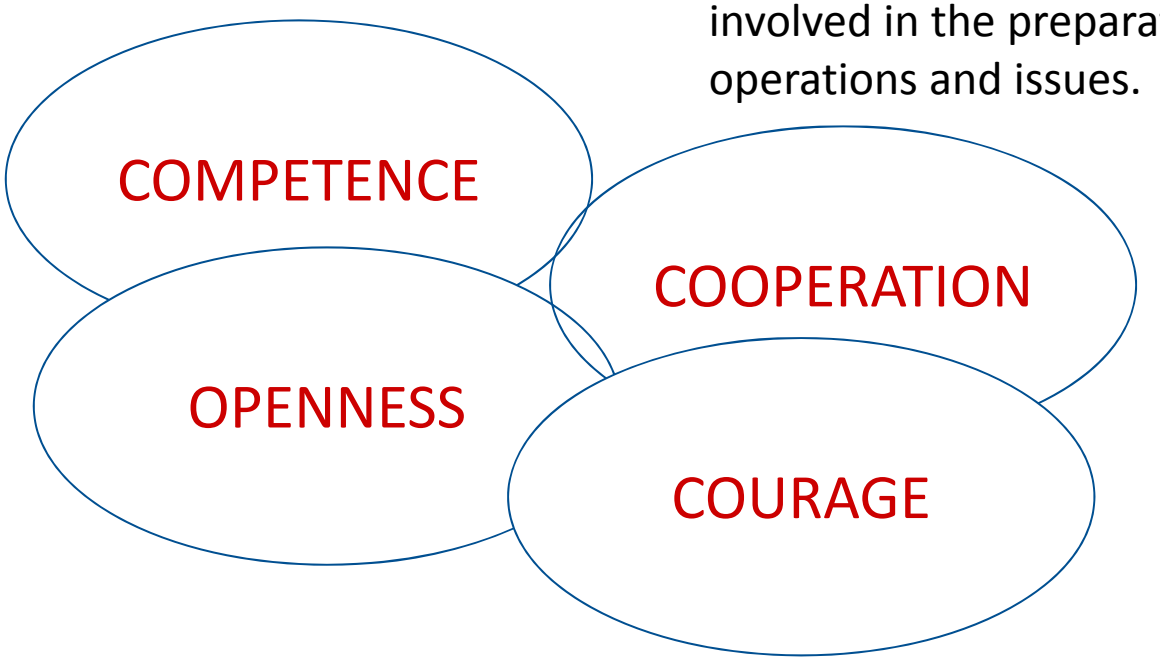
Development and ability to work

- quality and effectiveness of our work are improving continuously
- our staff is feeling well and is motivated to conduct their work
- our staff is professionally competent and has high work ethic
- good internal cooperation and leadership ensure full utilization of competence

STUK strategy for 2007-2011 - Values

Actions, statements, and decisions are based on professional knowledge and factual information.

Cooperation within STUK is based on good co-worker relations, teamwork and mutual respect. Stakeholders are involved in the preparation of new operations and issues.



Operations are open and honest, both with stakeholders and general public as well as internally.

Observed problems and personal views are brought up boldly. Responsibility for own decisions is assumed. Mistakes are acknowledged and corrected.

Assessment and measurement

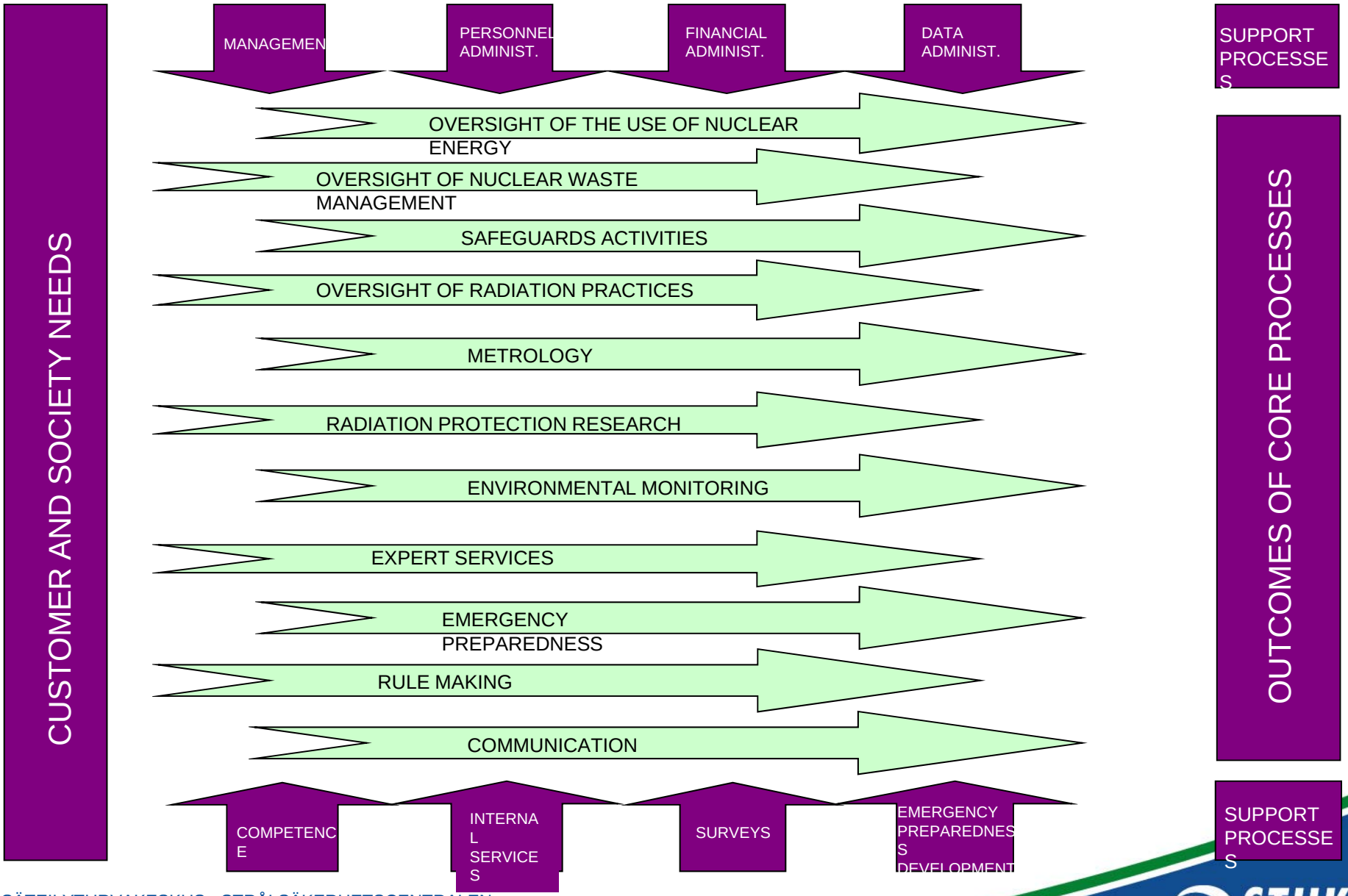
Internal assessment

- systematic follow-up of achievements against the agreed annual targets
- cross-audits conducted by staff members according to annual audit programme
- self-assessment carried out in internal workshops
- annual upper management reviews
- staff surveys every two years (on staff engagement, motivation, satisfaction, etc.), and
- annual Report to the Ministry on work results and developments, including assessment against agreed targets and other performance indicators.

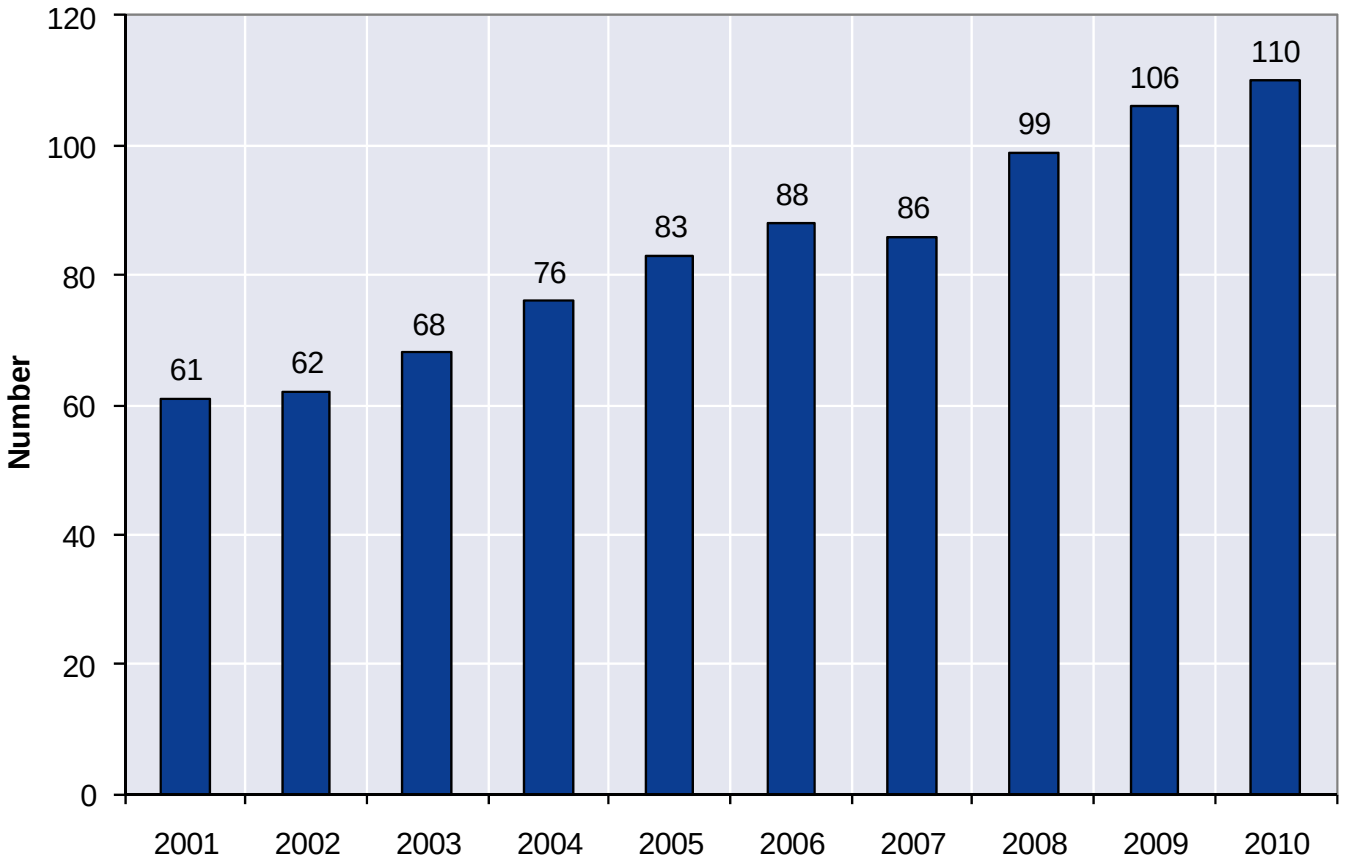
External assessments are conducted by international and national peers, including the following:

- regulatory activities were evaluated by an IAEA's IRRT mission in year 2000 and a follow-up in 2003 (next IRRS mission in Finland October 2012)
- IPPAS mission in Finland in summer 2009

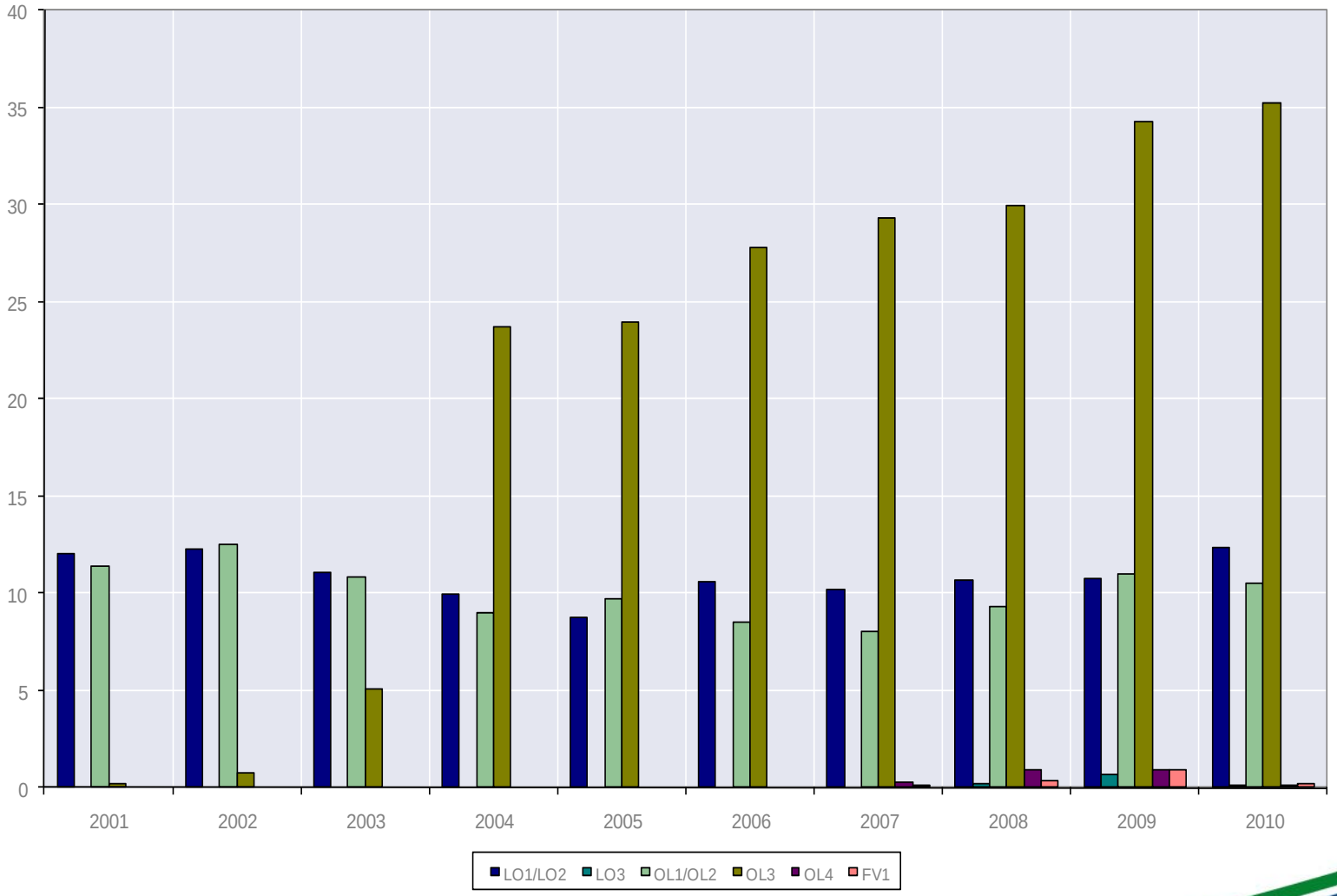
Core and support processes of STUK



Number of Personnel at Nuclear Reactor Regulation Department



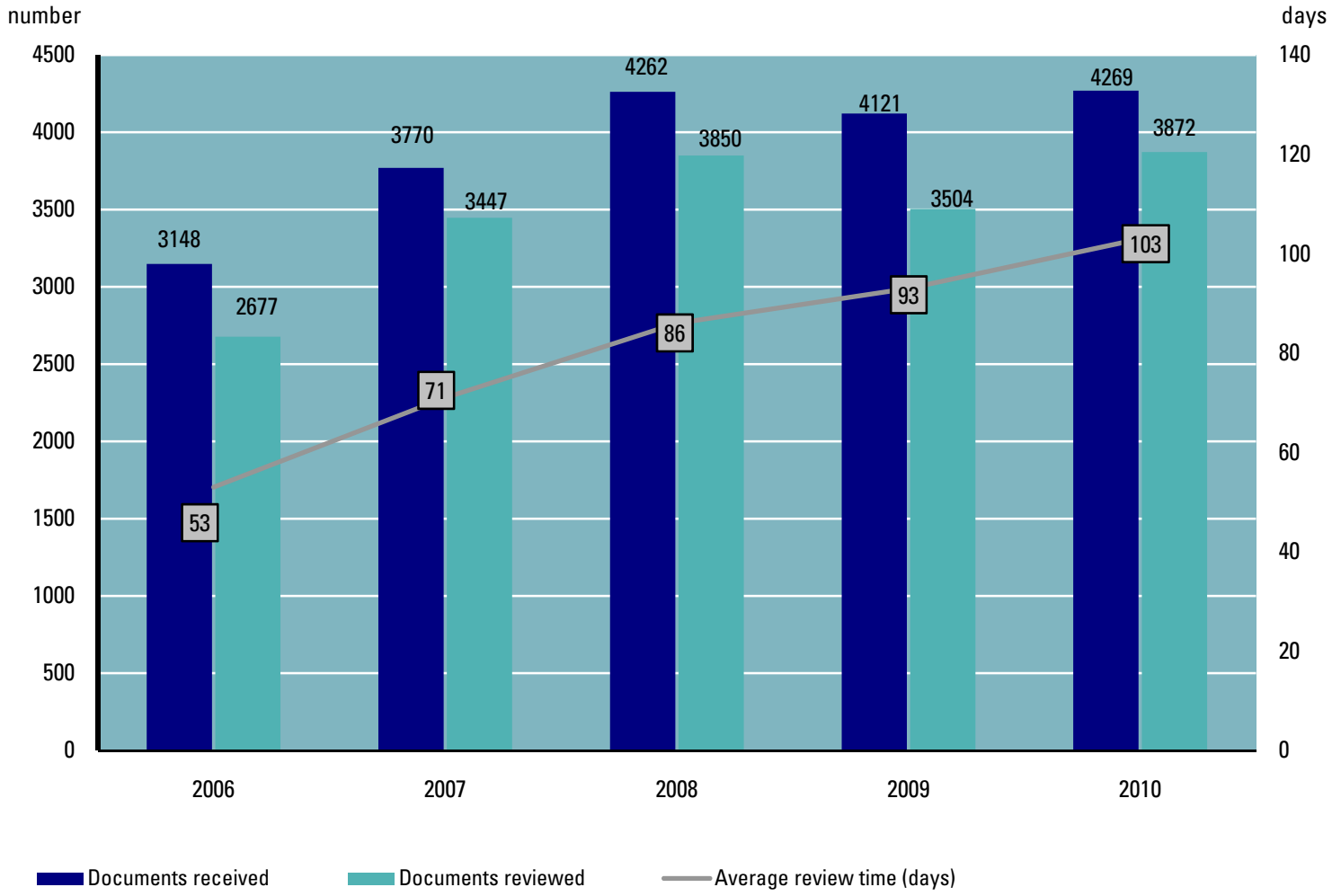
Regulatory Oversight (man-years/NPP)



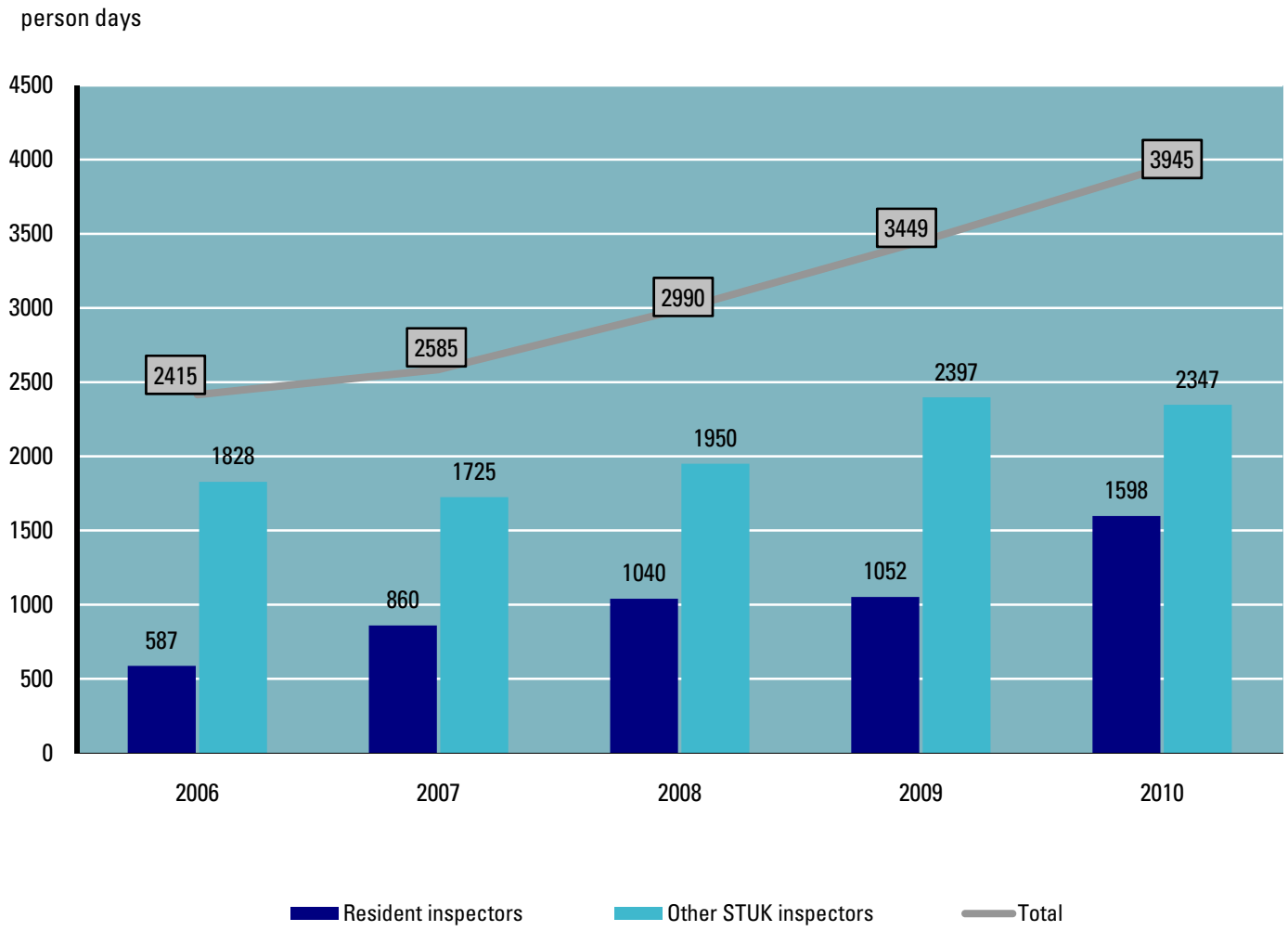
2010
Reviews
41 man-years

Inspections
22 man-years
Resident 29,9 %
HQ 70,1 %

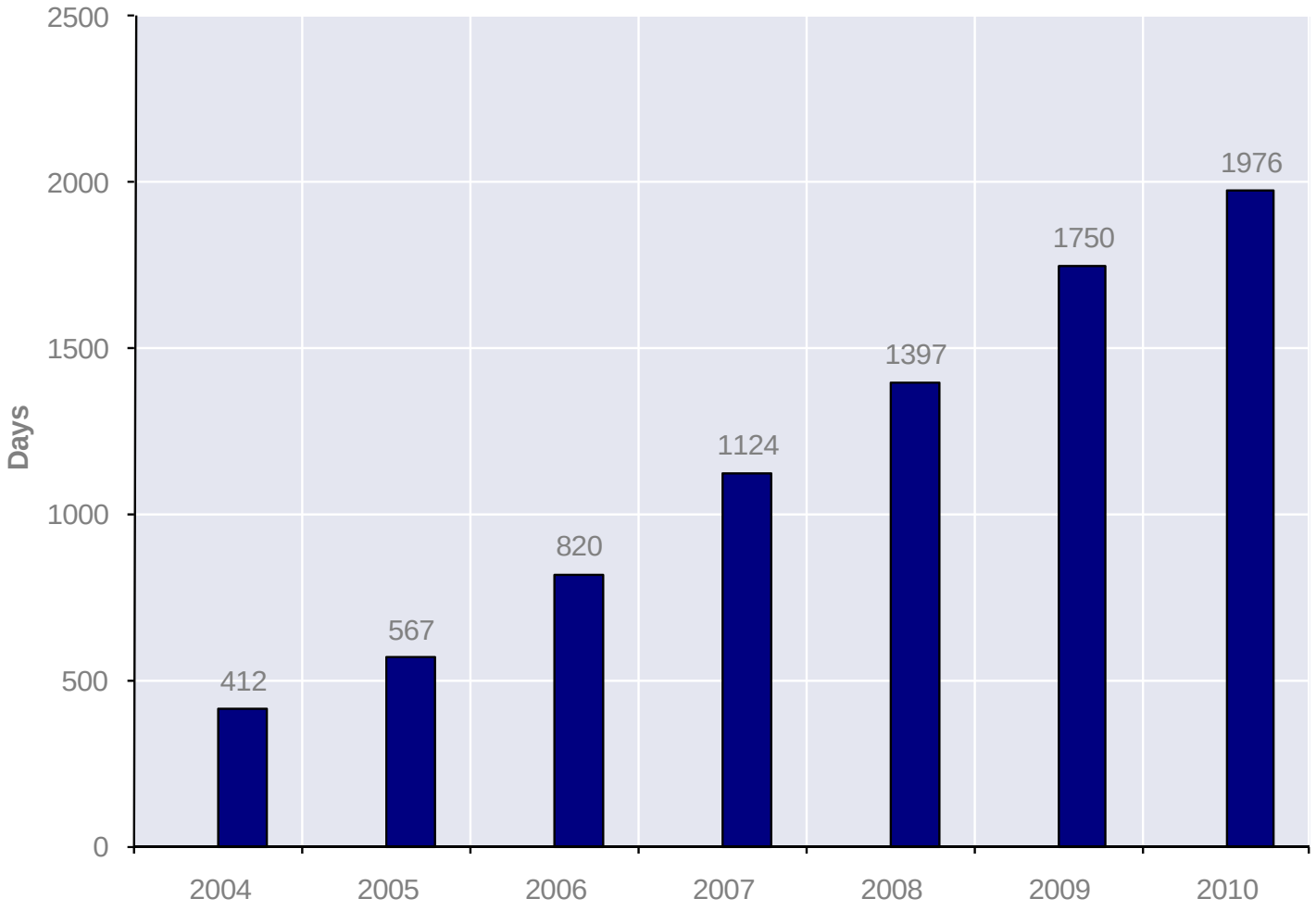
Numbers of documents received and reviewed as well as average document review time in 2006-2010



Number of Inspection Days Onsite and at Component Manufacturers' Premises



Number of Inspection Days Onsite and at Component Manufacturers' Premises, Olkiluoto 3 Related Inspections only



Development of Finnish nuclear regulations, 1

- Modification of the Nuclear Energy Act and Decree and the Decisions of the Government
  - fundamental safety requirements were transferred to the Act (2007) in order to reflect the spirit of revised Constitution (2001)
  - Decisions of the Government were replaced with Government Decrees (2008)
  - no major changes either in the safety requirements or in the licensing process
  - consideration of development of science and technology as well as operating experience.

- Changes due to EU Directive on Nuclear Safety and IPPAS mission
  - have been incorporated into nuclear law. NPP related changes were:
    - forbidding to delegate licensee's responsibility (Dir.)
    - requirement to licensees to take care of training of their staff (Dir.)
    - requirement to actively protect classified information (IPPAS).

Development of Finnish nuclear regulations, 2

- Nuclear liability act amended on national basis (into force 1.1.2012)
  - the Paris/Brussels convention changes not foreseen to be ratified in near future
  - licensee's liability amount covered by insurance 700 M€
  - in case of exceeding this limit, licensee's unlimited liability.
- Regulatory guide system restructuring
  - improved consistent structure and terminology
  - improved clarity and user-friendliness
  - early licensee involvement in working groups during preparation
  - updated national legislation, IAEA and WENRA guidance considered
  - project continues until 2011.
- Main references of the work
  - IAEA Safety Fundamental, Requirements, Guides
  - WENRA Reference levels (2007/8), WENRA Safety Objectives for new NPPs (2010)
  - lessons learned from OL3 construction project.

Structure of the new YVL guides

A Safety management of a nuclear facility	B Plant and system design	C Radiation safety of a nuclear facility and environment	D Nuclear materials and waste	E Structures and equipment of a nuclear facility
A.1 Regulatory control of the safe use of nuclear energy	B.1 Design of the safety systems of a nuclear facility	C.1 Structural radiation safety and radiation monitoring of a nuclear facility	D.1 Regulatory control of nuclear non-proliferation	E.1 Manufacture and use of nuclear fuel
A.2 Siting of a nuclear facility	B.2 Classification of systems, structures and equipment of a nuclear facility	C.2 Radiation protection and dose control of the personnel of a nuclear facility	D.2 Transport of nuclear materials and waste	E.2 Construction plan of the mechanical components and structures of a nuclear facility
A.3 Management systems of a nuclear facility	B.3 Safety assessment a NPP	C.3 Control and measuring of radioactive releases to the environmental of a nuclear facility	D.3 Handling and storage of nuclear fuel	E.3 Manufacture, installing and commissioning of the mechanical components and structures of a nuclear facility
A.4 Organisation and personnel of a nuclear facility	B.4 Nuclear fuel and reactor	C.4 Radiological control of the environment of a nuclear facility	D.4 Handling of low- and intermediate-level waste and decommissioning of a nuclear facility	E.4 Verification of strength of pressure equipment of a nuclear facility
A.5 Construction of a NPP	B.5 Reactor coolant circuit of a NPP	C.5 Emergency preparedness arrangements of a NPP	D.5 Final disposal of nuclear waste	E.5 In-service inspections of the mechanical components and structures of a nuclear facility
A.6 Operation and accident management of a NPP	B.6 Containment of a NPP		D.6 Uranium and thorium production	E.6 Buildings and structures of a nuclear facility
A.7 Risk management of a NPP	B.7 Preparing for the internal and external threats to a nuclear facility			E.7 Electrical and I&C equipment of a nuclear facility
A.8 Ageing management of a nuclear facility	B.8 Fire protection of a nuclear facility			
A.9 Reporting on the operation of a nuclear facility				
A.10 Operating experience feedback of a nuclear facility				
A.11 Security arrangements of a nuclear facility				

Collected definitions of YVL-guides: a part of the regulations, but a separate document.

Updates to National Report to 5th Review Meeting

- No major updates necessary. Covered in this presentation.

- Changes since issuance of the 5th report are
  - STUK granted in October 2010 a permit to extend the operation of the pressure vessel at the Loviisa unit 2 until the end of 2030

  - STUK has submitted letters requesting assessment after Fukushima accident to Finnish NPP licensees and utilities having Decision in Principle for new plants.

Follow-up from 4th Review Meeting – issues addressed to Finland

- Ageing management of reactors in operation
  - ageing management programmes exists (see Article 14)
  - addressed especially in license renewals and PSRs
  - Upgrades being done at both operating plants, renewal of I&C systems at Loviisa NPP progressing (see Article 18)
- Maintaining competence and responding to the growing needs for staff
  - addressed, however a constant issue on nuclear Sector (see Articles 8 and 11)
- Restructuring, streamlining and updating the safety regulation
  - revision of the existing YVL guide system progressing (see Article 7)
- Further enhancing the operating experience feedback processes
  - addressed, however a constant issue on nuclear sector (see Article 19)

Follow-up from 4th Review Meeting – issues addressed to Finland (Cont)

- Responding to increased demand for timely and effectively communication to public
  - especially important in new plant projects (see Articles 8, 16 and 17)
- Increased attention to information security issues
  - Legislation has been updated, and issue will be addressed in new YVLs.
  - STUK has increased the number of personnel in security area (see Article 8)
- Completing the NDT qualification programme
  - most of the qualifications performed and approved
  - international evaluation on qualification performed in 2010 (see Article 14)
- Ensuring reliability of digital I&C, verification & validation
  - concerns taken into account in I&C renewal projects and in OL3 project (see Article 18)
- Completing the PRA at the existing NPPs
  - item discussed in the recent PSRs (see Article 14).

For details, please see the Finnish national report as referenced above.

Finnish good practices (1)

- Modern nuclear legislation and regulations
  - reflects citizens' constitutional rights (safety, participation in environmental matters, hearing), proven licensing procedure, clear distinction of authority functions.
  - covers all safety related issues, is regularly updated to follow development of science and technology and responds to operational experience.

Finnish good practices (2)

- Advanced regulatory infrastructure
  - STUK has clear mission, values, vision and strategy
  - QM system defining the quality policy, management principles, processes, functions as well duties and authorities of all employees
  - professional, safety oriented and motivated staff with knowledge on all fields of nuclear safety
  - service oriented attitude towards society, effective communication to public.
  - National safety research programme established to support regulatory activities

Finnish good practices (3)

- Trustworthy, safety-minded licensees
  - demonstrated alertness in nuclear and radiation safety issues
  - determined implementation of ageing management programmes
  - pro-active continuous investments for plant safety improvements.

Challenges - Planned measures to improve safety

- Regulatory oversight of the construction and commissioning of OL3 unit
  - installation of equipment, review of the OL application, commissioning tests, start of operation
- Preparations for the new build (OL4 and Fennovoima 1)
  - review of the possible CL applications
- Revising the existing regulatory guidance system (YVL guides)
  - goal for new guides to be published by the end of 2011
  - task is highly prioritised because of new NPP projects in Finland.
- Provision for plant ageing
  - the licensee ageing management programmes carefully reviewed
  - I&C and other systems modernisation carried out at the existing NPPs.
- Security arrangements
  - security issues at NPPs
  - information exchange need to be enhanced worldwide.

Challenges - Planned measures to improve safety

- Maintaining and improving competence
  - broad cooperation (industry, universities, authorities, licensees) for national training courses
  - national funding for competence building safety research ensured through nuclear legislation, SAFIR -research programme
  - the Ministry of Employment and the Economy organised a new infrastructure working group which started in fall 2010.
- Communication and information sharing on nuclear and radiation safety
  - regulatory processes and decisions have to be clear and understandable to general public
  - more timely information on STUK's website (STUK's decisions, event descriptions etc.)
  - interactions with media is important.
- Response to the Fukushima accident
  - short term and long term measures in Finland
  - International co-operation.

Questions raised from Peer Review of 5th Finnish Report

The answers are available also at STUK's website (www.stuk.fi)

- number of questions has been increasing: 1999 (63 from 9 countries), 2002 (78 from 14 countries), 2005 (100 from 20 countries), 2008 (132 from 25 countries), 2010 (162 from 21 countries)
- distribution according to articles - very even. Most interested countries were Japan, Korea, Rep. of, China, Germany, Russia, United Arab Emirates, Switzerland
- more frequently asked: systematic updating of regulations, STUK's independence, safety assessment/use of PSA, OL3 lessons learned.

Questions raised - some selected answers

How to manage continuous development of regulations?

- The SAHARA principle is stated in the Nuclear law
  - NEA §7a “The safety of nuclear energy use shall be maintained at as high a level as practically possible. For the further development of safety, measures shall be implemented that can be considered justified considering operating experience and safety research and advances in science and technology.”
- STUK has a process to assess the compliance of detailed safety requirements (YVL Guides)
  - NEA §7r “The safety requirements of the Radiation and Nuclear Safety Authority (STUK) are binding on the licensee, while preserving the licensee's right to propose an alternative procedure or solution to that provided for in the regulations. If the licensee can convincingly demonstrate that the proposed procedure or solution will implement safety standards in accordance with this Act, the Radiation and Nuclear Safety Authority (STUK) may approve procedure or solution by which the safety level set forth is achieved.”
- STUK’s enforcement policy is not going to be changed
  - YVL Guides are to be applied as such to new NPPs. Application of new or revised YVL Guides to operating plants and plants under construction is considered case by case.
  - After issuing a new or revised YVL Guide STUK asks the licensees to assess whether the facility and the licensee operations are in compliance with its requirements. In case of non-compliances the licensee is expected to propose plans and schedules for achieving compliance.
  - Exemptions from new requirements can be accepted if it is not technically or economically reasonable to implement respective modifications and if safety justification is considered adequate.

Questions raised - some selected answers

Is STUK independent as the regulator?

- financially: according to the legislation, all costs of nuclear regulation can be recollected from licensees or license applicants – this provides a possibility to recruit staff and use consultant services as needed to implement the regulatory strategy
- legally: STUK's tasks and authorities are specified in the legislation; STUK has broad authorities to ensure that nuclear power is produced in a safe manner, and based on its expert judgment to give necessary orders for this purpose; statement on safety is a prerequisite for issuing a license
- functionally: STUK is administrated by a ministry that has no tasks in energy policy or industrial development: Ministry of Social Affairs and Health; Ministry is not involved in substance decision but allocates budget money to STUK and coordinates the nomination of STUK's DG for Government who makes the appointment; DG's appointment is not political but knowledge and experience from work area is required by the statutes; DG is appointed for an unlimited time and he decides on STUK's organization, strategy, use of financial resources, and appointment of new staff
- practically: STUK's management and all professional staff stays strictly away from energy policy debate and comparisons between various energy sources; STUK is dedicated on nuclear safety and its main goal is to keep safety level as high as reasonably achievable, no matter what is the political atmosphere with respect to use of nuclear power; in preparing and making STUK's decisions, thorough understanding of relevant nuclear safety issues and their balanced consideration is underlined; STUK has public trust and it would not be accepted by the public that STUK's safety concern would overlooked by the Government.

Questions raised - some selected answers

- **How PSA is used in Finland?**

  - PSA analyses are required by the nuclear legislation during the licensing process (up to level 2); the scope has to include normal and low power states, internal and external initiators (e.g. fires, floods, extreme weather conditions, seismic events)
  - Safety Objectives (CDF less than 10-5/a; large release less than 5*10-7/a) are set for new NPPs, in case of operating units SAHARA principle will be applied; for operating units the safety goals are interpreted as objectives, not as strict criteria.
  - For the operating NPP units, PRA is regarded as a tool for identifying needs for safety improvements and for helping decisions on plant and procedure modifications according to the SAHARA principle. Some examples of improvements made based on PSA are structural and operative fire protection improvements, an additional auxiliary feedwater system and control of primary secondary leaks in Loviisa, provisions against seawater intake blockage due to algae or frazil ice, provisions against diesel generator combustion air intakes by snow, protection against flooding.
  - The use of PSA methods is mandatory in several applications, such as applications for exemption from Technical Specifications and for plant modifications. The risk significance of operating events is assessed on semiannual basis. On-line risk monitors are not in use in Finland. The use of Living PSA models by expert users has been considered preferable to on-line risk monitors.

Questions raised - some selected answers

What has been learnt in Finland from OL3 project ?

- Importance of
  - Design completeness in the Construction License phase, and design management from there on
  - Clarity and common understanding of safety and design requirements and use of codes and standards
  - Experience, competence and resources of Licensee, Vendor and Contractors
  - Requirements and knowledge on Management systems (Quality, Project and Requirement management)
  - Management of subcontractors and management of construction site
  - Safety Culture in a construction project

Conclusions 2011

- A significant part of electricity consumed in Finland will be generated with nuclear power also in future
  - new capacity through Olkiluoto 3 will be commissioned in 2013
  - other existing units continue to operate to a far future
  - new facilities will be built.
- Finnish approach to safety is a proper approach to us – and it will be further strengthened
  - safety is based on licensees' high safety culture and effective safety management systems
  - independent safety verification is based on effective regulatory processes, periodical re-licensing including periodic safety reviews
  - the principle of continuous improvement of safety is followed.
- Finland is in compliance with the articles of the Convention on Nuclear Safety