Radiation and Nuclear
Safety Authority - STUK 4.4.2005

Answers to the written questions on the third Finnish National Report on Nuclear Safety Convention

The Finnish Report on Nuclear Safety - Finnish 3rd national report as referred to in Article 5 of the Convention on Nuclear Safety

has been published as report STUK-B-YTO 234, September 2004. The report is available from STUK and also at the STUK's Internet site http://www.stuk.fi/ .

Questions Posted To Finland in 2005

Seq. No	Country	Article	Ref. in National Report
1	France	General	p. 1

Question/ Comment	The reports reviewed by France in view of the third peer-review meeting were all examined according to a standard list of issues derived from the obligations of the Convention. If an issue appeared to be covered in an incomplete way by the report of a Contracting Party, this led to a question or comment. However France recognizes that the corresponding information may be available in other existing documents.
Answer	The comment is excusable.

Seq. No	Country	Article	Ref. in National Report
2	Ireland	General	Annex 2

Question/ Comment

Re: Technical barriers for preventing the dispersion of radioactive materials in the Loviisa NPP

(i) It is noted that the space between the hermetic containment, which encloses the whole primary circuit, and the concrete cylindrical secondary containment is equipped with a filtered ventilation system for reducing possible releases of radioactive materials in accident situations.

What does this system consist of and how is it different to the standard systems used in other VVER 440 reactors?

(ii) It is noted that the containment was not originally designed for severe reactor accidents, but that measures to mitigate the consequences of such accidents were implemented later.

What in brief outline did these measures include?

Answer

(i) The Loviisa NPP has been equipped with an ice-condenser containment similar to in Westinghouse plants. This is a unique design in VVER-440 reactors. The space between the primary containment and the concrete cylindrical secondary containment is equipped with a ventilation system which includes particle and active carbon filters. The system is keeping underpressure in this space during accidents. If the primary containment is leaking to this space the filtered ventilation system reduces releases to the environment. In other VVER-440 reactors there are either no real containment or they are equipped with a bubble condenser containment.

(ii) Several hardware modifications have been carried out at the Loviisa plant to improve the containment against severe accidents. The main modifications, now installed at both plant units, are:

• new independent primary system depressurisation valves (2 valves per unit) to reduce the reactor pressure vessel stress prior melt relocation into the lower plenum

• core melt retention within the reactor pressure vessel by vessel external cooling. This required modification of the thermal and neutron shield support structures at the bottom of the pressure vessel. Flow paths for the external coolant were also enlarged.

• improvement of the hydrogen management by installation of passive autocatalytic recombiners in the containments and by adding a new mechanism to open the ice

condenser doors. The latter is needed to ensure hydrogen mixing.
• long term containment cooling by installation of external spray systems on the containment dome. The external spray system is independent of DBA systems, supplied by dedicated local diesel generators.

Seq. No	Country	Article	Ref. in National Report
3	Ireland	General	Annex 2

Question/ Comment

Re: Application of Defence in Depth Concept in Finnish NPP's
Technical barriers for preventing the dispersion of radioactive materials in the Loviisa NPP

(ii) It is noted that the containment was not originally designed for severe reactor accidents, but that measures to mitigate the consequences of such accidents were implemented later.

What in brief outline did these measures include?

Answer

Please see the answer to question 2.

To 2 (withdrawn):
(i) The Loviisa NPP has been equipped with an ice-condenser containment similar to in Westinghouse plants. This is a unique design in VVER-440 reactors. The space between the primary containment and the concrete cylindrical secondary containment is equipped with a ventilation system which includes particle and active carbon filters. The system is keeping underpressure in this space during accidents. If the primary containment is leaking to this space the filtered ventilation system reduces releases to the environment. In other VVER-440 reactors there are either no real containment or they are equipped with a bubble condenser containment.

(ii) Several hardware modifications have been carried out at the Loviisa plant to improve the containment against severe accidents. The main modifications, now installed at both plant units, are:
• new independent primary system depressurisation valves (2 valves per unit) to reduce the reactor pressure vessel stress prior melt relocation into the lower plenum
• core melt retention within the reactor pressure vessel by vessel external cooling. This required modification of the thermal and neutron shield support structures at the bottom of the pressure vessel. Flow paths for the external coolant were also enlarged.
• improvement of the hydrogen management by installation of passive autocatalytic recombiners in the containments and by adding a new mechanism to open the ice condenser doors. The latter is needed to ensure hydrogen mixing.
• long term containment cooling by installation of external spray systems on the containment dome. The external spray system is independent of DBA systems, supplied by dedicated local diesel generators.

Seq. No	Country	Article	Ref. in National Report
4	Lithuania	General	pages 76-77

Question/ Comment

Please specify, what performance indicators are used for inspection, monitoring and assessment with regard to the occupational and public radiation protection at Finnish nuclear power plants? (section "Conclusions on benefits from the first review meetings")

Answer

STUK has following indicators for the NPP occupational exposure:

- annual collective dose
- the average of two successive year's collective dose per net electric power at one reactor unit (limit 2,5 manSv/GW given in Guide YVL 7.9)
- the average of ten highest personal radiation doses.

Indicator for public exposure is the calculated radiation exposure in a year to a person of the critical group near the NPP.

Seq. No	Country	Article	Ref. in National Report
5	Russian Federation	General	Annex 2

Question/ Comment

Figure 19 demonstrates that the contribution of safety system unavailability to core damage probability has been increasing in the last 5 years at Loviisa NPP. It follows from the text that this contribution is mainly due to diesel generator (DG) failures and preventive maintenance of auxiliary feed water system.
1) What DG failures contribute to the increase of core damage frequency?
2) What corrective actions are being taken to prevent diesel generator failures?
3) Why does preventive maintenance of auxiliary feed water system contribute to the increase of core damage frequency, i.e. does not contribute to safety improvement?

Answer

1) The Figure 19 does not indicate an increase of core damage probability but indicates only a relative share of the DG failure in comparison with the average annual core damage estimate. PSA based event analysis (Risk follow up) is not to indicate any increase in average core damage frequency but to give insights of the risk coming from various component failures, online maintenance, exemptions from Tech Specs, violations of Tech Specs and few other operational events during a specific time span. The possible increment in core damage frequency estimate will be introduced only if the DG failure events give rise to the increment in DG failure rate which is used in PSA.

2) Customary corrective maintenance was used to eliminate the diesel generator failures during normal operation. In few last years approximately 40 % of failures of diesel generators originate from the automation systems. The automation systems of diesel generators will be revised in conjunction with the modernization project of the Loviisa automation in order to improve the reliability of diesel generators. A conceptual design plan for improving the automation of diesel generators is in progress.

3) The Figure 19 does not indicate an increase of core damage probability but indicate only the relative share of the auxiliary feed water system failure in comparison with the average annual core damage estimate. PSA based event analysis (Risk follow up) is not to indicate any increase in core damage frequency (See answer 1).

The on-line preventive maintenance has a dual effect on the plant safety. First of all the online preventive maintenance contributes to the plant risk because the system under maintenance is disconnected. Secondly the on-line preventive maintenance contributes to the safety improvement but there is a lack of a method which is capable to assess the quantity of the respective safety improvement. Hence only the negative impact of the preventive maintenance has been analyzed in PSA.

The reason why the maintenance disconnection provides a fairly big contribution to the annual core damage probability of Loviisa units 1 and 2 is that the additional auxiliary feed water system is common to both units. This means that both redundancies of the system are able to supply water to Loviisa units 1 and 2 and this feature is also introduced in the PSA model of Loviisa 1/ 2. When redundancy 1 (formally dedicated to unit 1) of the additional auxiliary feed water system is under maintenance during the annual refuelling outage of unit 1, the unavailability of redundancy 1 contributes to the risk of unit 2 which is operating and vice versa.

Seq. No	Country	Article	Ref. in National Report
6	Russian Federation	General	Annex 2, p.85

Question/ Comment

On page 85 of the Report it is mentioned that in 1995 multiple damage to fuel assemblies at Loviisa-1 occurred due to fuel assembly clogging and vibrations.

1) What was the cause of this clogging?
2) What actions have been taken to preclude fuel assembly clogging and vibrations?

Answer

1) The whole primary circuit and most of the primary circuit auxiliary systems of Loviisa Unit 2 were decontaminated during the summer 1994 refuelling outage using the Siemens CORD-process. The decontamination succeeded in reducing the average external dose rate around the primary circuit by a factor of ten.

However, at the end of 1994 an unexpected gradual temperature increase was noticed in some fuel bundles. Based on fuel bundle outlet temperature and neutron flux measurements it was concluded that a certain degree of coolant flow blockage was the reason for the temperature increases.

Six fuel bundles showing the strongest outlet temperature increase were removed from the reactor during an extra shutdown at beginning of 1995. Flow resistance measurements were made for about 80 bundles during the summer 1995 refuelling outage. On the basis of the measurements, 30 bundles with two years burnup were replaced by clean bundles.

From the start of the cycle after the 1995 refuelling outage there was a continuous increase in the fission product activities of the primary coolant water. The bundle outlet temperatures had, however, ceased to increase with the exception of only a couple of bundles. At the end of October when the steadily increasing noble gas level reached a value of about 200 GBq/m3, which is half of that allowed in the Technical Specification, the utility (IVO) made the decision to open the reactor and to remove the leaking fuel.

The observations of visual inspection of the leaking assemblies indicate that the reason for the fuel failures was mechanical wear (fretting) of the cladding due to a vibration of the rods and spacer grids. It is assumed that the vibration was due to an increased crud clogging the two lower spacer grids of the assembly.

Even if the primary cause and mechanism of the deposition is still unknown, it is possible that it is a consequence of the primary circuit decontamination.

2) As long as the actual mechanisms and reasons of this exceptional crud deposition are not fully understood it is difficult to define what really should be learned from this experience. However, it can be stated that the evaluation of a suitable decontamination process to each plant type has to be carried out very carefully. Special consideration must be devoted to the cleaning and passivation of the systems after decontamination.

Seq. No	Country	Article	Ref. in National Report
7	Slovakia	General	2.2

Question/ Comment

There are intentions to introduce a new type of fuel for VVER type of reactors operated in Finland. What are the regulatory requirements to be fulfilled for this change? What are the specific technical measures taken by the licensee prior to the new fuel type loading?

Answer 1.1 Licensing of core design
Safety analysis report of the core and fuel design is submitted to STUK for approval. Utility calculations for safety margins and operation limits will be checked. Independent calculations will be also made by STUK if necessary.

1.2 Licensing of fuel (or control rod) design
STUK's acceptance of fuel occurs always by delivery batches.
Licensing procedure will take three steps:
Step 1
(initial core, new fuel type or new manufacturer of fuel)
In case of new type of fuel or major changes to previous one and in case of new fuel manufacturer for Finnish plants lead test assemblies will be used.

Pre-inspection documentation is submitted to STUK for approval before manufacturing is commenced, including:
• feasibility study showing the neutronic and thermal hydraulic compatibility and mechanical structure of the fuel
• manufacturers QA-programme and QA-manual (for information)
• design criteria
• experimental studies and analyses of fuel behaviour
• operating experience.

Step 2
(for all fuel batches)
Pre-inspection documents shall be complemented before manufacturing is commenced, including:
• item list
• specifications
• drawings
• QC-programme
• description of manufacturing.

Step 3
Before manufacturing is commenced:
1) documents above (Step 1 and 2) shall be approved by utility and STUK
2) implementation of manufacturer's (and designer's) QA is reviewed by utility (usually a separate QA-audit)
3) fabrication and QC-methods are reviewed by utility
4) STUK controls the surveillance activities of the utility by participating on a case by case basis in the utilities visits to the manufacturer and by the utilities reporting to STUK.

1.3 Modifications of core and fuel design requiring licensing.
All modifications require licensing. For major modifications (e.g. new type of fuel) the utility shall submit documents to STUK for acceptance according to Steps 1, 2 and 3 above. For minor modifications (old type of fuel) documents according Step 1 above are not needed and the utility shall submit documents to STUK for acceptance according to Step 2 above. In that case all new fabrication and QC-methods (Step 3) will be reviewed by utility during manufacturing inspection.

	Pre-inspection documentation for the next fuel delivery batch shall be approved by STUK even if there are no changes compared to the previous delivery batch. All changes of the pre-inspection documentation shall be approved by STUK. If there are no changes at all item list and common drawings is enough to be submitted to STUK for approval. The process is described more detailed in our guides YVL 6.2 and YVL 6.3.		
Seq. No 8	Country Slovenia	Article General	Ref. in National Report annex 2, p 83
Question/ Comment	Third paragraph mentions plant automation. Which standards must be met by the new automation (software & hardware)?		
Answer	The most central international standards to be met are the following: IAEA Safety Standards Series, NS-G-1.3, ”Instrumentation and control systems important to safety in nuclear power plants”, Safety Guide, March 2002. IAEA Safety Standards Series No. NS-G-1.1, ”Software for Computer Based Systems Important to Safety in Nuclear Power Plants”, Safety Guide, September 2000. IEC 61513 ”Nuclear power plants – Instrumentation and control for systems important to safety – General requirements for systems”, First edition 2001-03. IEC 60880 ”Software for computers in the safety systems of nuclear power stations”, First edition 1986. IEC 60880-2 ”Software for computers important to safety for nuclear power plants – Part 2: Software aspects of defence against common cause failure, use of software tools and of pre-developed software”, First edition 2000-12. IEC 60987 ”Programmed digital computers important to safety for nuclear power stations”, First edition 1989-11. IEC 62138 ”Nuclear Power Plants – Instrumentation and Control – Computer-based systems important for safety – Software aspects for I&C systems of class 2 and 3”, 2003. IEC 60780 ”Nuclear Power Plants – Electrical equipment of the safety systems – Qualification”, Second edition 1998-10. IEC 61226 ”Nuclear Power Plants – Instrumentation and Control Systems important for Safety – Classification, First Edition 1993-05 , under revision, draft CDV 2003 EN 19265, Common position of European nuclear regulators for the licensing of safety critical software for nuclear reactors, May 2000.		
Seq. No 9	Country United Kingdom	Article General	Ref. in National Report
Question/ Comment	The report is well written and includes information on all relevant Articles of the Convention. It is clear that Finland is taking its obligations under the convention seriously and using the reports in a positive way to generate improvement.		
Answer	The statement is noted with appreciation.		
Seq. No 10	Country Bulgaria	Article Article 6	Ref. in National Report page 11
Question/ Comment	How the uprating of the reactor installation affects the residual resource of the equipment and components?		
Answer	The power uprating of the Olkiluoto NPP by 16% in the years 1994-98 raised the main coolant volume flow and required uprating the blowdown capacity. The main steam flow rate increased respectively, and enhanced wall thickness measurements were done by order of STUK. No increased erosion trend was detected, though, thanks to the low steam moisture. The increased blowdown forces prompted extensive updating of the related		

strength analyses. Checks were done for the as-built geometry, material properties and integrity of the most stressed parts, and the code allowables were met for the residual design life time with adequate margin.

The power uprating of Loviisa NPP by 9 % in the years 1996-2002 was based on enhanced thermal efficiency. It did not affect the main parameters of the primary circuit but raised the flow rate in many secondary circuit systems. Some of them were in the early years prone to erosion corrosion, which was mitigated by introducing alkaline water chemistry in the mid-90's. No turn has been reported in these trends. The steam generator tubes now present a slightly rising defect frequency, but this is not traced to power uprate. The harmful effects are thus confined to increased vibration of high-energy piping. Several snubbers have been installed and they have helped to keep the vibration within established limits.

Both utilities have been active in replacing components susceptible to major degradation, such as IGSCC and erosion-corrosion. This will be the policy after these power upratings which are therefore unlikely to limit the life time of these NPP units. No harmful effects to unreplaceable components have been reported.

Seq. No	Country	Article	Ref. in National Report
11	Canada	Article 6	2.2.1,p9 & 2.2.2,p11

Question/ Comment: It is stated that Loviisa 1 was connected to the electrical network on February 8, 1977. The report also elaborates on the plant systematic life management (subsection 2.10.5, page 47) that was pursued for the Loviisa 1. In Annex 2, page 86-87 the report mentions that “the brittle weld joint of Loviisa 1 reactor pressure vessel was heat-treated during the 1996 annual outage, ….The use of the reactor pressure vessel has been accepted so far until the 2004 annual outage.”
Please explain what specific measures, provisions, or inspection plans have been or will be developed to justify extension of the operating life of Loviisa 1 beyond its design life.

Answer: Fortum has made a new safety analysis of Loviisa 1 reactor pressure vessel and updated the probabilistic safety analysis in 2004. In the analysis of 1996 the re-embrittlement rate was evaluated very conservatively.

The main difference is the re-evaluation of the re-embrittlement rate after annealing of the vessel compared to the analysis made in 1996. The new surveillance program started after the annealing in 1996. The samples were annealed after three years of irradiation and put back to the reactor. After re-irradiation the samples were tested according the Master curve principles. The use of Master Curve method gives more accurate and reliable value of the fracture toughness KIc. Based on the new analysis the use of Loviisa 1 reactor pressure vessel is accepted until the revision of 2012.

The critical weld and the base metal in core area is inspected at least every 8 years from inside surface of the wall utilising UT an ET methods. UT inspection of the weld is also made from outside surface.

Seq. No	Country	Article	Ref. in National Report
12	China	Article 6	P11.Ch2.2.2

Question/ Comment: Regarding to power uprating and license renewal for plant life extensions, are there any adequate considerations on the capacity of onsite storage for low and medium level waste as well as interim storage for spent fuel ?

Answer: At both NPPs, the capacities of interim storages for spent fuel need to be increased within

5-7 years. The enlargement projects have not yet commenced. If the needs of the new NPP unit are also taken into account, approximately 1000 tU additional storage capacity is needed until early 2020's, when the spent fuel repository is envisaged to be in operation.

About 73 % of the low and intermediate level waste has been transferred to the disposal facilities. The capacity of the disposal facility at the Olkiluoto site is adequate until 2020's. At the Loviisa site, expansion of the disposal facility is currently underway in order to meet the future capacity needs. The NPPs have storages mainly for waste which will be later on either cleared from regulatory control or conditioned for disposal.

Seq. No	Country	Article	Ref. in National Report
13	France	Article 6	§2.2.3 - p. 14

Question/ Comment: In the safety enhancement programme, could Finland explain how was considered the operating experience of other countries, in order to raise the safety level?

Answer: In STUK, a group of experts is screening all IRS-reports, and those meaningful for Finnish plants are taken in more detailed analysis in both the regulatory body and in plant organisations. With complicated events bringing new evidence on risks, research projects can be used to get more information and to plan possible corrective actions.
The NPP organisations also get all IRS-reports and, additionally, the WANO-reports. The screening of reports is made independently of the regulator's process. All reports with experiences applicable to plants and operating organisation are then treated similarly as in-house events. The plant quality system is used to follow up that correcting actions are carried out.

Seq. No	Country	Article	Ref. in National Report
14	Ireland	Article 6	Loviisa NPP

Question/ Comment: It is understood that the Instrumentation and control system at Loviisa NPP has been upgraded. What type of system has been installed and how has STUK satisfied itself that the present system when fitted to a VVER reactor, offers acceptable performance and safety standards when compared with those expected of the I&C systems on the BWR reactors at Olkiluoto?

Answer: Loviisa I&C upgrading has started a few years ago. Scope of project is to upgrade automation systems and control room but not field equipment (sensors or actuators). New systems will be programmable digital systems.

STUK satisfies itself as to the adequacy and compliance with safety requirements (Decision of Council of State 395/1991, Guides YVL 1.0, 2.0, 2.1, 2.7, 2.8 and 5.5) according to STUKs normal licensing procedure (see YVL 2.0 for details). At present, the Conceptual Plan for the main upgrading parts has been approved; preparations for System Pre-Inspection are underway. This review does not compare plants against each other - Loviisa I&C, as it stands today, is already at least as good as that of Olkiluoto BWRs, which, moreover, will also have their I&C upgraded in more or less similar fashion during the next 10 years.

Seq. No	Country	Article	Ref. in National Report
15	Korea, Republic of	Article 6	2.2.1

Question/ Comment: What were the key issues for power up-rating of nuclear power reactors in Finland? If there were operational software changes for reactor power up-rating, what were they? What was the change in legal system for the licensing of power up-rating?

Answer: The modernisation of both Olkiluoto and Loviisa NPPs was the main issue in power uprating. The main objective in this process was to maintain safety margins as high as they were before power uprating. This goal required a number of modifications especially in Olkiluoto where power uprating was larger (15 %). In Loviisa power was uprated 9 %.

In Olkiluoto (BWR) the power uprating included a number of modifications all over the plant. The most important of them were
• new fuel designs for lower linear heat rating and better stability
• modernisation of safety valves (two additional safety valves)
• enhancement of decay heat removal system
• new steam separators
• new moderator tank head
• modifications in turbine plant
• modernisation of pressure controller (digital three channel automation system)
• modernisation of neutron monitoring system
• number of modifications in feedwater system
• modification of ATWS protection
• elimination of the pump trip transient by adding a parallel, asynchronous motor-generator device to the pump drives.

In Loviisa (VVER-440) original safety margins were larger than in Olkiluoto. The maximum linear power of the fuel in Loviisa plant is limited by the peak clad temperature during a large break LOCA. In order to maintain existing safety margins there was a need to modify emergency core cooling system. The modification included new low pressure emergency core cooling pumps with higher shut off head and a reduction of accumulator pressure.

Due to power uprating there were no changes in the Finnish legal system. Operating license renewal was required.

Seq. No	Country	Article	Ref. in National Report
16	Korea, Republic of	Article 6	2.2.1

Question/ Comment: What is the scope of the intermediate safety assessment for Olkiluoto units to be carried out by the end of 2008, according to the conditions of the licenses for the new power level of 2500 MW?

Answer: The scope of the PSR (=intermediate safety assesment) in Finland is equal to the license renewal process, considering the safety issues. The only difference is that there is no need for application to be submitted to the Government. You could say “less bureaucracy, more engineering.”

Please see also the answers to questions 21, 24, 62, 99 and 100.

Seq. No	Country	Article	Ref. in National Report
17	Korea, Republic of	Article 6	2.2.1

Question/ Comment: The 96.6% of load factor and the 7 days of annual outage and refueling of Olkiluoto 2 seems to be remarkable one. What is your recommendation to achieve this in other countries? Is there any possibility of challenging to safety in pursuit of that remarkable performance?

Answer: There are several factors influencing the outage time, and the short outages follow optimizing these factors and their interactions. The most important factors considered are the plant concept and good planning of plant usability, planned and constantly ongoing preventable maintenance, good knowledge of plant condition and accurate planning of the whole outage and work flows during it. Also the regulatory attitude and way of action bear considerable influence on outage length. The flexibility of regulatory body is reflected in the fact the regulatory staff is on plant and carry out their activities day and night during the outage period, when needed.

The possible challenges to safety might follow from haste and emphasis on time rather than safety by the personnel carrying out the work. This possibility has been identified both by the plant organisation and the regulatory body, and there have been special arrangements to control the performance and safety level. After each planned outage, the responsible persons in plant and the representatives of regulatory body have a feedback session, in which also all issues related safety are discussed.

Seq. No	Country	Article	Ref. in National Report
18	Russian Federation	Article 6	

Question/ Comment
1) What are the underlying implications of Loviisa 1 and 2 reactor power uprating by 9% above the design level?
2) Does this testify to large safety margins incorporated in VVER-440 reactor design?

Answer
The main objective during Loviisa power uprating was to maintain safety margins as high as they were before power uprating. The maximum linear power of the fuel in Loviisa plant is limited by the peak clad temperature during a large break LOCA. In order to maintain existing safety margins there was a need to modify emergency core cooling system. The modification included new low pressure emergency core cooling pumps with higher shut off head and a reduction of accumulator pressure.

Seq. No	Country	Article	Ref. in National Report
19	Russian Federation	Article 6	

Question/ Comment
The Report lacks information on the status of SG tubes and collectors/headers at Finnish NPPs.
What kinds of defects are detected in SG tubes and collectors at Finnish NPPs?

Answer
STEAM GENERATOR INSPECTIONS
General
Inspections of safety class 1 and 2 components are performed as specified in YVL 3.8 guide, based on the ASME CODE section XI. Inspection techniques and inspectors are or will be qualified according the requirements in YVL guide 3.8.
Heat exchanger tube inspection
Heat exchanger tube inspections using eddy current bobbin coil technique are performed every second year. The extent of the inspection is 2 steam generators at 100% per unit. The recording criterion is 20% of wall thickness and the plugging criterion is basically 50% of wall thickness.
To the end of 2004 there have been:
Unit Inspected tubes
(half length) Indications Plugged tubes
Loviisa 1 84879 66 28
Loviisa 2 113604 54 19
Steam generator primary collector inspection
The inspection of the steam generator primary collector welds and flange area is performed by ultrasonic technique every 8 years. During the pre service inspection hot cracks and lack of fusion indication where detected in the upper and lower welds of the primary collectors. Some of the defects were repaired and other defects where accepted according ASME CODE section XI. No crack growing has been detected in the previous in service inspections.

The original feed water distributor located inside the tube bundle was replaced by a new feed water distributor located above the tube bundle. Reason for replacement of the distributor was damages due to erosion corrosion.
Modification of the primary collector cover sealing from Ni -ring to Graphite sealing has been carried out. The modification reduces the tightening force of the cover bolts.
The new primary collector cover is equipped with a flow reduction ring and absorbing ring. The new cover reduced the maximum primary to secondary leakage rate in accident condition if the collector cover bolts are failed.

Seq. No	Country	Article	Ref. in National Report
20	Slovenia	Article 6	section 2.2.3, p 14

Question/ Comment: This section lists the most important safety related modifications included in the modernisation program. Among them is the earthquake resistance of the plant (item 4). Please, explain the legal basis for additional seismic protection measures at Olkiluotto (required or voluntary).

Answer: The additional seismic protection measures at Olkiluoto in context of modernisation of the plant were made on consensus basis. The changes were made based on the experience and insights received from the seismic PSA performed for OL 1and 2 in the spirit of the SAHARA principles. Guide YVL 2.8 requires that PSA is applied to the enhancement of plant safety and identification of needs for plant modifications. If Olkiluoto should have not proposed the necessary modification itself, STUK should have set forth specific requirements to improve the plant.

Seq. No	Country	Article	Ref. in National Report
21	Canada	Article 7	2.3.5, p20

Question/ Comment: The report indicates that “the periodic re-licensing has allowed good opportunities for comprehensive periodic safety review”.
Please indicate whether PSR’s were legislated through a regulatory document, and whether PSR’s were performed for any of the two NPPs.

Answer: The Finnish nuclear legislation does not use the wording ”PSR”, instead of it, it requires, that
1) (Nuclear Energy Act Section 24) “the licence, excluding the construction licence, shall be granted for a fixed term. When the length of the term is considered, particular attention shall be paid to ensuring safety and to the estimated duration of operations. “

2) (Nuclear Energy Act Section 6) “the use of nuclear energy must be safe; it shall not cause injury to people, or damage to the environment or property.”
3) (Government Resolution 395/1991, Section 27) “Operating experience from nuclear power plants as well as results of safety research shall be systematically followed and assessed. For further safety enhancement, actions shall be taken which can be regarded as justified considering operating experience and the results of safety research as well as the advancement of science and technology. “
The details of the licensing and relicensing process are given in the Nuclear Energy Decree and STUK’s regulatory guides (YVL Guides). Especially, the Guide YVL 1.1 (draft) describes in detail, how relisensing and/or periodic safety review have to conducted in administrative sense and which are the documents the applicant has to submit for STUK’s approval.
Last time the operating licenses of Loviisa 1 and 2, as well as OL1 and 2, were renewed in 1998.

Seq. No	Country	Article	Ref. in National Report
22	Pakistan	Article 7	P17

Question/ Comment It is mentioned that YVL Guides also provide administrative procedures for regulation of the use of nuclear energy. It is also mentioned that YVL Guides are rules an individual licensee or any other organization concerned shall comply with, unless some other acceptable procedure or solution has been presented to STUK by which safety level laid down in an YVL Guide is achieved. Since Finland operate three types of NPPs, could you please elaborate the basis on which the YVL Guides are issued?

Answer In Finland there are two type of NPPs in operation, The Loviisa 1 and 2 are PWR type reactors originating from Russian VVER-440 design, and OL 1 and 2 units are BWR reactors originating from Asea-Atom Sweden. The new OL 3 unit will be of EPR (PWR) design developed mainly by Germany and France.

The YVL Guides are issued by STUK on the basis of a mandate provided in Nuclear Energy Act, Section 55, and in five topical Governmental Resolutions on nuclear and waste safety. The YVL Guides in general are not plant type specific. Only exceptionally it is noted in the Guides, if some requirements are not relevant to all plant types. The plant type specific requirements are issued by STUK when needed as STUK's Decisions.

The general trend already during 1990's in preparing the regulatory guides has been to decrease the amount of technical details, which especially can be very plant type dependent, and move to less prescriptive regulatory guides.

Seq. No	Country	Article	Ref. in National Report
23	Pakistan	Article 7	P17

Question/ Comment It is written that "the procedure to apply new guides to existing nuclear facilities is such that the publication of an YVL guide does not, as such, alter any previous decisions made by STUK". However, the previous decisions by STUK about any nuclear installation would have been based on the regulatory positions presented in the older versions of the guide. It is not quite clear whether the earlier decisions made by STUK about an installation are also revised with introduction of new regulatory requirements?

Answer The earlier decisions by STUK remain as they are, if not otherwise decided by STUK.

After issuing a new or revised YVL Guide the licensees are asked to compare the compliance of the status of their operating NPPs with the requirements of revised regulatory guides. If a non-compliance is recognized, a justification for continuation of the existing situation is required or, a proposal for necessary plant modifications.

What is needed to do because of new requirements, is decided in a plant specific decision by STUK based on licensee's and STUK's independent safety analysis of non-compliances.

Seq. No	Country	Article	Ref. in National Report
24	Pakistan	Article 7	P18 Section 2.3.3

Question/ Comment It is mentioned that "the Operating Licences are granted for a limited period of time. This period at the beginning is five years and then about ten years. The periodic re-licensing has allowed good opportunities for a comprehensive, periodic safety review." Finland may elaborate:
• What is the rationale for issuance of initial five years licence and how it is revalidated?
• Is completion of comprehensive periodic safety review the only requirement for revalidation of Operating Licence after ten years?

Answer The 5 years license is to be understood as a historical record and nothing else. When the first Finnish NPPs were started late 1970's and early 1980's, the Finnish nuclear infrastructure in general and also the legislation was at its early years. The nuclear legislation was totally renewed in 1987 and after that, the licenses have normally been granted for 10 years.

The prerequisites for an operating license are given in the nuclear legislation, general safety regulations issued by the Government and regulatory guides issued by STUK.

The licensing process includes much more than a regular PSR (as described in IAEA NS-G-2.10). Also other issues are evaluated, e.g., the financial situation of the licensee and arrangements for nuclear waste management (technical and financial), nuclear liability, nuclear material control and security (physical protection) as well as the compliance with earlier license conditions. The process also includes quite a few administrative and juridical actions dealing with land-use, environmental matters, financing etc.

Seq. No	Country	Article	Ref. in National Report
25	Pakistan	Article 7	P19

Question/ Comment: It is stated “STUK is also developing Risk Informed Regulation Practices. These include among others use of PSA for planning regulatory inspections to focus inspections on risk significant areas. It also includes assessment of inspection findings by PSA.” All these applications of PSA in regulatory decision making naturally requires PSA studies. Does STUK performs its own PSA studies or PSA is carried out by its support organization VTT? If VTT carries out studies for STUK as well as utilities, Finland may like to clarify that how conflict of interest is avoided in such a case?

Answer: The essence of the risk informed regulation and safety management is that the Living PSA works as an interactive communication platform between the licensee and STUK. Accordingly a PSA model performed by the licensee and reviewed by STUK is used for resolution of safety issues both by the licensee and STUK. For this purpose the licensees provide STUK with the PSA model in electronic form and regularly maintain and update it. STUK will provide the licensees with SPSA/FinPSA code developed by STUK and maintains and updates it as necessary. There is no conflict of interest between STUK and the licensees on how to use PSA for the risk informed regulation (STUK) and safety management (the Licensee) because both are using the identical PSA model which after a thorough review process has been accepted by both parties.

VTT does not carry out PSA studies for STUK or the licensees. The licensees have performed the PSAs using their own personnel in accordance with the requirement of the regulatory guide YVL 2.8. VTT have been used as a consultant only for resolving methodological problems of PSAs if necessary.

Further information on the risk informed regulation and safety management process:
A plant specific, design phase level 1 and 2 PSA is required as a prerequisite for issuing the construction licence for a new NPP unit and a complete level 1 and 2 PSA for issuing the operating licence as stated in the regulatory guide YVL2.8. The plant specific level 1 and 2 PSA includes internal initiators, fires, flooding, harsh weather conditions and seismic events for full power operation mode and for low power and shutdown mode. The regulatory guide YVL 2.8 includes general guidelines for ensuring the quality of PSA. STUK will review the PSAs and makes an assessment of the acceptability of the design phase PSA/ construction phase PSA prior to giving a statement about the construction licence/operating licence application.

PSA has got an important role in the evaluation of proposed plants modifications of operating plant units. The licensees have provided STUK with the assessment of safety significance of each proposed modification. The risk assessment has to be submitted to STUK independent of the safety class of the systems to be changed. For example, in the course of past several years the estimate of the core damage frequency of the Loviisa plant has decreased with a factor of ten thanks to the plant modifications.

In the area of operational events, PSA is a standard tool to assess the safety significance of component failures and incidents. Today risk follow-up studies are a common practice at STUK. Since 1995 STUK has performed systematic risk follow-up studies on an annual basis for each Finnish nuclear power plant unit.

The relevance of allowed outage times (AOT) of most important front line safety systems has been re-evaluated with PSA. Certain inconsistency of AOTs in comparison with the respective risk impact has been identified between various safety systems. Risk assessment has also questioned the traditional conclusion that in all faulted states the shutdown of the plant would be the safest course of action. If systems used for decay heat removal are seriously degraded (CCF), it may be safer to continue operation than to shut down the plant immediately, although shutdown may be required by the current Technical Specifications. If a licensee applies for an exemption from Tech Specs the licensee has to submit a risk analysis to STUK and indicate that the risk from the exemption is tiny. STUK reviews the licensee´s analysis and makes its own risk assessment for comparison as necessary.

STUK allows on-line preventive maintenance during power operation provided that the deterministic safety criteria are fulfilled (e.g. single failure criterion) and the risk contribution is small. According to the first Olkiluoto PSA study in 1989, the risk contribution of on-line preventive maintenance was about 5 % of the total core damage frequency. When the maintenance schedule was optimised with PSA, the risk contribution of on-line preventive maintenance could be reduced to less than 1 % of the total core damage frequency.

Pilot projects on in-service inspections of piping both in a pressurized water reactor plant (Loviisa) and a boiling water reactor plant (Olkiluoto) have been completed by STUK in cooperation with the licensees. STUK’s risk-informed procedure combines both the plant specific PSA information and the traditional insights in support of the system specific detailed in-service program planning.

STUK is in progress of training inspectors to understand and use the PSA insights while planning the inspection programs and conducting regulatory inspections at site. A special PSA Info system is in progress in order to use the insights of PSA for training the inspectors, to upgrade their risk perception and to demonstrate the importance of most significant accident sequences.

Seq. No	Country	Article	Ref. in National Report
26	Pakistan	Article 7	P19

Question/ Comment: Regarding enforcement, it is mentioned “the enforcement system includes provisions for executive assistance if needed and sanctions in case the law is violated”. Finland may elaborate;

• What are major enforcement tools? Do the enforcement tools include monetary penalties and punishment to the violators?

	• Who is responsible for suspension, modification or revocation of a licence? • Do the licensees have rights of appeal against the decisions of STUK?
Answer	The procedures used in the enforcement of regulatory requirements are based on the regulatory authorities given in the legislation. The regulatory authorities of STUK and the officials working for STUK are presented particularly in Chapter 10 of the Nuclear Energy Act (990/1987) and Chapter 14 of the Radiation Act (592/1991). Chapter 15 of the Nuclear Energy Decree (161/1988) discusses regulatory oversight of the use of nuclear energy. The most severe procedures are presented in Sections 64-67 of the Nuclear Energy Act. Basically, the enforcement tools are as follows: Measures of an inspector: 1) oral notice and 2) a request for actions in the form of a protocol. Measures by STUK: 1) Written notice, and 2) Order for actions. A STUK decision (Order for Action) is drawn up of the required actions. The decision may require the licensee to take immediate actions in order to restore the safety level. If the situation requires, STUK may ask for executive assistance from the police (Nuclear Energy Act 68§). A deadline is set for the actions. If necessary (Nuclear Energy Act 67§), the decision may include orders concerning the operating conditions at the installation, for example that the installation shall be shut down, the installation may not be started up, or its power level or other limitations may be changed before the licensee's separate application has been handled at STUK. The ultimate coercive actions available to STUK are: 1) Setting a conditional imposition of a fine by STUK decision 2) Threat to interrupt or limit the operation 3) Threat that STUK has the neglected action made at the licensee's expense. Monetary penalties (fines) for licensees or licensee employees have never been used in Finland. In practise, the measures used have been those given to the inspectors directly, or to STUK (Written Notice, Order for Actions). Since the last reporting (2001) no Orders for Actions have been needed. The licenses are issued by the Government and only the Government can change (suspend, modify, revocate) them. STUK's decisions can be appealed to Local Administrative Court in Helsinki. This has never happened so far. In practise, possible disputes are discussed (hearing) before decision making with the licensees and decisions by STUK are justified in written. The Court would examine the legal validity of the decision making process, not questions like "what is safe enough".

Seq. No	Country	Article	Ref. in National Report
27	United Kingdom	Article 7	2.3.2 p.17

Question/	There is a brief mention of the establishment of research funds (the Nuclear Safety

Comment	Research Fund and the Nuclear Waste Safety research Fund). What are the terms of reference of these funds including information on the source of the money, the legal obligations of the parties and the initial size of the funds.		
Answer	Please see the answer to question 38.		
Seq. No 28	Country United Kingdom	Article Article 7	Ref. in National Report 2.3.5 p.20
Question/ Comment	There is a very brief mention of STUK's enforcement powers. What powers are available to STUK and to what extent have they been used in the period covered by the report.		
Answer	Please see the answer to question 26.		
Seq. No 29	Country Japan	Article Article 7.2.3	Ref. in National Report P.19,Para2.3.4
Question/ Comment	In section 2.3.4, it is mentioned that STUK is developing Risk Informed Regulation and Plant Performance Indicator system. Could you explain the outline of STUK's Risk Informed Regulation and how does STUK use the performance indicator system in regulatory inspection and assessment system?		
Answer	As to the Risk Informed Regulation and Safety Management please see the answer to question 25. The STUK Safety Performance Indicator (SPI) System for NPPs is a complementary tool in the overall assessment of nuclear safety in addition to inspections and safety reviews. The indicator system has been intended for a tool, which inspectors and different organisation levels (offices; management; etc.) and functional teams within the department of Nuclear Reactor Regulation (YTO) could utilise in their work for different purposes. The process of analysing and reporting of indicator results is described in a guide of YTO Quality Manual. In its appendix definitions, purposes, data sources and responsibilities for data collection, calculation and assessment of specific indicators and indicator areas are determined. At the department are set goals to improve the indicator process by integrating the work as an essential part of the normal supervision processes of nuclear safety and overall assessment of nuclear facilities safety. This is connected to the process management at the department (definition, describing and implementation of processes). Every nuclear safety performance indicator has a responsible person (inspector) who performs the data collection, calculation and assessment of the state of the indicator area. The person is nominated from the technical office, whose supervision area or expertise the specific indicator (indicator area) is. Interpretation of trends of indicators is given in the memorandum. This ensures the most reliable interpretation of results and trends. Even as such the process gives inspectors responsible the best benefit considering their work. The collection of data and assessment of results is intended to be an essential part of normal supervision process of nuclear safety. The external indicator group (look at answer to question number) has an administrator who collects the data at the department, up-dates the intranet and makes assessments of the overall situations of the principal group and indicator areas of the system on quarterly and annual bases. Data needed for the calculation of indicators related to the safety of nuclear installations is gathered mainly from the regular reports (daily, quarterly, annual reports) submitted by		

the licensees. Regulations related to the reporting requirements are given in the Guide YVL 1.5 concerning licensee reporting to STUK. In connection of the renewal of the guide in 2003 especially needs concerning data collection for indicators were taken into account. There are still some indicators for which the data required is not formally reported to the regulator. These are mostly related to the failure data indicators and the source data is submitted by the utility or gathered by the person in responsible.

The review period of the indicators relating to the safety of nuclear facilities has until present been a calendar year and in some cases also an operating cycle from the beginning of the refuelling outage to the beginning of the next refuelling outage. [The indicators relating to the regulatory activities have been determined every calendar year.] On the bases of the reassessment of the indicator system and of the frequency of the overall assessment of nuclear safety performed by YTO the decision to update indicators and to make assessments of indicators and trending (if possible) quarterly was made. The summary report about results and trends of specific indicators and indicator areas, as well as an overall assessment of safety level and changes in performance of nuclear power plants based on indicators is prepared annually for the management. This report is attached to “the Annual report on Regulatory Control of Nuclear Safety in Finland” submitted to the ministry of Trade and Industry and other stakeholders. The report is available for public on STUK website. All indicators are available in STUK’s intranet.

YTO focuses and partially develops its periodic inspection programme on the basis of the results of SPI data, results and trending. Baseline inspections are always performed even if no deteriorating trend is detected.

The trends of indicator values, if showing a deteriorated trend during two consecutive years, a need for increased YTO response (e.g., additional inspection or establishment of an investigation team by STUK) is indicated. The YTO’s regulating action depends on the trend that has been violated and the margin to safety (Legislation; YVL-guides; Tech.Spec; Plants’ target values; STUK’s annual goals). Increased inspection examines the effectiveness of the licensee’s actions to correct the deficiency and also if STUK’s own performance has contributed to the degradation. Effectiveness of corrective actions can also be followed by indicators.

SPIs are utilised also in Periodic Safety Reviews (PRS) in assessment of the plants’ operation during a longer period.

Seq. No	Country	Article	Ref. in National Report
30	United States of America	Article 7.2.3	Section 2.3.4

Question/ Comment	Please describe further the development of risk-informed regulation processes to use PSA data in planning inspections and assessing inspection findings. How will risk assessment data be used, and for what applications?
Answer	The reviewed licensees` PSA models are in use at STUK. Hence STUK´s personnel makes specific PSA calculations at its own in context of any safety issues. Typical PSA calculations are for assessing the risk significance of operating events (risk follow up), for assessing the risk impact for evaluating the application for exempting Tech Specs requirements by the licensee, for assessing the risk decrement from plant changes proposed by the licensee or required by STUK, assessing the risk impacts coming from changes in Tech Specs (AOT, surveillance periods) applied by the licensee, assessing the proposed INES categorizations by the licensee etc. Further a special PSA Info system is

	in progress in order to use the insights from PSA for training the inspectors, to upgrade their risk perception and to demonstrate the importance of most significant accident sequences. The future use of PSA applications contain the assessment of in-service inspection program planning by the licensee. The pilot projects on in-service inspections of piping both in a pressurized water reactor plant (Loviisa) and a boiling water reactor plant (Olkiluoto) have been completed by STUK in cooperation with the licensees. STUK's risk-informed procedure combines both the plant specific PSA information and the traditional insights in support of the system specific detailed in-service program planning.		
Seq. No 31	Country United States of America	Article Article 7.2.4	Ref. in National Report Section 2.3.5
Question/ Comment	The report states that AThe repertoire of [enforcement] tools together with some practical examples for implementing them has been presented in an internal policy document as part of STUK=s Quality System (2003).@ Please discuss these specific enforcement tools that are available to the regulatory body.		
Answer	Please see the answer to question 26.		
Seq. No 32	Country China	Article Article 8	Ref. in National Report P20.Ch2.4
Question/ Comment	What Measures the safety authority are taken to deal with the challenge of different designed reactors and the proposed EPR for Olkiluoto3?		
Answer	To meet the challenge of reviewing Olkiluoto 3 design STUK has taken following measures: • During 2003 a project plan was implemented for the Olkiluoto 3 regulatory review process. Resource and research needs were identified including also needs for external assistance on specific topics. In 2003, STUK negotiated with several research organisations and companies to support STUK in the review process. STUK made contracts with for example VTT, GRS, ISaR to perform independent review on specific topics mostly related to accident and transient analyses. STUK also asked expert judgment on some detailed topics (EMC, Weather phenomena etc.) from other organisations. • New personnel have been recruited during 2003 and 2004 for the review and assessment of the construction license application of the new power plant unit Olkiluoto 3. Recruiting continues also during 2005 by hiring new people on PSA, I&C, construction and mechanical components area. In addition STUK is also hiring two new resident inspectors to Olkiluoto site to oversee construction activities on site. • Co-operation between STUK and other authorities both in Finland and other countries especially France, was also planned beforehand. STUK was able to utilize the review work that has been done on EPR by the French and German regulators and research organisations (IRSN, GRS) during 1990's. STUK also had several co-operation meetings with the French regulator (DGSNR) and research organisation (IRSN) on specific design topics. Co-operation results were actively utilised in the review process. In Finland emergency preparedness and physical protection issues were discussed with officials from Ministry of Interior and local authorities. • Regulatory requirements for the design of new nuclear power plant were updated in 2003 to meet current status of the operating experience, research and science.		
Seq. No 33	Country Pakistan	Article Article 8	Ref. in National Report P20
Question/	Figure 4 presents organization of STUK and Figure 3 presents cooperation/interfaces		

Comment	between STUK and Ministries and other governmental organizations. There is no legal branch within the organizational structure of STUK and also as per Figure 3, STUK doesn't have interface with the Ministry of Law and Justice. Finland may clarify how the legal advice, if needed, would be sought in case the licensee appeals against the decisions of STUK?
Answer	STUK's main co-operation lines with other governmental organisations are presented in Figure 3 of the report. When needed, STUK co-operates also with other ministries and organisations, including the Ministry of Justice. As regards the radiation and nuclear legislation, the responsible ministries are the Ministry of Social Affairs and Health and the Ministry of Trade and Industry, respectively. So in the case of appeals contacts with these Ministries could be taken, if necessary. Also the Ministry of Justice could be consulted. However, it should be mentioned that until now there has been no appeals against STUK's decisions in the field of radiation and nuclear safety.

Seq. No	Country	Article	Ref. in National Report
34	Slovenia	Article 8	section 2.4, p 22

Question/ Comment	It is reported that STUK financed in 2000 independent analysis made by VTT or other TSOs with respect to their independence. This audits were performed by Qualitas Fennica Ltd. Could you provide us the information on what legal grounds such audits were performed and who ordered them?
Answer	There is general agreement made between VTT and STUK on the technical support by VTT for the regulatory decision making. In this agreement one of the issues is the independence of the experts working for STUK due to the fact that VTT as a research organization makes research also for the nuclear licensees. The demonstration of this independence is also discussed in the agreement. In 2000 it was agreed with VTT that STUK will order an audit to VTT to verify the independence of the research made for STUK. Similarly in 2001the performance of the audit was agreed with the main technical support organization for the nuclear waste management, GTK.

Seq. No	Country	Article	Ref. in National Report
35	Spain	Article 8	2.4, page 23

Question/ Comment	What criterion is applied as regards notifying the public of events at nuclear and radioactive facilities, and with what degree of social acceptance?
Answer	When it comes to nuclear or radiation safety issues, the public information threshold is quite low. STUK does not wish to be put in a situation where it would be seen as concealing information. The media and general public will of course be told if a situation affects the health or property of the general public, or the environment. An event will also be reported if health or any other significant factor is not affected, as long as it is of interest to people. The knowledge of the general public must be adequate even if there is no threat. In this way, trust can be forged with the media and general public. This also decreases the likelihood of rumours starting. Transparent communication about even the smallest event creates a state of trust in the authorities in preparation for a more serious event.

	STUK's policies seem to have gained approval from the media and general public, based on the fact that press releases regarding nuclear and radiation safety events are handled by the media in a responsible manner.

Seq. No	Country	Article	Ref. in National Report
36	United Kingdom	Article 8	2.4 p.21

Question/ Comment	The report states that "in practice" no licence would be issued without STUK's confirmation of safety. Does this mean that the legislation does not prescribe that STUK has a veto?
Answer	The Finnish licensing system includes the following licensing phases for nuclear facilities: • Decision-in-Principle • Operating License • Construction License. In the Nuclear Energy Act there is no explicit written provision that STUK has a veto as regards licensing of nuclear facilities. However, STUK's role is defined very clearly in the Act. In the Decision-in-Principle -phase STUK's safety assessment is required in Section 12 of the Act. According to Section 14 of the Act, a condition for making a Decision-in-Principle is that no factors indicate a lack of sufficient prerequisites for constructing a facility according to Section 6 of the Act. In Section 6 it is provided that the use of nuclear energy must be safe; it shall not cause any injury to people, or damage to the environment or property. As regards Construction and Operating Licenses, Section 23 of the Act provides that a statement has to be requested from STUK. Conditions for granting a License are provided in Sections 18, 19 and 20 of the Act. They include e.g. that provisions of Section 6 are fulfilled. In Section 20 of the Act it is further stated that the operation of the nuclear facility shall not be started until STUK has ascertained that the nuclear facility meets the prescribed safety requirements.

Seq. No	Country	Article	Ref. in National Report
37	United Kingdom	Article 8	2.4 p.23

Question/ Comment	The report states that STUK is known amongst the general public and that information from STUK is regarded as truthful. To what extent is this statement based on surveys of public opinion? How often are surveys made and with what size of sample? Are they carried out by an independent organisation? Are other stakeholder groups, other than the general public, also surveyed for their opinion on STUK and, if so, what are the questions asked of them?
Answer	STUK collects feedback on its actions in many ways. The reputation of STUK among frequent stakeholders has been monitored twice within the last 3 years: in 2001 and in 2003. In 2003 the measuring process was carried out as part of a larger study for the Ministry of Social Affairs and Health and this study will be repeated next time in the spring of 2005. These studies are carried out by a university researcher independent from STUK. Reputation is measured both as attitudes and as different factors, and the questionnaire is structured to measure both. In addition, studies are regularly conducted on collaborators from different areas of the field. Reporter's attitudes towards STUK are tested every year, for example. The study is

carried out by an independent, impartial company.

The previous study of the opinion of the general public was carried out at the end of the 1990s. The feelings of the general public are also monitored in other ways. Every year, approximately 300 questions are asked and answered through the internet. All questions and answers are archived.

Questions asked over the telephone are answered daily, through the information officer on duty. This is not limited to office hours.

Seq. No	Country	Article	Ref. in National Report
38	France	Article 8.1	§2.4 p. 22

Question/ Comment	The report mentions (See also § 2.3.2 p.17) that the Nuclear Energy Act has been changed in 2004 to ensure funding for a long-term nuclear safety and nuclear waste management research in Finland. However the report does not specify the particular responsibility, if any, of the nuclear regulator in the research field. Could Finland provide some information about the specific role of the nuclear regulator in safety research? (Which amount of the funding, which choice of research topics, which follow-up of research project, etc.)?
Answer	The amendment “Ensuring availability of expertise”, (1131/2003) of the Nuclear Energy Act was made in 2003 to change the funding of the nuclear safety research from the beginning of the year 2004.

The section 53 of the act defines that whoever has a licence to operate a nuclear facility, has a licence to construct such a facility or has submitted an application on basis of which the Government has made a decision-in-principle on such a nuclear facility shall be obliged to participate in financing research aimed at ensuring that, should such new factors concerning safe operation of nuclear facilities emerge that could not be foreseen, the authorities have such sufficient and comprehensive nuclear engineering expertise and other facilities at their disposal that can be used, when necessary, to analyse without delay the significance of such factors. At the moment the fee collected is 220 EUR/Megawatt given in the licence or the highest thermal output Megawatt laid down in the decision-in-principle, or construction licence application.

Also the operators assessed for liability for the nuclear waste management shall be obliged to participate in financing research aimed at ensuring that the authorities have such sufficient and comprehensive nuclear engineering expertise and other facilities at their disposal that are needed for comparisons of the various ways and methods of carrying out nuclear waste management. At the moment the fee is 0,08 cent/assessed liability.

The research projects shall be of high scientific standard and their results shall be publishable and the usability of the results shall not be restricted to the nuclear facilities of one licensee only.

The Ministry of Trade and Industry makes a proposal to the Fund for allocation of the funds for financing of the projects. Before making its proposal, the Ministry shall first request a statement on it from the Radiation and Nuclear Safety Authority (STUK) and the Advisory Committee for Nuclear Energy.

STUK is participating in the selection of the research projects to be funded and the steering of the research programs. The publicly funded nuclear and waste management safety research is organized into four year programs in Finland. Before launching a new program a framework program reflecting the current understanding of the research need is prepared. The current programs are SAFIR for the nuclear safety (http://www.vtt.fi/pro/tutkimus/safir) and KYT (http://www.vtt.fi/pro/tutkimus/kyt) for the nuclear waste management.

The supervision of the SAFIR program is organized so that there are a steering group and six reference groups. STUK and the power companies Teollisuuden Voima Oy (TVO) and Fortum Oyj along with National Technology Agency Tekes and Helsinki and Lappeenranta Universities of Technology are represented in the steering group of the programme. The chairperson of the steering group is from STUK.

The SAFIR programme has been divided into six research areas supervised by the reference groups:
1. Reactor fuel and core,
2. Reactor circuit and structural safety,
3. Containment and process safety functions,
4. Automation, control room and information technology,
5. Organisations and safety management, and
6. Risk-informed safety management.

STUK has experts in all of the reference groups.

The volume of KYT program is smaller and there is a steering group chaired by STUK to supervise the program.

Seq. No	Country	Article	Ref. in National Report
39	France	Article 8.1	§2.4 – p. 23

Question/ Comment	The report mentions that the "communication is a privilege and duty of all employees". Does this mean that any employee is authorized to communicate with any media or with the general public on any topics? How can be insured the consistency of information likely to be provided by a large variety of staff?
Answer	All employees of STUK have the right and an obligation to pass on information about their particular field of work to those who are interested. On the other hand, employees of STUK are only permitted to discuss the area their expertise concerns. Every STUK employee also has a duty to pass forward questions to the suitable person when they are unable to answer themselves. This ensures that the media or general public is not given wrong or misleading answers.

In practice, this means that STUK does not subscribe to the spokesman culture. STUK does not use two or three individuals who speak to the media or general public on behalf of the entire organisation. Each question is responded to by the most qualified experts in their field, which means that answers are factually correct and the questioned expert is able to field further difficult questions.

Responses to requests by the media are, in practice, generally handled by a reasonably small group of experts. If necessary, collaboration within a flexible, larger group is possible.

To maintain a consistent set of communications, a tight line of contact is kept between management and experts. Experts also converse between each other effectively.

STUK constantly arranges media training for those experts which have the most contact with the media. The communication professionals at STUK also assist the experts when working with the media.

Seq. No	Country	Article	Ref. in National Report
40	Japan	Article 10	P.24,Para.2.6.1

Question/ Comment

Your report mentioned "Regulatory approach to safety culture" in section 2.6.1 and "Regulatory approach to quality assurance" in 2.9.1.
Concerning this approach, could you kindly explain the followings?
a. The procedures of quality audit and inspection.(such as audit / inspection items, methods and process etc..)
b. The criteria of assessment on audit / inspection results.
Is qualitative criteria or method developed and applied?

Answer

a) Quality assurance audit and inspection
The quality assurance of the NPP is inspected in the inspection C14 Quality assurance of the periodic inspection programme. The inspection is aimed at verifying that the licensee of a nuclear installation observes in its operations the requirements set forth in the Quality Manual and among other things in the Administrative Rules, organisation manual and administrative procedures as well as the requirements presented in STUK’s decisions on the quality system and STUK’s guides.
The following operational entities are inspected and assessed:
1. Maintenance and development of the quality system
• modifications in the quality system
• quality goals and planning
• independent evaluations on the functionality and coverage of the quality system
• internal evaluations
• audits made by outside experts groups
• handling of inspection results and corrective actions.
2. Quality assurance unit
• organisation, resources and instructions
• documents made during the inspection period concerning the operation of the organisational unit mentioned above
• coverage and scope of the internal quality auditing of the quality system
• results of internal quality auditing from the inspection period and the situation of the corrective actions decided on accordingly
• quality auditing performed by outside companies that have been targeted on quality systems and their observations.
One segment of the quality system is chosen each year for more extensive assessment.
The observations made in inspection and control operations performed by STUK that concern the quality system of the licensee, are also summarised in the inspection.

b) The inspection criteria
For example the following requirements and conditions are used as acceptance criteria for the results of the inspection C14 Quality assurance:
• the quality assurance operations of the utility have be executed according to the requirements of the quality manual

• the development of the quality system has taken place according to the principles set by the utility itself and by applying practical procedures
• the functions meet the requirements of the YVL Guides (e.g. YVL 1.9, YVL 3.1, YVL 3.4, YVL 6.1)
• other relevant STUK's decisions have been taken into account in the functions.

In addition, the quality management is evaluated in the framework of the complete safety management of the plant, in the inspection A1 Safety Management of the periodic inspection programme.

Seq. No	Country	Article	Ref. in National Report
41	Korea, Republic of	Article 10	P9

Question/ Comment	In relation to paragraph 2.6.1, 'Regulatory approach to safety culture', the report states that 'STUK has indicators in its indicator system to detect the development in plant safety'. Please specify the indicators and detection methodology using that indicators.

Answer

Safety of nuclear power plants is composed from different factors as the performance of the operational organisation and performance of the plant, condition of equipment relevant to safety and accident risk at the plant, and integrity of barriers. According the concept of defence-in-depth indicators describing "Safety of nuclear facilities" (principal group A) is divided into 3 sub-groups. The sub-groups or areas (layers) under consideration are: I) Safety and quality culture; II) Operational events and III) Structural integrity.

Indicator areas and specific indicators of the STUK Safety Performance Indicator (SPI) system are as follows:
A.I Safety and Quality Culture
A.I.1 Failures and their repair
A.I.1 a Failures of TS components
A.I.1 b Preventive maintenance of TS components
A.I.1 c Repair time of TS components
A.I.1 d Human based maintenance failures:
o total number; and
o human based CCFs
A.I.1 e Technical critical CCFs
A.I.1 f Technical potential CCFs
A.I.1 g Capability loss of due to failures
A.I.2 Number of TS deviations
• non-compliances with TS
• exemption orders of TS
A.I.3 Availability of safety systems
unit specific WANO-indicators (3 indicators/plant)
A.I.4 Occupational radiation safety
• annual collective dose
• average of ten highest doses
A.I.5 Releases
• air-born releases (noble gases, iodines, aerosols)
• liquid releases
• calculated dose caused by releases
A.I.6 Keeping documentation current
A.I.7 Improvements and investments

A.II Operational events
A.II.1 Number of events
• safety significant events
• reactor scrams
• operational failures
A.II.2 Significance of events:
Numbers of events in different risk categories:
• risk significant events (CCDP ≥ 1E-7)
• other significant events (1E-8 ≤ CCDP <1E-7)
• other events (CCDP ≤ 1E-8)
(Events: Initiating events; planned unavailability; component failures)
A.II.3 Causes of events
• HOF/technical
A.II.4 Number of fire alarms
• failures, actual alarms, fires

A.III Structural integrity
A.III.1 Integrity of nuclear fuel
• coolant activity (I-131)
• number of leaking fuel bundles
A.III.2 Integrity of primary circuit
• process chemistry index
• impurities of primary/secondary coolant
• identified / unidentified leakages
A.III.3 Integrity of containment
• isolation valves and containment

Definition and purpose of each individual indicator is described in the YTO Quality Manual.

Indicators are numbers, ratios, percentages and amounts of matters or parameters that can be monitored and measured and are found suitable for regulatory purposes. Most indicators do not have defined thresholds for unacceptability or action requirements. Limits specified in the legislation, STUK’s YVL-guides and the technical specifications of NPPs are applied where applicable. For the most of SPIs there are no thresholds for acceptability/unacceptability. STUK prefers for following for trends; values of indicators shall not degrade annually significantly. If a degrading trend is observed consecutive two following years causes shall be clarified.

Assessment of results; Use of SPIs in regulatory inspection and assessment system; look at answer 29.

Seq. No	Country	Article	Ref. in National Report
42	Pakistan	Article 10	P24

Question/ Comment	It is mentioned “safety culture has also been an essential topic in STUK’s continuous interaction with the power plant. The top level inspection of periodic inspection programme, called ‘Safety Management’, includes an assessment of safety culture issues and quality management”. Regarding inspection of safety culture at NPP, Finland may elaborate that what are the safety culture inspection elements used by STUK. What guidelines are used in assessing safety culture in Finland other than INSAG-4?

Answer	The safety culture of the NPP is assessed in the framework of the complete safety management of the plant in the inspection A1 Safety Management of the periodic inspection programme. This inspection is targeted at the management operations of the nuclear power plant from a safety point of view. The inspection is aimed at studying which importance has been embedded in factors affecting to safety in the plant documentation concerning management operations, in practical implementation and in future plans. Similarly, the procedures concerning the management operations are studied in order to identify possible safety deficiencies and connections between the deficiencies identified in connection with STUK's oversight operations and, the management operations by the licensee. For example the following basic elements of management operations are included in the inspection: • the principles of management operations (values, mission, vision) • the plant's safety policy • safety targets and goals • the status and operation of the support groups of the management • short and long run planning of the operations • fulfilment, follow-up, assessment and measuring of risk-aware safety management operations • procedures designed to maintain, reinforce and develop the safety culture among personnel • training projects for personnel and their assessment. All these elements are reflecting the management of the NPP, but also the safety culture of the plant organisation. In the preparations and conclusions of the inspection, the participation of experts in human and organisational factors is crucial, as the safety culture is not completely measurable and expert judgment is needed. The inspection criteria include the legislation (the requirements set in the Government decisions, the operating license statements, the YVL Guides, the STUK decisions) but also the principles set by the utility itself and the "good practices " applied elsewhere.

Seq. No	Country	Article	Ref. in National Report
43	Pakistan	Article 10	Section 2.6

Question/ Comment	In Olkilnoto, the total number of events as well as the number of events caused directly by human error show a significant and continuous increasing trend over the period 1998-2003. Is there any explanation e.g., ageing of personnel, insufficient training, technology upgrades, more in-depth reporting or analysis of the events etc.
Answer	The events, and especially those caused by human errors, at Olkiluoto plant were extensively analysed both by the plant organisation and by the regulator during 2003. No single root cause was found behind the trend, but rather a set of multiple complicated causes. Several corrective actions with broad impacts were carried out by the licensee. Please see the answer to question 52.

Seq. No	Country	Article	Ref. in National Report
44	Russian Federation	Article 10	

Question/ Comment	What safety culture characteristics and indicators have been adopted in Finland for assessing safety culture status at NPPs?
Answer	STUK has not defined specific indicators for safety culture. STUK prefers assessing safety culture of the plant in its SPI system indirectly by the effectiveness of safety management, which can be illustrated and measured by the performance of different responsible units of the plant: maintenance (indicators I.1a-g; I.3), operation (indicators

II), radiation protection (I.4; I.5), quality management (I.6) and plant's willingness for modernisation and improvements (I.7).

Indicator I.2, compliance with the Technical Specifications (deviations and exemptions from Tech Spec) shows the ability of the plant's operating organisation to follow rules and about its safety attitude as well as about the familiarity with the Tech Spec.

Look specific indicators at answer 41.

Seq. No	Country	Article	Ref. in National Report
45	United States of America	Article 10	

Question/ Comment: How are allegations of safety concerns from the public or nuclear power plant workers handled by the regulatory body?

Answer: STUK answers the questions of concerned citizens and people working with radiation as quickly as possible, whether it is during office hours or not. Press releases and other channels of communication report security-related matters openly and honestly.

A member of the general public who asks about radiation matters is treated respectfully and compassionately, even if the person's concerns prove unfounded. Questions received over the internet are responded to without delay, and STUK has a public information number which can be called around the clock.

It is important to communicate openly and honestly to concerned members of the public because they are interested in radiation and nuclear safety matters. Communication assists STUK in its desire to be a recognised and established expert on radiation and nuclear safety matters in Finland.

In Finland there is no special "whistler blower" system in use for the licensee employees, but of course they have the same right as all citizens to contact STUK in case of safety concerns. These communications are handled with appropriate tact and there is no need to expose the identity of the person contacting STUK. Depending on the safety concern, STUK can carry out e.g. unannounced plant inspections to seek further clarification on the matter.

Seq. No	Country	Article	Ref. in National Report
46	China	Article 11	P28.Ch2.7.2

Question/ Comment: What incentives do the plants provide for new recruits and how to ensure the know-how and experience are not lost due to staff retirement? If the existing different reactor designs and the proposed EPR for Olkiluoto 3 make this issue more complicate?

Answer: One of the key aspects with the power plant organizations is that the personnel turnover is very small - this provides a possibility for the new staff members to have time to get acquainted with their jobs under the guidance of experienced personnel. Power companies have realized the future needs in the field and have started to recruit new staff members for technical jobs with the purpose that, in the future, they will replace the retiring personnel. In the Third National Report it is described how national basic nuclear safety related training programme is provided to these newcomers to provide a broad overview on nuclear safety field. This kind of common training programme is one of the key elements to motivate newcomers when they have a possibility to get acquainted with other companies and facilities, meet lecturers who are the older experts in the field and meet new young staff in other companies. Timely recruitment of new staff members is the key issue to compensate the loss caused by the future retirement.

The new nuclear power plant has a positive effect on the recruitment of new staff members and it creates general enthusiasm in the field. The new plant provides new jobs and tasks for newcomers and provides a possibility for the older staff to transfer to new duties. It creates circulation. So in the psychological point of view it is one of the key factors for positive development in the future.

In addition to the interesting work itself, also competitive working conditions are important issues to take into account.

Seq. No 47	Country United Kingdom	Article Article 11.1	Ref. in National Report 2.7.1 p.27

Question/ Comment: The report states that the Nuclear Energy Act requires each licensee to have adequate financial resources to enhance the safety of the facility. How is it judged that a licensee has adequate financial resources and stability, who makes the judgement and how is that body equipped to make the judgement? Given that changes in the business climate can be very swift, how is the judgement made that adequate resources will be available to deal with safety issues in the future?

Answer: The judgement is made primarily by the licensing authority, which is the Ministry for Trade and Industry. The Ministry of Trade and Industry is responsible for conducting the licensing procedure and for the control of economic and financial aspects of the use of nuclear energy. The financial stability of the licence holders or applicants for a licence is judged primarily on the basis of official financial reporting and on ownership information. Additional investigations and the use of outside financial experts are possible when necessary.

On its behalf, the nuclear safety regulator, STUK, is informed on the quality manual and decision making procedures and criteria of the licensee, as well as on the planned and implemented actions aimed to maintain and develop the safety of the plant. The assessment made by STUK is focused on the questions whether adequate technical expertise is utilised in investment decisions and sufficient resources are used in safety enhancement.

Comment from TVO: In license applications financial information concerning the licensee (financial statements) is included. For new nuclear facilities also a financing plan is included. Each shareholder is responsible to TVO for the annual costs of the plant, divided into variable and fixed costs in accordance with the Articles of Association. The responsibility for variable annual costs depends on the shareholder’s consumption of electricity associated with the share series. The shareholder is responsible for the fixed annual costs for the particular share series in proportion to its holdings, regardless of the amount consumed.

Seq. No 48	Country United Kingdom	Article Article 11.2	Ref. in National Report 2.7.2 p.28

Question/ Comment: The report states that both licensees have a systematic approach to training. Substantial training programmes are described. Are these programmes embedded in a competency and resource system which analyses the tasks required to be carried out in all aspects of the licensee's activities, the numbers required to do those tasks, the skills required and matches the required skills to the actual skills available (and likely to be available in the future) in a gap analysis, thereby determining the training programmes and recruiting needed? How do the organisations deal with the loss of personnel and how do they

	ensure that they are not vulnerable to loss of key personnel?
Answer	Concerning the nuclear power plant personnel the following describes training and competence related aspects how the training is carried out in the power plants. “The principles and organisation of the training activities of the Loviisa plant as well as detailed training instructions have been presented in the Training Manual. It has been established to ensure the systematic implementation of training activities. The training and simulator groups take care of training activities at the plant. The total manpower is 11 persons. For assisting the training group, organisation unit-specific contact persons have been appointed. They ensure that unit- and individual-specific needs are taken into account and that information is transferred to both directions. The competence requirements of the personnel are presented in the Training Manual. The competence requirements are based on the duties of each vacancy, on responsibility areas and on regulatory requirements related to the duties in question. The competence requirements define the basic education of a person and the initial and refresher training to be given at the Loviisa plant.” “The principles and organisation of TVO's training activities as well as detailed training procedures are presented in the training manual, by the means of which a systematic implementation of the training is ensured. The training in the company has been organised so, that in addition to the existing seventeen persons in the training centre and line managers in the organization there is one training contact person for both units in operation and also one person in the project organization of the third unit in Olkiluoto. In addition to this, there are several committees that survey and handle the training needs of e.g. operation and maintenance as well as of the entire company and monitor training results. External or internal experts give major part of the general training and the training centre staffs gives only minor part. The training centre staffs, instead, gives all simulator training. An organisation model like this makes it possible to take unit and individual related training needs into account in an efficient manner. The training manual presents vacancy related competence requirements that have been defined for the personnel. The competence requirements are based on the tasks, areas of responsibility relating to the vacancies in question, and the related regulations of the regulatory authority. Person's basic education and the basic and refresher training given by the TVO are defined in the qualification requirements.” One of the key aspects with the power plant organizations is that the personnel turnover is very small - this provides a possibility for the new staff members to have time to get acquainted with their jobs under the guidance of experienced personnel. Power companies have realized the future needs in the field and have started to recruit new staff members for technical jobs with the purpose that, in the future, they will replace the retiring personnel. In the Third National Report it is described how national basic nuclear safety related training programme is provided to these newcomers to provide a broad overview on nuclear safety field. Timely recruitment of new staff members is the key issue to compensate the loss caused by the future retirement. Another element is to have technical support organizations available for technically demanding services.

Seq. No	Country	Article	Ref. in National Report
49	United Kingdom	Article 11.2	2.7.2 p.28

Question/ Comment	How do the licensees gain assurance that their organisations and safety management systems are adequate to ensure nuclear safety? How does STUK assure themselves? How

	do licensees deal with maintaining that assurance before during and after organisational change and how does STUK regulate this?
Answer	In the assessment of organisation and management, there is no one sufficient method to assure the adequacy and safety of an acting organisation. Thus, a diversity of different methods is needed, and co-operation of experts in technical and organisational questions is used both by the licensee and the regulatory body. Important is the constant follow-up of business parameters and indicators, as the production, results related to objectives, number of events and deviations, accidents and personnel absence from work. The numbers must also be assessed, and often comparative data from other companies and organisations is needed in assessment. The licensee is using self-assessments, peer-reviews and external consultants with varying expertise and foci in assessing their organisation and management. STUK is collecting information on licensee performance in document review, in inspections, and in daily interaction with licensee organisation in the plant sites (site inspectors). The issues identified are discussed in regular meetings, and significant issues are studied in detail in inspections. It is important that in reviews and inspections dealing organisational issues human and organisational expertise is used. The planning and implementation of organisational change as well as the regulatory review of licensee organisational changes is under development, the corresponding regulatory guide is estimated to be implemented in revised form during the year 2005. The new guide demands a more conscious change process with specified objectives and follow-up. When the organisational change has impacts on safety critical organisational functions, it is also reflected in administrative rules, and these must be approved by STUK before implementation also presently.

Seq. No	Country	Article	Ref. in National Report
50	United States of America	Article 11.2	Section 2.4

Question/ Comment	Section 2.4 states that retirements in the nuclear energy sector will cause a two- to three-fold increase in the need for experts in industry around 2010, but states that the current training capacity of universities can meet this need. It is not clear, however, that actual enrollment will meet the training capacity of universities and thereby ensure adequate human resources. Please clarify how confidence in actual graduation of nuclear experts from universities is maintained.
Answer	Currently, the new nuclear power plant project has shown that the recruitment of new staff members is not a problem in Finland. The two universities provide professors for nuclear energy and enough students have selected nuclear option. In case nuclear energy is promoted by the industries and government difficulties hardly appear. It is also clear that if general attitude in the society is negative against nuclear, difficulties to get the best students in the field appear. Many newcomers come from other engineering fields and they can be trained by the power companies to the specific features of nuclear safety and energy. This kind of special training programme created in co-operation between the nuclear organizations in nuclear safety is organized and described in the Third National Report. It is necessary that this kind of initiative is created also in the future, because companies in the nuclear field cannot expect all services from the society.

Seq. No	Country	Article	Ref. in National Report
51	Canada	Article 12	2.8.1, page 31

Question/ Comment	Figure 8 does not clearly match what is given in its description (figure leads reader to believe that there have been 19 total events when there have only been 17 as stated on page 30 "…and Olkiluoto NPP reported 17 events from which 8 contained human root causes". Also, there appears to be mismatch between the textual number and the number

	in the figure for human root causes events!
Answer	The statement of the text may be slightly misleading. The total number of events was 17, out of which • in 7 cases technical causes were identified, explaining the event in sufficient detail, • in 8 cases primarily human causes were identified and in 2 cases there were both obvious technical cause and a related, relevant human cause, and the event was caused in interaction of these factors.

Seq. No	Country	Article	Ref. in National Report
52	Canada	Article 12	2.8.3, p33

Question/ Comment	It is said, under Human Factors, that "errors related to the maintenance actions have also been examined and measures developed to avoid corresponding errors". Please elaborate on what types of measures have been developed and whether they have been implemented.
Answer	The measures to avoid human errors in maintenance understandably depend on the root causes identified behind the events on the plant in question. In this case the essential measures to avoid recurrence of human errors include: • Training and cultural development Training sessions have been organised to maintenance personal with aim to support their understanding of technical specifications and procedures. A developmental project has been started with aid of IAEA consultants, aiming to analyse and strengthen the safety culture of the plant. • Development of plant modification process A developmental project was started to analyse and develop the plant modification process, including the control of actions at each stage of the modification planning and implementation. • Analysis of the recurring event and human errors An analysis of the recurring technical faults was done and correcting actions were planned. In addition, the analysis of human factors and human errors was supported by recruiting a specialist in human and organisation factors in the plant • Systematization of corrective actions A database was developed and implemented in use, in which all identified deviations from optimal procedure are recorded and with which the analysis, decisions made and correcting actions are systematically followed.

Seq. No	Country	Article	Ref. in National Report
53	Canada	Article 12	2.8.2,p32, last para

Question/ Comment	It is said that "the functions of an organization more extensively and the preventing of human errors in design activities may be significant targets for development". Please provide more information on any plans for development in these areas.
Answer	As a part of management development the activities and processes of the organisation have been described. The NPP has carried out a project in which the plant modification process was analysed and systematised. In addition, the safety culture of maintenance work has been intensively studied and developed with help of psychological researchers. Participative design has been used in development of Man-Machine-Interface and plant automation systems. Further Loviisa NPP has started an extensive program for improving the industrial safety. In this program the main point is laid on proactive measures, ie. good planning, risk assessment of tasks to be performed, leadership. Although this is an industrial safety program it will influence on the way of thinking and acting on other areas of safety.

Seq. No	Country	Article	Ref. in National Report
54	Japan	Article 12	P.30,Para2.8

Question/ Comment: In section 2.8, there are Figure 7 and Figure 8.
Figure 7 shows that the number of incidents comes to peak at 2001 and decreases as usual from next year.
What kind of countermeasure was taken for the reduction of incidents?
In Figure 8, number of incidents goes up after 2002.
Is there a special reason for this increase of incidents?

Answer: The causes of events have been studied, but no one clear cause could be identified behind the events in either nuclear power plant. The numbers of events are still so small that no statistical proof can be got, thus each event is treated separately and corrective actions are planned and carried out case by case. However, with aim to enhance safety and prevent human errors, both Finnish NPPs have implemented an extensive project to analyse and develop the safety culture in maintenance activities. Additionally, at the Olkiluoto NPP the analysis of events was strengthened by recruiting a human factor specialist, a research on the 2003 events was bought from a consultant and a whole scale safety culture developmental process was started, supported by IAEA.

Seq. No	Country	Article	Ref. in National Report
55	Korea, Republic of	Article 12	p30-31

Question/ Comment: In tables of paragraph 2.8 Human factors(p. 30-31), it is shown that many of direct causes of events and incidents occurred in Loviisa NPP and Olkiluto NPP are related to human factors.
What are sub-causes of this human related causes? Are there events that you judge are related to weak safety culture?

Answer: The identified sub-causes of the human-related causes were
• plant procedures were not complied (work orders, operation instructions, line up proceedings)
• deficiencies in periodic tests (errors in testing, deficiencies in test programs)
• unability to detects failures in inspections
• unability to identify the requirements of technical specifications.
It was suggested both by the plant management and the regulatory body, that there might be potential root causes related to the safety culture. Even this could not be verified, the plant started a whole scale safety culture developmental process.

Please see also the answer to question 54.

Seq. No	Country	Article	Ref. in National Report
56	Slovenia	Article 13	section 2.9.1, p 34

Question/ Comment: In the second paraghraph it is stated that quality management systems of the licensees/applicants and of the main suppliers are subject to approval by STUK. In the approval process how does STUK treat quality management systems that deviate from requirements of YVL Guides (e.g. based on ISO 9001:2000, 10CFR50 App.B, national standards, etc.)?

Answer: The requirements set to the quality system in YVL Guides are not very detailed. Thus, the quality system, based on an internationally accepted standard, either fulfils the requirements as such or the deviations are minor and more formal. The STUK experts assess each deviation and the system is agreed if a corresponding level of safety can be obtained, related to the requirements of YVL Guides.

Seq. No	Country	Article	Ref. in National Report

57	United Kingdom	Article 13	2.9.2 p.34

Question/ Comment: Reference is made in the report to reviews and self assessments in the Licensees management? How are these reviews used to deliver continuous improvement?

Answer: The reviews and self assessments can state either deviations from requirements or suggestions for development. Each of them are registered by unit in charge on quality assurance, and this unit follows the counteractions until the issue is seen as solved. The clarification of the issue is given to the organisational unit having responsibility or best possibilities to find a solution, and the decision maker is determined on the basis of organisational accountabilities.

Seq. No	Country	Article	Ref. in National Report
58	Canada	Article 14	2.10.1, p36

Question/ Comment: Please explain why "special attention" has been given to seismic events in Finland during PSA studies if Finland is not a seismically active area.

Answer: Please see the answer to question 59.

Seq. No	Country	Article	Ref. in National Report
59	Korea, Republic of	Article 14	2.10.1 , p37

Question/ Comment: (Article 14 , 2.10.1 Regulatory approach to safety assessment, p.37)
It is stated that special attention has been paid to seismic events and the PSA has been done although Finland is not in a seismically active area, however, some modifications have been made at Olkiluoto nuclear power plant.
What were the earthquake levels (horizontal and vertical peak ground accelerations) and design ground response spectra in the original seismic design and the PSA of the nuclear power plants in Finland?

Answer: Originally risk analysis of seismic events was embedded in the Finnish PSA program for the sake of completeness of PSA scope. However, the seismic risk assessment identified some problems in the plant design even though the Finnish ground is stable as to the seismic events. The reason is that the original plant design basis did not take into account the seismic events. Hence even small seismic events can fall batteries or affect electronics and electrical equipments and contribute to the plant risk more than anticipated.

The remedial actions at Olkiluoto BWR plant included upgraded anchorage of battery system backing the DC systems and the cabinets of DC/AC rectifiers. The plant modifications were made step by step during several years in connection with the renewal of systems and components, e.g. batteries. The seismic events have been taken into account also in the modernization project of Olkiluoto while renewing electrical systems. For example the rotary converters have been replaced with UPS systems. Similar issues were identified also at Loviisa plant but because of very small relative contribution to the total core damage frequency no plant changes were made.

The following design response spectrum for horizontal acceleration in southern Finland was confirmed by STUK in 2001 [Guide YVL 2.6]:

frequency (1/s) acceleration (m/s2)

0.3 0.05
1 0.2
5 1.7

10 2.3
25 1.9
50 1
100 1

The spectrum corresponds to 5 % relative damping factor. For vertical acceleration the spectrum shape is the same but the magnitude is two thirds of the vertical acceleration. The maximum of the spectrum is at a relatively high frequency due to the hard bedrock in Finland.

According to a statistical evaluation based on observed earthquakes, the peak ground acceleration corresponding to the recurrence period 100 000 years was estimated as 0.06 g for the Loviisa site and as 0.085 g for the Olkiluoto site. However, the peak ground acceleration value 0.1 g is applied, according to the IAEA recommendation [IAEA Safety Series Nro 50-SG-S1].

Seq. No	Country	Article	Ref. in National Report
60	Pakistan	Article 14	Section 2.10

Question/ Comment: Does STUK, use safety analysis codes other than those used by the plant owners, for its independent analysis? What is the basis of the validation of the codes used by STUK?

Answer: STUK has its own capabilities to carry out independent safety analyses. STUK has independent codes and competent personnel to use them. But STUK can also use its technical support organisation VTT for that purpose. Codes which we are using are validated. Validation is based on validation practice defined by CSNI working groups.

Seq. No	Country	Article	Ref. in National Report
61	Slovakia	Article 14	2.10

Question/ Comment: Is the best-estimate methodology with the evaluation of the uncertainty acceptable to be used for the licensing calculations included in safety analysis reports (SAR)?

Answer: The best-estimate methodology with the evaluation of uncertainties is acceptable for the licensing calculations. However some conservativeness is required in selected initial parameters. These parameters are presented in our regulatory guide YVL 2.2.

Seq. No	Country	Article	Ref. in National Report
62	Slovakia	Article 14	

Question/ Comment: Are there plans for the lifetime extension for the existing NPPs? If yes, are there any regulatory guides or rules ready or under preparation to specify the regulatory requirements to be fulfilled by the licensee asking for the operational extension?

Answer: The licensee for Loviisa 1 and 2 units (Fortum) has decided to apply for continuation of the existing operating licenses beyond the original design life of 30 years. The existing OLs will be due at the end of 2007. Assumingly, the application will include an extension of additional 20 years.

The Finnish legislation, general safety regulations or the regulatory guides don’t include, nor there are any such documents under preparation, specific requirements to be fulfilled only in case of operating license extensions. The safety requirements are the same for all plants and the operation can continue as long as they are all fulfilled.
Based on Governmental Resolution 395/1991 Section 27, the “Operating experience from nuclear power plants as well as results of safety research shall be systematically followed and assessed. For further safety enhancement, actions shall be taken which can be regarded as justified considering operating experience and the results of safety

	research as well as the advancement of science and technology. “. According to this principle the Finnish NPPs are kept continuously up to date with the latest knowledge. In the key position is of course the plant Ageing Management Programme, which has to be effective enough to cope with all known and anticipated ageing phenomena. In case of lifetime extension, the licensee has to be prepared for changing major plant components, if the integrity of them can not be otherwise ensured. This means, that principally the life time extension is to high extent a financial question to the licensee.

Seq. No	Country	Article	Ref. in National Report
63	Slovenia	Article 14	section 2.10.1, p 37

Question/ Comment	Article 14 states the most important safety features of Olkiluoto 3 design and one of them refers to plant structures, which are designed against a possible aircraft crash so that event does not lead to release of significant amount of radioactive substances to the environment or threaten the safety functions required to achieve safe shutdown state. The military and large commercial aircraft are considered in the design. What is the basis (i.e. input, analysis assumptions) for the analysis showing that the plant structures of Olkiluoto 3 are designed against aeroplane crash?
Answer	Loading basis: assume that a largest flying (or designed) passenger craft can impact on the plant from any horizontal direction at a speed compatible with aerodynamic constraints and allowing accurate steering of the craft. Craft is assumed to have left an airport no long before the impact (ie. can be tanked quite full). Military fighter crafts are also considered but their loads tend to be enveloped by large passenger craft. Wall analysis basis: design documentation of materials, structural arrangement, and dimensions. Computational basis: well established commercial structural analysis FEM codes with validated reinforced concrete material models.

Seq. No	Country	Article	Ref. in National Report
64	Sweden	Article 14	

Question/ Comment	Regarding in-service inspection it is mentioned that qualification of the entire NDT-system is required in YVL Guide 3.8. However, implementation of the qualification is at an early stage and will be a significant improvement issue for the future. Please explain a little more the current status and plans regarding this issue. What organisation with what legal status will be (or is) responsible for the qualification of the NDT-systems?
Answer	Improvements of the qualification are still at an early stage in Finland. Four qualified inspection systems have been approved by STUK until now in the Loviisa NPP and the first one in the Olkiluoto NPP is in the course of reviewing just now in STUK. The utilities have written a totally new strategy document and national level qualification procedures last year. Those documents are following YVL Guide 3.8 and ENIQ principles. The timetable of qualifications in the Loviisa NPP is reaching to the year 2010 and in the Olkiluoto NPP the year 2008. Inspection systems of the fifth unit Olkiluoto 3 shall be totally qualified before the commissioning the unit in the year 2008. The licensee is legally responsible for the qualification of the NDT-systems. Therefore it is responsible for organising qualification and using in its implementation the services of a testing body and a qualification body. It is the duty of the Finnish national certification body SFS-Inspecta Certification Oy to establish qualification-specific ad hoc type qualification bodies. The Steering Group established by the utilities and the Reference Group established by the Steering Group are steering and supporting the qualification

activities. The qualification organisation has been described in the new national strategy document and in the figure below.

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(only on paper)

Seq. No	Country	Article	Ref. in National Report
65	Bulgaria	Article 14.1	page 37

Question/ Comment	A comprehensive programme for safety assessment of the new plant Olkiluoto 3 is presented in the Report. Can Finland provide some more information about the expected phases of this process?
Answer	Safety assessment of Olkiluoto 3 (or any other new nuclear installation requiring construction and operating license) is phased according to the licensing steps. • First phase is the decision in principle phase where feasibility of the different reactors (basic designs) to meet Finnish safety requirements is evaluated (for FIN5, see preliminary safety evaluation report on STUK website). • Second phase is the construction license phase where more detailed conceptual plans of the reactor design is evaluated against Finnish safety requirements. Review is especially focused on the application of redundancy, diversity and separation principles of safety significant systems to meet (n+2, n+1) failure criteria. In this phase also accident and transient analyses will be performed by the license applicant/vendor and reviewed by the regulator. STUK will also perform own analyses and contract independent accident and transient analyses from research organisations or companies on most limiting accidents and transients. Together with deterministic analyses also probabilistic analyses will be reviewed to verify that the plant can meet probabilistic design targets. For the construction license review STUK issued its safety evaluation report that is available on STUK website. • During construction STUK oversees that construction is carried out according to the design approved in the construction license phase. For Olkiluoto 3 it means in practise that STUK reviews the detailed design of all systems. Manufacturing of structures and components is not allowed prior system level approval. Detailed design of safety

significant structures and component will also be reviewed and approved by STUK prior manufacturing.

• In the operating license phase the detailed design and behaviour of the plant especially in transient and accident conditions will be reviewed and analysed again. Transient and accident analyses will be done with the detailed design and models. STUK will perform own analyses and also contract independent accident and transient analyses from research organisations or companies on most limiting accidents and transients. Development of detailed models will be done during construction of Olkiluoto 3. Also the detailed probabilistic analyses will be reviewed.

Seq. No	Country	Article	Ref. in National Report
66	France	Article 14.2	§2.10 - p.40-45

Question/ Comment

Could Finland give some details about the assessment of the LOCA frequencies in the PSAs (what are the values and what is the justification)?

Could Finland provide more details about the use of PSA results in the following areas:

- Testing and maintenance
- Ageing management
- Analysis of operating events (precursor analysis)
- Analysis of technical specifications

Answer

LOCA frequency (generic data combined with plant specific experience)

LOCA BWR VVER
Large 9,80E-06 /a 1,5E-05 /a
Medium 1,10E-03 /a 8,1E-05 /a
Small 3,10E-03 /a 2,1E-04 /a
Very small 1,2E-03/a

Testing and maintenance

PSAs are to be used to effectively optimize the test intervals and procedures of those components and systems which contain the major risk reduction potential. PSA can also be used for the identification of potential failures and common cause failures.

The testing program of safety significant systems and components which is set forth in context of technical specifications must be argued by the aid of risk assessment and the results of analysis have to be submitted to STUK for information. The testing program must be regularly evaluated on risk basis during operation of the plant.

The on-line maintenance of safety significant systems and components is allowed during operation in accordance with the restrictions set by technical specifications. If the licensee wants to perform preventive maintenance work during operation, an acceptable estimate of risk significance of preventive maintenance must be achieved.

The insights of PSA must be used in the working up and development of the inspection programs of piping as per guide YVL 3.8. While drawing up the risk informed inspection program, the systems of classes 1, 2, 3, 4 and non-code must be regarded as a whole. Similarly how far the radiation doses can be reduced by focusing inspections and optimising inspection periods must be regarded.

Pilot projects on in-service inspections of piping both in a pressurized water reactor plant

(Loviisa) and a boiling water reactor plant (Olkiluoto) have been completed by STUK in cooperation with the licensees. STUK's risk-informed procedure combines both the plant specific PSA information and the traditional insights in support of the system specific detailed in-service program planning.

- Ageing management
No PSA applications exist

- Analysis of operating events (precursor analysis)
The goal in PSA-based event analysis is a simple and easy-to-use procedure to get retrospectively an overall picture of the risk significance of the analysed events. PSA-based event analysis is not meant as a substitute of more thorough event analyses methods, such as root cause analysis.

The analysis of safety system unavailabilities due to failures, tests, maintenance etc. can be used, for example:

• to monitor plant operation and maintenance activities along with other indicators,
• to monitor unavailabilities of equipment and systems (increased risk significance may be an indication of changes due to ageing or changes in maintenance practises),
• to target inspections by STUK and the utility,
• to evaluate the completeness of PSA regarding initiating events and modelling of components and systems,
• to strengthen confidence in the reliability data and assumptions used in PSA.

PSA-based indicators for estimating the significance of events have been studied at STUK. It has been suggested that the indicators be defined as the risk associated with the events as a percentage of the average core melt probability (base result) during one year. The following four event categories have been suggested

• Exemptions from Technical Specifications
• Failures in equipment covered by Technical Specifications
• Preventive maintenance and other separations of systems covered by Technical Specifications
• Other operational events such as violations of Technical Specifications and incidents launching safety functions.

STUK has carried out PSA-based analysis of the events at Loviisa and Olkiluoto plant units since 1995. The number of analysed events is ranging round 100 per plant unit annually. The analyses have been carried out by two persons, one from the operational safety office and one from the risk assessment office. Earlier the analyses were done once a year but now the analyses are done each third month. The total time used for the analysis and reporting has been two or three person weeks per year.
For most events the risk significance was insignificant and the total annual risk significance was caused by a few important events. Equipment faults have been in general the most important event category contributing to the annual risk significance.
For example the high value of the risk significance in the year 2000 at both Olkiluoto units was caused by a common cause event in the valves of the core spray systems. Two containment isolation valves of the core spray system failed to open or close in periodic tests. The time between failures was about four months. The reason for the failures was

that cogs in the actuator gear had broken. The gear material was bakelite. After the second failure a detailed investigation of all the actuators of the type in question was carried out at both units. It turned out that there were cracks in the gears of all the eight actuators (one valve at each of the four subsystems at two units). All actuators were replaced with actuators having brass gear. At Unit 2 the risk was also increased by common cause failures in two emergency diesel generators.

- Analysis of technical specifications
PSA is used to provide arguments for developing Technical Specifications.

The meaningfulness of some AOTs given in Technical Specifications has been re-evaluated through PSA, although such failure situations resulting from AOT extension have not been met in practice. Certain inconsistency with deterministically defined AOTs and the actual risk impact has been identified.

It has also been concluded that for certain failed states (i.e. CCF of equipments important for decay heat removal), it is safer to continue plant operation than to shut down the plant immediately, as would be required by current Technical Specifications. Accordingly, on the basis of risk studies, an exemption of Technical Specifications for a certain plant configuration (with specific safety system trains inoperable) has been requested by the licensee. A respective general statement was inserted into the Technical Specifications to advice the plant operator not to shut down the plant immediately, but only after completion of necessary fixes (in case the heat sink is seriously ineffective).

Additional items have been included in the Technical Specifications for shutdown states, based on results of the PSA for shutdown mode. In 1994, STUK set forth a new requirement to keep the lower air lock of the containment of TVO plant units closed during maintenance of the main circulation pumps, because this task contributed to an increase of the probability of large LOCA at the bottom of the reactor vessel. If the large LOCA took place and the lower air lock was open, the water would escape from the containment, preventing any core cooling measures and leading to core damage within short time, along with open reactor vessel and open containment. The deterministic rules do not require keeping the lower air lock closed during maintenance of the main circulation pumps, but the complementary review based on PSA findings and results prompted STUK to require the lower air locks being closed during maintenance. A pilot project on Risk-Informed Technical Specifications was completed at the end of 2001.

Seq. No	Country	Article	Ref. in National Report
67	Japan	Article 14.2	P.45,Para2.10.5

Question/ Comment	In section 2.10.5, your activities on the plant-life management is described and we can find good practices in it One of our concern is the ageing problem of pipes and your plant-life management should include this matter. Then, could you explain your ageing management program of safety related pipes?
Answer	Ageing management of piping belonging to primary circuit is taken care by regular in-service inspections (ASME XI) both at Olkiluoto and Loviisa plants. The state of other safety related piping (secondary circuit, sea water piping) has been supervised at both plants in Finland by separate condition monitoring programmes. These programmes were taken in use already as early as in the beginning of 1980’s at Olkiluoto

and a few of years later also at Loviisa. The programmes were very extensive and were planned so that same object became inspected repeatedly in a period of few years. At both plants the secondary piping has been originally made of mild steel. Thus the expected degradation phenomenon was erosion corrosion both in water and steam phase. Sea water piping was also made of mild steel coated with epoxy painting or soft rubber combined in some areas also with cathodic protection.

At Olkiluoto plant big amounts of secondary piping has been inspected yearly. As a result extensive amounts of piping have been changed to stainless steel because of erosion corrosion. Also pressure vessels and valves have been changed. Because of change to stainless steel the yearly inspection extent has been reduced. Until now no serious accidents have happened. In sea water piping extensive recoating has been made because of loosening of the soft rubber coatings. As new coating material epoxy painting was used in early years but later on also hard rubber coating has proved to be a good solution. At Olkiluoto the condition monitoring programme has been maintained “manually” without computer programmes.

At Loviisa plant the programme covered in the beginning single form pieces. Totally there were about 3000 inspection objects per unit of which 400-600 were inspected yearly dependent of the lengths of the refuelling outages. In secondary circuit erosion corrosion was detected as at Olkiluoto and single objects were changed. The inspection programme was also maintained “manually”. After two pipe ruptures in the beginning of 1990’s Loviisa plant bought computer programme WATHEC to help in predicting the inspection results and the condition of piping. WATHEC has proved to be a good tool. During the 1990’s Loviisa plant has changed a lot of piping to low alloyed mild steel 13CrMo44 and in minor extent also to stainless steel. No pipe ruptures have happened since then. A couple of years ago Loviisa bought a new more versatile computer system called COMSY. Also at Loviisa the amount of inspected objects has been reduced during the recent years. In sea water piping the problems as well as repair solutions have been much the same as at Olkiluoto.

Seq. No	Country	Article	Ref. in National Report
68	United States of America	Article 14.2	Sections 2.2.3, 2.3.

Question/ Comment The report mentions capacity factor as a performance indicator and the use of PSA based indicators to determine risk significance of operational events. What specific performance indicators are used to assess the safety performance of a licensed reactor?

Answer Please have a look at the answer 41.

Seq. No	Country	Article	Ref. in National Report
69	Czech Republic	Article 15	

Question/ Comment The dose commitment of 0,1 mSv/year is limit (authorized?) or constraint for radionuclides releases from normal operation of the NPP? This value is implemented in the Guide/legal documents or in the NPP license/permit?

REMARKS: In the Chapter 2.11.4 (Article 15) of the NR regulation of radioactive effluents from a NPP is described. It is mentioned, that the radioactive releases from normal NPP operation are below authorized limits; i.e. of the order of (0,01- 0,1) % of set values based on the requirements of Guides YVL 7.1 – 7.3, 7.6.

Answer The dose commitment of 0.1 mSv of an individual of the population, arising from normal operation of a nuclear power plant in any period of one year is a dose limit based on Nuclear Energy Act and prescribed in Section 9 of the Government Decision on the

General Regulations for the Safety of NPPs (395/1991) and also given in Section 2.1.1 of Guide YVL 7.1 of STUK (Radiation and Nuclear Safety Authority). Thus the dose commitment of 0.1 mSv is a dose limit prescribed in regulations of Finland. According to IAEA's terminology (see Safety Guide No. WS-G-2.3), however, this can be considered as a dose constraint. According to the section 6 of Radiation Decree the use of radiation shall be planned and organized so that the annual effective dose of a person not engaged in radiation work does not exceed 1 mSv. The equivalent dose in the lens of the eye shall not exceed 15 mSv per year, nor shall the equivalent dose at any point on the skin exceed 50 mSv per year.

The Loviisa and Olkiluoto NPPs have radioactive discharge limits based on the dose commitment of 0.1 mSv. The discharge limits are presented in the Technical Specifications of the NPPs and they have been derived by the licensees and approved by STUK (see Guide YVL 7.1, Section 2.2.1).

Seq. No	Country	Article	Ref. in National Report
70	Czech Republic	Article 15	

Question/ Comment: What is ratio of individual and collective doses of NPP radiation workers and contractors (outside workers - in particular - from foreign countries)? Is the Directive 90/641/EURATOM implemented still?
REMARKS: In the Chapter 2.11.2 – 3 (Article 15) radiation exposures of NPP workers are presented. We assume that in presented results exposure of outside workers is included as well.

Answer: The radiation doses of outside workers are included in figures given in Chapters 2.11.2–3. More specific distribution of radiation doses are presented below.

LOVIISA NPP

Collective dose (number of workers)
Year Personnel of NPP Contractors*)
2001 0,29 manSv (201 workers) 0,84 manSv (424 workers)
2002 0,48 manSv (196 workers) 2,13 manSv (630 workers)
2003 0,19 manSv (176 workers) 0,75 manSv (422 workers)
Maximum individual dose
2001 9,25 mSv 12,36 mSv
2002 16,64 mSv 19,48 mSv
2003 9,62 mSv 11,61 mSv
*) all contractors (domestic and foreign) are included

OLKILUOTO NPP

Collective dose (number of workers)
Year Personnel of NPP Contractors*)
2001 0,25 manSv (235 workers) 0,93 manSv (719 workers)
2002 0,23 manSv (243 workers) 0,89 manSv (782 workers)
2003 0,21 manSv (255 workers) 0,82 manSv (815 workers)
Maximum individual dose
2001 12,70 mSv 11,45 mSv
2002 10,35 mSv 9,25 mSv
2003 6,20 mSv 7,90 mSv

*) all contractors (domestic and foreign) are included

FOREIGN WORKERS IN FINNISH NPPs
source: National Dose Register of Finland)
Year Number Collective dose
2001 251 0,21 manSv
2002 337 0,46 manSv
2003 246 0,29 manSv

Finland joined the EU in year 1995. Soon after that the Directive 96/29/EURATOM (laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation) was implemented in Finland. However, the dose limits which were in line with ICRP 60 were implemented already in year 1992.

Seq. No	Country	Article	Ref. in National Report
71	Hungary	Article 15	Chap. 2.11.5, P. 52

Question/ Comment: What kind of environmental samples content Cobalt-60 and what was the top level of activity concentration?

Answer: Cobalt-60 has been detected mainly on indicator organism and sinking material samples in the aquatic environment. The bladder-wrack, Fucus vesiculosus, and the filamentous green alga Cladophora glomerata have been used as aquatic indicator organisms in both NPP areas for several years, as have the relict crustacean Saduria entomon in Loviisa and the bivalve mussels Mytilus edulis and Macoma balthica in Olkiluoto. Since 1998, perifyton and the submerged seed plants Myriophyllum spicatum and Potamogeton pectinatus were taken as new indicator organisms into the monitoring programmes at both power plants. Indicator organisms effectively accumulate radionuclides from water and sediments, thus promoting the detection of small traces of radionuclides in the environment. In Olkiluoto area Cobolt-60 has been found also in some fish samples. Co-60 has been detected in air and deposition samples at both power plants, more rarely in Olkiluoto and twice in reindeer lichen in Olkiluoto.

The activity concentrations of Co-60, detected during last five years, were in indicator organisms below 11 Bq/kg dry wt. except perifyton in which the concentrations were bellow 40 Bq/kg dry wt. The activity concentrations in sinking material were below 80 Bq/kg dry wt. and in fish samples below 0.1 Bq/kg fresh wt. In air samples the values were below 3 ìBq/m3, in deposition samples below 0.4 Bq/m2 and in reindeer lichen below 0.4 Bq/kg dry wt. The concentrations were so low that they did not significantly increase the radiation burden in the environment.

Seq. No	Country	Article	Ref. in National Report
72	Hungary	Article 15	Chap. 2.11.5

Question/ Comment: What is the source of isotope Ag-110m?

Answer: Silver-110m is a neutron activation product of silver. It is regularly detected in the discharges of the Loviisa NPP. In recent years the annual discharges of silver-110m from the Loviisa NPP have been roughly 10 MBq to the atmosphere and 100 MBq to the sea. At the Loviisa NPP the main source of the silver activated in the reactor is considered to be soldered joints of resistors in the pressurizer of the primary coolant circuit. At the Olkiluoto NPP silver-110m has not been detected in the discharges in recent years.

Seq. No	Country	Article	Ref. in National Report

73	Korea, Republic of	Article 15	

Question/ Comment: In relation to 2.11, it is mentioned that the changes in the revised guides YVL7.9 and 7.10 include the international development in dosimetry QA.

1. What is the international development in dosimetry QA ?
2. Please explain the national program for quality assurance in dosimetry, if any.

Answer: YVL 7.10 contains in itself many requirements for quality assurance in dosimetry. When the YVL-guides were updated, it was also referred to international standards. The most important standards were:

- Thermoluminescence dosimetry systems for personal and environmental monitoring, International Standard IEC 1066, International Electrotechnical Commission, 1991.
- SFS-EN ISO/IEC 17025 – General requirements for the competence of testing and calibration laboratories, 21 August 2000.

Both standards mentioned above deal with routines and QA essential in dosimetry. Olkiluoto and Loviisa NPPs have made assessment whether the dosimetry laboratories at NPPs meet the recommendations stated in these standards. At both NPPs the instructions and practices in question were reviewed. Some additional quality tests were carried out.

Seq. No	Country	Article	Ref. in National Report
74	Lithuania	Article 15	pages 49-52

Question/ Comment: Please provide details on reasons of increase of collective dose at Loviisa NPP in 2003? (section 2.11)

Answer: Collective dose at Loviisa NPP in year 2003 was somewhat lower than in previous years. In general, yearly collective doses depend on the duration of the outage as well as on the targets and amount of the maintenance work. At each Loviisa NPP unit every fourth year the annual inspection and maintenance is extensive. Collective doses are estimated during the planning process of outages. STUK requires that the licensee minimises radiation doses in outage planning. STUK also compares the actual doses vs. the estimated doses on yearly basis.

Seq. No	Country	Article	Ref. in National Report
75	Lithuania	Article 15	page 50

Question/ Comment: It would be interesting to get more detailed information, about how it works it practice the system of reports about the occupational doses received by Finnish workers in other countries than Finland? (section 2.11.1)

Answer: Between Finland (STUK) and Sweden (SSI) there is an agreement since 1983, on exchange and reporting the dose data directly between national dose registers. In other countries radiation dose passports are used. Dose passports are given by STUK. Practical procedures of implementation are followed by the dose registers and the NPPs which measure, and report the individual doses to employees.

A prerequisite for this practice is reasonable similarity in the national regulations and dosimetry systems in use. A follow up review of the practice is made annually. A number of 50-200 employees work usually in the other country’s NPPs. The collective dose in the other country during the last five years lies between 0,1-0,5 manSv. This reporting practice saves effort compared to a dose passport usage and is in line with the basic aim of Directive 90/641/Euratom.

Seq. No	Country	Article	Ref. in National Report

76	United States of America	Article 15	Section 2.11.2

Question/ Comment: The relationship between Table I and the text is not clear. The table lists collective doses in manSv, for which the 2002 value is more than twice the goal of 1.22 manSv given in the text. However, the text states that the goal was exceeded only in 2001 at Loviisa 1 with a collective dose of 1.7 manSv, a value that is not given in Table 1. Please clarify the relationship of the radiation doses at the two Loviisa units to the goal of 1.22 manSv.

Answer: The limit 1,22 manSv should not be used for values given in Table I because
1) 1,22 manSv is not the limit for collective dose of one year.
2) 1,22 manSv is calculated for one reactor unit and average over two successive years, not for the whole plant (two units).

The net electric power of Loviisa NPP’s one unit is 0,488 GWà the limit 2,5 manSv/GW presented as a collective dose is 2,5 manSv/GW*(0,488 GW+0,488 GW)/2 = 1,22 manSv.

Seq. No	Country	Article	Ref. in National Report
77	Slovenia	Article 16	section 2.12, p 54

Question/ Comment: Fourth paragraph mentiones exercises focusing recovery phase of an emergency. Could Finland provide some more information about the recovery phase exercises (i.e. what were the objectives and basic assumptions for the scenarios)?

Answer: Recovery phase exercises focus on fallout situations when a release of radioactive material has ceased and radioactive cloud has passed the area in question. The objectives of late phase exercises are to look at issues regarding recovery management e.g. decontamination, waste problem, long term countermeasures regarding foodstuffs and public information.
Scenarios used in these exercises have often been severe nuclear power plant accidents. In 2000, a nuclear explosion was used in one of the late phase exercises. In 2005, Finland conducted a late phase exercise (INEX 3) where deliberate contamination of foodstuffs was discussed.

Seq. No	Country	Article	Ref. in National Report
78	Ukraine	Article 16	

Question/ Comment: 1.What organisations participate in the local off-site emergency management groups? What are their functions and responsibilities? Do these teams have emergency response plans for nuclear accidents? Who is responsible for development and approval of these plans?

Answer: he Decree of the Ministry of the Interior (2001) gives an obligation to plan for emergencies. These plans should define e.g. tasks and responsibilities of authorities, notifications and activation of emergency organisations, management of rescue operations, arrangements for radiation monitoring, protective measures, informing the public and the media prior and during an emergency and training programme (including exercises) of emergency staff. The plans are approved by respective Provincial State Office. Maintenance and development is the responsibility of the local chief of rescue operations, but for major revisions a group is established. In these groups there are representatives from the local rescue authorities, the nuclear power plant, Radiation and Nuclear Safety Authority STUK, respective Provincial State office as well as representatives of each municipality of the emergency zone. Comments from other relevant counterparts are also requested.
The emergency planning zones around the Finnish nuclear power plants reach for about 20 km. In Loviisa NPP area four municipalities and in Olkiluoto NPP area three

	municipalities belong to these emergency zones. The plans follow the requirements of the Decree of the Ministry of the Interior. The local emergency management group consists of representatives of rescue operations (chair), police, health authorities, social affairs, municipal administration, transport and clearance and public information. In addition there are liaison officers from the nuclear power plant, STUK and Defence Forces. Each of the representatives has procedures and list of duties.

Seq. No	Country	Article	Ref. in National Report
79	Ukraine	Article 16	

Question/ Comment	2.What time limits have been established for notification in case of accident (for the operating organisation to inform the regulatory body and authorities, and for authorities to inform the public)?
Answer	No exact time limits have been established. Regarding information to authorities about ongoing event the YVL Guide 7.4 describes emergency classifications to be used as follows: • A site emergency is a situation during which nuclear power plant safety deteriorates or is in the danger of deteriorating significantly. • A general emergency is a situation during which there is the hazard of a radioactive materials leak that may require protective measures in the vicinity of a nuclear power plant. In the event of a general emergency, STUK and the rescue authorities shall be alerted immediately. In the event of a site emergency, STUK shall be alerted and the rescue authorities notified immediately. Emergency classifications also include an emergency standby, which involves alerting the nuclear power plant emergency organisation to the extent necessary to ensure the safety level of the plant. The emergency standby and its justification shall be promptly communicated to STUK and, if considered necessary, to the local rescue authority. Information (alert / notification / initial information) about an incident or an emergency is always received by 24 hour duty systems of STUK as well as of local rescue authorities. Duty officers activate emergency response. At STUK the time limit for activation is set to 15 minutes. Local authorities are responsible to inform the public staying in the vicinity of the accident place. If e.g. rapid sheltering is needed, sirens and vehicles with loudspeakers are used. All telephone directories throughout the country contain instructions for nuclear or radiological emergencies. In case of a sudden emergency STUK or local rescue authority may issue emergency bulletins via radio and television. These bulletins will be published immediately interrupting ordinary ongoing programme.

Seq. No	Country	Article	Ref. in National Report
80	United Kingdom	Article 16	2.12 p.53

Question/ Comment	The report refers to onsite emergency exercises being carried out annually. Does this mean an annual programme of many exercises or one exercise per year? If the latter, how doe the licensee and STUK ensure that each shift has been exercised and is prepared for an emergency situation? What criteria are used to determine that an exercise has been successful?
Answer	Finnish NPPs prepare an emergency training and exercise plan every year. It includes task related basic training for the persons of the emergency organisation prior to their assignment to a task (such as simulator training for the shifts of the control rooms, the measurement patrols, the experts calculated environmental radiation situations and their prognoses on and off-site etc.) and annual refresher training and advanced training. An

emergency exercise is organised at the end of the emergency training period every year and a joint exercise of the authorities and the nuclear power plant at least once every three years at both NPPs.

The participation of the members in the emergency organisation has been maximised in all exercises. E.g. the shifts have been changed during the exercise or different shifts have trained one after another the same scenario in separate days. Double shifts, such as experienced expert as a mentor and an incomer, have also taken part together in the same exercise.

The criteria for successful action depend on the type of the exercise. The evaluators pay attention to alerting and alarm systems, starting of the action, management, communication between NPP and authorities, public information, assessments on the situation review and its development and possible causes, emergency plans, premises and equipment etc. Every now and then the day and time of the yearly exercises have not been told the participants beforehand and then the main idea is to test and evaluate the start of the action: how the participating organisations are alerted and how the emergency staff organises the action, nominates the shift, makes the situation review etc.

Also the participants give valuable experiences and suggested improvements in an evaluation meeting held after the exercise, by post-exercise interviews or by means of written feedback. This feedback is very valuable too when developing emergency preparedness.

Seq. No	Country	Article	Ref. in National Report
81	Germany	Article 16.1	p. 53, 2.1.2

Question/ Comment: The report mentions that STUK has approved major changes to the emergency plans of the NPP.
Please provide some examples of the areas addressed and changed in this field.

Answer: The emergency plans of Finnish NPPs describe the actions taken in emergency situations. In addition, the plans give an overall picture of other organisations acting in emergency situations and their main duties. The functions of the nuclear power plant’s emergency organisation shall be presented in such a way that the plan defines the responsibility of the nuclear power plant for managing an emergency situation; the plan shall also define how the plant’s activities are co-ordinated with the rescue operations of authorities and STUK’s activities.

STUK approves for instance changes of NPP’s main duties such as managing an emergency situation, alarm arrangements or co-ordination with the authorities. These changes may be caused for instance by review in fire legislation. E.g. contact information in the emergency plan and other comparable minor changes or definitions of instructions that do not change the principal content of activities, are submitted to STUK for information.

Seq. No	Country	Article	Ref. in National Report
82	Czech Republic	Article 17	

Question/ Comment: The utilization of existing NPP sites is very probable approach also in other countries which relay on future renesation of nuclear power Can you, please describe in more details the process of relicensing (confirmation) of the site Olkiluoto which was selected for new NPP with EPR?

Answer: STUK regulatory Guide YVL 1.10. ‘Requirements for siting of a NPP’ describes the process as a whole (see www.stuk.fi/regulations). The government issued a construction permit based on a safety assessment report compiled by STUK.

The first action of the licensing of a new nuclear power plant in Finland is the Environmental Impact Assessment (EIA) for the site. The project of the fifth Finnish nuclear power reactor was formally started in May 1998. The EIA process was made for the both existing Finnish plant sites, i.e., Loviisa and Olkiluoto, and was completed in January 2000. Results of the EIA were used to support the application for a Government's Decision in Principle. The EIA process would have been similar also for a site with no existing plant units. The process was more straightforward because the license applicant had existing information and measurement results from the sites with operating NPPs.

Seq. No	Country	Article	Ref. in National Report
83	Korea, Republic of	Article 17	2.13.1 , p55

Question/ Comment: (Article 17, 2.13.1 Regulatory approach to, p.55)
What are the details of the design requirements for malevolent external threats whose definition was updated after September 11, 2001 and which were provided as an addendum of the safety assessment of the new unit in January 2002?

Answer: Direct crash of a large passenger craft or a military craft, plus attack from outside of plant using chemical or biological agents dispersed in air, plus directed microwave pulse. Also other requirements were presented.

Seq. No	Country	Article	Ref. in National Report
84	Sweden	Article 17	

Question/ Comment: Please explain if there has been any upgrading of the passive fire protection (improved physical separation by new walls, shields or cable re-routing etc) at Loviisa and Olkilouoto after commissioning of the plants. Have full deterministic fire hazards analyses been made of these units?

Answer: Passive fire protection improvements at the Loviisa NPP

The following fire safety improvements at the Loviisa nuclear power plant have been completed after the commissioning of the plant:

• Removing of start up transformers from the main transformer yard to the plant switch yard
• Fire insulation of the load bearing steel structures of the control building.
• Relocation and reconstruction of the generator hydrogen cooling system's hydrogen station and lines to a more safe place.
• Improvement of passive fire separation for main and plant transformers at the main transformer yard
• Construction of a fire wall (F180) between the turbine hall and the control building (so called B line wall, fig. 2). The fire wall separates the steam and feed water lines and valves from the turbine hall into an individual fire compartment to protect them against turbine hall fires. The wall is constructed to withstand the potential collapsing of the roof. Also, smoke and heat removal hatches were added.
• Relocation and compartmentation of safety-related cables and equipment in the turbine hall.
• Constructing the new auxiliary residual heat removal system
• Constructing the new independent auxiliary emergency feed water system
• Structural fire separation improvements of turbine hall e.g.

• A-line wall
• Fire barrier improvements
• cable penetration improvements
• permanent closure of doors between redundant rooms
• fire insulation of some cables in the reactor containment
• fire insulation of some control cables
• fire insulation of pressure transmitter (service water)
• fire insulation and modification of pressure air pipelines
• passive fire protection of hydraulic stations of RC-steam dumping valves

Passive fire protection improvements at the Olkiluoto NPP

Fire barrier improvements
• Improve passive fire protection of plant start transformers
• Permanent closure of some fire doors between redundant cable spreading rooms
• Construction of new fire wall in cable spreading rooms between redundant cable trays
• Cable penetration improvements
• Fire insulation of some cable routes
• Modification of fire compartments.

Seq. No	Country	Article	Ref. in National Report
85	United Kingdom	Article 17	2.13.2 p.58

Question/ Comment	In this section and elsewhere, mention is made of analyses of external events such as natural phenomena. On page 58 reference is made to probabilistic estimates of the risk of severe weather. Given that the Nordic countries may be strongly affected by global warming, have any deterministic analyses been made of the possibility of weather pattern (or other external hazard) changes which might render the probabilistic estimates invalid?
Answer	In the review of Olkiluoto 3 design phase PSA the frequencies of some temperature limits and wind speeds have been questioned because a possible global warming may affect the frequency estimates of extreme air temperatures in Finland during the years to come. No deterministic analyses have been performed for analysing the possible change of the weather pattern but instead it is recommended to use rather high confidence estimates while predicting the future frequencies of the extreme air temperatures in Finland. STUK is following the research results on the effects of global warming and on natural long term trends in extreme weather conditions in cooperation with the Finnish Meteorological Institute and Finnish Institute of Marine Research.

Seq. No	Country	Article	Ref. in National Report
86	France	Article 17.3	§2.13.2 - p. 56-57

Question/ Comment	Could Finland indicate which safety improvements resulted from re-examination of natural phenomena?
Answer	Olkiluoto Plant Based on operating experince, improvements were made in early 1990’s to reduce the risk of blockage of seawater intakes due to algae, mussels or frazil ice. Flushable strainers were added to the shutdown cooling system seawater lines and operating procedures were implemented for changing seawater intake to the outlet side in the event of blockage of the normal intake.

In the spring 1995 Olkiluoto PSA was revised due to two weather related phenomena which took place at Olkiluoto plant.
In February 1995 snow storm blocked the air intake filter of the combustion air channel to diesel generators and stopped two diesels running in a surveillance test.

- To upgrade the reliability of DG system, dampers opening automatically on pressure difference were installed to enable the taking of the combustion air directly from DG rooms

In January 1995 sub-cooled seawater blocked coarse bar screen in the inlet channel of service water system which is vital to emergency core cooling systems.

- To reduce the risk coming from the frazil ice, a system circulating warm water to the intake of sea water channel has been installed. The system is to prevent frazil ice formation in the bar screen and its blocking. For two subsystems out of four, the intake of service water in winter is routed from the outlet side.

Modelling of these two CCF type of phenomena (before plant modifications) contributed to Olkiluoto PSA core damage frequency an increment no less than 1.9x10-5/a. The total core damage frequency including all identified initiating events and changes made due to the regulatory review was 3.34x10-5/a. The defence against the aforementioned type of external initiators has been introduced with respective plant changes which lowered the core damage frequency back to the almost preceding level.

Loviisa Plant
Sea vegetation (algae) can cause a blockage of band screens in the sea water channel.
- To reduce the risk of band screen rupture due to a high pressure difference over screens and to prevent the consequent access of algae to the main circulating and service water system an automatic power and flow reduction system has been installed.

Frazil ice (freezing of subcooled water) may cause blockage of seawater intake.
- To reduce the risk of blockage by frazil ice recirculation of warm outlet water to the water intake was arranged and fine scale measurements were installed for monitoring inlet water temperature.

Blockage of diesel generator air in-take by snow or freezing rain during a storm can result in a loss of emergency diesel system.
- To upgrade the reliability of DG system, dampers were installed to enable the taking of the combustion air directly from DG rooms.

Seq. No	Country	Article	Ref. in National Report
87	France	Article 17.3	§2.13.3 - p. 58

Question/ Comment: Could Finland confirm that only electrical equipment anchors on Olkiluoto NPP had to be strengthened after reassessment of earthquake effects?

Answer: The remedial actions at Olkiluoto BWR plant included upgraded anchorage of battery system backing the DC systems and the cabinets of DC/AC rectifiers. The plant modifications were made step by step in 1998-2001. The seismic events have been taken into account also in the modernization project of Olkiluoto while renewing electrical systems. For example the rotary converters have been replaced with UPS systems. The similar issues were identified also at Loviisa plant but because of very small relative contribution to the total core damage frequency no plant changes were made.

Seq. No	Country	Article	Ref. in National Report
88	Sweden	Article 18	

Question/ Comment	It is mentioned in section 2.14.3 that both Loviisa and Olkiluoto plan to modernise their control rooms and for Loviisa a major project is in progress. What will be required with regard to supplementary or auxiliary control rooms? What validation and verfication will be required of the licensees in connection with modernisation of the control rooms?
Answer	It is expected that a supplementary control room will be established as part of the automation modernization project. Control room design V&V is required, guided by international references such as relevant NUREGs and IEC 11064.

Seq. No	Country	Article	Ref. in National Report
89	Germany	Article 18.1	p. 59, 2.14.1

Question/ Comment

The measures taken in Loviisa and Olkiluoto NPPs to control severe accidents are explained by applying the defense-in-depth concept.

What are the regulatory requirements for implementing severe accident management measures?

Answer

The high level requirements concerning severe accidents are given in the Government Decision 395/1991:

Section 12, Limit for a severe accident

The limit for the release of radioactive materials arising from a severe accident is a release which causes neither acute harmful health effects to the population in the vicinity of the nuclear power plant nor any long-term restrictions on the use of extensive areas of land and water. For satisfying the requirement applied to long-term effects, the limit for an atmospheric release of cesium-137 is 100 TBq. The combined fall-out consisting of nuclides other than cesium-isotopes shall not cause, in the long term, starting three months from the accident, a hazard greater than would arise from a cesium release corresponding to the above-mentioned limit.

The possibility that, as the result of a severe accident, the above mentioned requirement is not met, shall be extremely small.

Section 17, Ensuring containment building integrity

The containment shall be designed so that it will withstand reliably pressure and temperature loads, jet forces and impacts of missiles arising from anticipated operational transients and postulated accidents.

Furthermore, the containment shall be designed so that the pressure and temperature created inside the containment as a consequence of a severe accident will not result in its uncontrollable failure.

The possibility of the creation of such a mixture of gases as could burn or explode in a way which endangers containment integrity shall be small in all accidents.

The hazard of a containment building failure due to a core melt shall also be taken into account in other respects in designing the containment building concept.

Detailed requirements concerning severe accidents are given in the Regulatory Guides

• YVL 1.0 “Safety criteria for design of nuclear power plants”,
• YVL 2.2 “Transient and accident analyses for justification of technical solutions at nuclear power plants,
• YVL 2.4 “Primary and secondary circuit pressure control at a nuclear power plant,
• YVL2.7, Ensuring a nuclear power plant's safety functions in provision for failures, and
• YVL 3.5, Ensuring the firmness of pressure vessels of a NPP.

Seq. No	Country	Article	Ref. in National Report
90	Germany	Article 18.2	p. 60-61, 2.14.3

Question/ Comment: Digital instrumentation and control technology has already been implemented in some modernised systems. Which requirements, tests and QA procedures are applied as long as detailed safety requirements and procedures have not yet been developed?

Answer: Requirements, procedures and tests have been adapted from international standards base (see Seq. no. 8). Development of detailed safety requirements (e.g. YVL 5.5) generally takes significant time and draft provisions can thus be tested in practice.

Seq. No	Country	Article	Ref. in National Report
91	Russian Federation	Article 19	Figure 13

Question/ Comment: What is meant under "exemptions" from operation limits and conditions (as opposed to breach of operation limits and conditions)?

Answer: When the licensee organisation identifies in advance, that in a certain situation, for a certain limited period, and often for a certain goal it is practical and relatively safe to deviate from Technical Specifications, the licensee may ask for permission to this deviation. The situation may be a planned plant modification, during which some safety functions are turned off and other arrangements are used for ensuring the safety level. In these cases STUK makes the deterministic as well as the probabilistic safety analysis, and may decide that during determined period the arrangements are accepted. For these cases the concept “exemption” is used.

On the contrary, in some cases the latent defect may cause that all equipment in the plant is not usable as stated in Technical Specifications. When this is found out in periodic test or in inspection, the situation is treated and reported as a breach of operational limits and conditions.

Seq. No	Country	Article	Ref. in National Report
92	Russian Federation	Article 19	Figures 13 and 14

Question/ Comment: Figure 13 indicates a trend towards an increase in "exemptions" from operation limits and conditions at Loviisa NPP, and Figure 14 shows a trend towards an increase in the cases of non-compliance with operation limits and conditions at Olkiluoto NPP. Though the text gives some explanation of these negative trends, the above figures demonstrate that this has been a pronounced trend in the last 3 years, i.e. this trend has not been overcome. What corrective actions have been taken to overcome the above mentioned trends?

Answer: The exemptions at Loviisa NPP are mostly related to modernisation projects. The large number of exemptions during the reported period was mostly related to modernisation of radiation measurement system. As there are more modifications in planning phase, the number of exemptions may also in future be rather high. However, the modifications are justified also from safety point of view, and as each exemption is considered case by case, the safety level is not compromised.

At Olkiluoto NPP, a number of corrective actions are carried out, with aim to enhance the safety; please see the answer to question 52.

Seq. No	Country	Article	Ref. in National Report
93	Russian Federation	Article 19	

Question/ Comment	Section 2.15.8 describes the state of the art with radwaste storage today. What are the future plans to deal with the problem of radwaste storage?
Answer	At both NPPs, radioactive management takes place on-site. For low and intermediate level waste, they have interim storages as necessary and rock cavern type disposal facilities. Management of waste from the new NPP unit will be integrated to the current systems at the Olkiluoto site. About 73 % of the low and intermediate level waste has been transferred to the disposal facilities. The capacity of the disposal facility at the Olkiluoto site is adequate until 2020's. At the Loviisa site, expansion of the disposal facility is currently underway in order to meet the future capacity needs. The NPPs have storages mainly for waste which will later on be either cleared from regulatory control or conditioned for disposal.

Seq. No	Country	Article	Ref. in National Report
94	United Kingdom	Article 19	2.15.5 p69

Question/ Comment	The report notes that competence of engineering and technical support is supervised by the licensee, and also indicates an uncertainty about the availability of expertise, particularly in the context of the new order for Olkiluoto 3. When a licensee uses contractors to do work the licensee must retain its competence and capability to assess the quality of work and keep responsibility for managing safe operation. It needs to set, interpret and deliver safety and engineering standards relevant to the business and to apply the same standards to contractors as to its own staff, even when the work is off the site. Additionally, the licensee must retain adequate supervisory and management controls over contractors' work on the site and ensure adequate numbers of its own suitably qualified and experienced staff are available to make the judgements pertinent to safety. How do licensees ensure that sufficient numbers of their own staff are suitably qualified for overseeing and controlling contractors?
Answer	The adequacy of engineering and technical support available to TVO was raised by STUK in the preliminary safety assessment of the Olkiluoto 3. One of the major issues was the sufficient internal expertise of TVO for assessing and supervising the plant supplier and the contractors used by supplier. When setting up the implementation project for the Olkiluoto 3, TVO expanded its organisation and recruited experts from several technical fields. With regard to high-level nuclear and safety engineering technology expertise, TVO's technical organisation itself is still quite limited. Therefore, TVO uses outside consultants as an alternative in case of large amount of work, due to particular special requirements or other corresponding reasons it is not feasible to have the needed expertise or personnel inside the company. However, the competence of the consultant has to be assessed according to the procurement process before the consultant's services may be used for the project. In the OL3 project the expertise of the whole company organization is widely used. For the project TVO has recruited not only experts to assess the technical plans but also quality control engineers at plant engineering and civil works departments for control over the contractors used in the project and to meet the quality requirements. TVO recruited also several quality assurance engineers representing all disciplines relevant in the project such as mechanical, I&C and construction works. QA engineers together with the technical experts carry out the external audit programme. According to the programme contractors supplying safety related components (Safety Class 1 and 2) will be audited and the Safety Class 3 and 4 will be audited based on a case-by-case

judgement.

The project quality system is a process based to standard ISO 9001:2000. It also fulfils the requirements of IAEA code 50-C-QA and standard ISO 10006. The quality system includes a personnel process which is implemented to assure the sufficient number of the project experts as well as the competence of the experts and their ability to work. The capability of the process and process results (indicators) are evaluated regularly by the process owner and the output is reported. Based on the regular assessments the deficiencies in the personnel process can be detected in a very early stage and the needed corrective actions may be implemented.

However, TVO should ensure that its organisation, still strengthened during the construction phase, remains competent enough also during the transition to the operation phase, particularly in the fields of nuclear safety and mechanical and automation technology.

Seq. No	Country	Article	Ref. in National Report
95	Germany	Article 19.1	p. 61, 2.15.1

Question/ Comment: At Loviisa and Olkiluoto NPP, power uprates were performed. It is reported that transient tests were conducted to check the plant behaviour, similar to the commissioning program. Was the licensing procedure for power uprates performed applying the current state of the art as reference?
Have the operating organisations or STUK conducted additional safety analyses for DBAs and BDBAs which take into account the higher thermal power of the core?

Answer: Our licensing procedure is based on our own requirements (similar as the current state of the art requirements). Power uprating includes the updating of FSAR, which means that it includes also new safety analyses for DBAs and severe accidents. STUK carried out its own independent analyses as well.

Seq. No	Country	Article	Ref. in National Report
96	Japan	Article 19.2	P.63,Sec.2.15.2

Question/ Comment: In section 2.15.2, it is mentioned that "Nuclear Energy Decree requires that the applicant for an Operating License must provide STUK with the Technical specifications (Operational Limits and Conditions).".
Could you kindly explain the outline of the Technical specifications (scope of specifications, items , content etc.)?

Answer: In Finland the Technical Specifications of NPP contain, in line with NRC and IAEA documents, following items:

- Definitions
- Safety Limits
- fuel
- reactor
- containment
- Safety Settings of the Safety Systems
- Conditions
- requirements
- deviations
- allowed outage times
- substantiations
- Surveillance/testing/preventive maintenance
- Administrative requirements.

Seq. No	Country	Article	Ref. in National Report
97	China	Article 19.3	

Question/ Comment: What measures does the safety authority take to deal with non-conformance on specification in NPPs? What criteria does the safety authority use to approve exemptions of the plant?

Answer: The exemptions of the plant are always analysed conservatively from the deterministic safety point of view, and a detailed risk-analysis is carried out. Only the exemptions bringing non-significant rise to overall risk can be approved.
The licensee event reports describing the non-conformance on Technical Specifications are analysed similarly as the exemptions. In addition, STUK evaluates the corrective actions and, if needed, sets more requirements, with aim to avoid the recurrence of corresponding event.

Seq. No	Country	Article	Ref. in National Report
98	Germany	Article 19.3	p. 64, 2.15.3

Question/ Comment: Despite the human factors programs performed both for Loviisa and Olkiluoto, the number of human errors and the number of deviations from Operational Limits & Conditions is increasing in Olkiluoto NPP.

Please explain this situation with regard to the implemented human factors program.

Answer: See answer to Seq. No 52

Seq. No	Country	Article	Ref. in National Report
99	Canada	Planned Activities	3.1, p 75

Question/ Comment: It is stated that "the (Finnish) regulatory control system includes both periodic safety review and continuous safety review process".
Please explain how the two types of reviews are or could be aligned to increase the effectiveness and efficiency of the process of safety review. Please elaborate on what outcome PSRs would produce that continuous safety reviews would not be able to offer.

Answer: The Finnish approach is to rely on the continuous regulatory process. The PSRs or relicensing occasions are only checking points to ensure that nothing has been underestimated. The question made can only be answered: ”Hopefully nothing”. We continue the questioning - what are those safety concerns, the observance of which could be put aside to be checked only at 10 years' interval?

Please see also the answer to question 21.

Seq. No	Country	Article	Ref. in National Report
100	Canada	Planned Activities	3.1, p75

Question/ Comment: From reviewing reports of other countries, it seems that PSRs take on the average two years to complete for each unit by the licensee, and one year on the average to be reviewed by the regulator.
Please explain how PSRs would be included in the overall plan to review the safe operation of the Finnish NPPs.

Answer: The conclusions are right considering the timely process of relicensing/ periodic safety reviews.

The regular term license has usually been 10 years, but there are no exact time limits in the legislation for the license duration. If the license is granted for longer time, a PSR is required after 10 years of operation. The licensee starts the PSR - or preparation for the application for license renewal - according to this schedule some three years before the license due date.