Convention on Nuclear Safety

3rd Review Meeting

Vienna, 11 – 22 April 2005

Answers (from HSK and RD-BFE) to

Questions on the Swiss National Report in Country Group 5 from the following countries:

Slovenia, Belgium, Germany, France, Argentina, Austria, Japan, Latvia, Australia, Pakistan, United States of America

Seq. No 1	General	Ref. in National Report: 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	-	

Seq. No 2	General	Ref. in National Report: p.2
Question/ Comment	Improvements are in progress for further independence of the Inspectorate. Presently the independence of the Inspectorate from licensing authorities is fulfilled on a technical level. Independence between inspection and licensing is not a requirement under NSC. This issue has some connection with Convention due to link with general regulatory system for commercial activities.	
Answer	The licensing authorities of Switzerland are the Federal Council and the Federal Department of Environment, Transport, Energy and Communication (ETEC). The licensing process is managed by the Federal Office of Energy (BFE). The granted licenses cover not only the aspects of nuclear safety but also of energy economics. Besides their licensing task, the BFE, and its superior authority the ETEC, are in charge of the execution of the energy legislation. They deal with questions of energy economics and energy politics and consider aspects of supply security. In addition, the BFE also supports nuclear energy research. Because of the double role of BFE and ETEC in licensing and energy politics, the Nuclear Energy Act requires that the supervisory authorities are to be formally independent from the licensing authorities and consequently from all governmental organizations concerned with the promotion or utilization of nuclear energy.	

Seq. No 3	Article 6	Ref. in National Report: p. 14
Question/ Comment	In the report it is stated that for all NPPs safety have been satisfactorily proven based on deterministic and probabilistic assessments, operational performance and safety culture aspects. Which are the criteria and the methodology used by the regulatory body to consider both operational performance and safety culture aspects in the Swiss NPPs periodic safety review analysis?	
Answer	The operational performance is evaluated by considering the number and kinds of reportable events, the number of scrams, the number of shutdowns for repair, the performance of radiation protection, and the operation performance of safety relevant systems, structures and components (SSCs). These evaluations are done for one year intervals in the frame of the yearly safety appraisals and for ten year intervals in the frame of the appraisal of Periodic Safety Reviews (PSR). The data	

are compared with data which are obtained from international experiences.

The Inspectorate recognizes the complex structure of safety culture and the problems of a regulator to get a deep insight into the culture of an organisation. Concerning culture, the Inspectorate applies consequently Edgar Schein's model of organizational culture. The Inspectorate does inspections (performed by human and organizational factors professionals) in the area of safety management. In doing this it is possible to inspect areas in the top level (artefacts) and in the second level (norms and values) of Schein's model.

With these inspections and in discussions, the Inspectorate also gets a view on the actions and efforts the plants take to foster their safety culture.

In addition, safety culture development programmes are a standing item on the agenda of management meetings between the Inspectorate and the NPPs.

For the PSR, the Inspectorate requires that the NPPs do a self-assessment on their safety culture. This self-assessment is reviewed by the Inspectorate.

Seq. No 4	Article 6	Ref. in National Report: p. 15

Question/ Comment

Referring to the second generation NPPs, in the PSR, it was stated that only minor requirements resulted, and these were mainly concerned with obtaining a better response to anticipated transients without scrams.

Could Switzerland provide more details of the minor requirements resulted from the PSR related with a better response to anticipated transient without scrams?

Answer

Requirements related to anticipated transients without scram (ATWS) resulted from the PSR of the Boiling Water Reactor NPP Leibstadt (GE BWR/6) within the framework of power up-rate by 15 %.

The limiting ATWS for this NPP includes the loss of main heat sink due to simultaneous closure of all main steam isolation valves.

In order to mitigate the consequences of this ATWS, plant operator actions are required as early as possible in order to reduce the reactor vessel water level to lower reactor power generation, and then to initiate the boron injection system (Standby Liquid Control System, SLCS) to shut down the reactor. Since these are crucial decisions for the operating personnel, sufficient time has to be provided for them.

In order to relax the demands on the operators, an automatic feed-water pump runback on an (existing) ATWS signal was required to initiate lowering of the reactor water level. This provides additional time for the most critical decision to initiate the SLCS. Further, it was required to inhibit the Automatic Depressurization System of the Emergency Core Cooling System by the ATWS signal. This takes off some additional tasks from the operators, as well.

Seq. No 5	Article 6	Ref. in National Report: p. 14-15

Question/ Comment: Many important changes increasing the safety level have been implemented following the PSR or back fitting campaigns. However, have any event from operating experience resulted in improvement modification of the NPPs?

Answer: Examples of modifications, resulting from operational experience:

- NPP Beznau: A manual valve in a safety system was found to be erroneously closed. Both the location and the indication were poor and inadequate. Improvements were made.
- NPP Mühleberg: The operators failed to initiate a scram "five minutes after the initiating event". The time dependant scram was changed into a scram based on a process signal, which can be clearly detected. See IRS report Number 7242.
- NPP Beznau: Certain containment penetrations have been found bent following a type B test. The investigation revealed that the penetrations had not been designed against buckling. All affected penetrations were provided with an additional support to increase stiffness. See IRS report Number 7541.
- NPP Mühleberg: A pressure spike in a reference line of RPV level measurement resulted in a scram. Later investigations came to the conclusion, that it was a hydrogen explosion. See IRS report number 1437. Some years later, the condensation pots were exchanged with a design, which is less sensitive to hydrogen accumulation.

In general, many event analyses lead to improvements of the NPPs' instructions and of the NPPs' personnel training.

Seq. No 6	Article 6	Ref. in National Report: p. 14

Question/ Comment: Chapter 6 states that in the late 1980's, a seismic requalification was carried out. The backfitting was performed mainly by adding one or two completely separated shutdown and RHR systems, including their support systems, taking care of the previous mentioned four points.

Please clarify the extent of the requalification – has this requalification been performed only for RHR systems or for the whole NPP?

Answer: The re-qualification involved the whole plant. The re-qualification was part of the back-fitting projects called "NANO" and "SUSAN". The components of these back-fitting projects are qualified for the Safe Shutdown Earthquake (SSE). In addition to this, piping and hangers in the plant were exchanged, if necessary.

Seq. No 7	Article 6	Ref. in National Report

Question/ Comment: Page 3 states that periodic safety reviews for Beznau were completed in 2002, and possibly the one for Muehlenberg in 2001 was completed after the 2002 Review Meeting. What were the significant findings?

Answer: Significant measures for NPP Muehleberg (BWR) are:

- An expanded programme for surveillance of neutron embrittlement of the

reactor pressure vessel, using reconstituted fragments of specimens from the third capsule, has to be submitted for approval by the Inspectorate.

- The testability of certain welds of the reactor pressure vessel has to be evaluated.
- The testability of the supports of the core shroud has to be evaluated.
- More aspects concerning the probabilistic and deterministic safety analyses have to be revised.

Significant measures for NPP Beznau (PWR) are:

- For the training of the NPP personnel a full-scope-replica-simulator has to be available.
- The effluent releases of radioactive material have to be to be reduced to the median value of the European PWRs.
- Leakage detection system of the primary circuit: Demonstration, that leakage much lower than the Tech. Spec. limit can be readily detected. (Davis Besse).
- The design limits for the safety systems have to be evaluated in the view of long-term operation.
- The probabilistic earthquake analysis has to be revised.
- The programme for in-service inspection of the RPV head and bottom has to be adapted taking into account recent experience, e.g. Davis Besse.
- The testability of welds in cast austenitic steel in the main coolant piping has to be evaluated.

Note: The findings of a PSR give a momentary look on those aspects that have not been satisfactorily solved during the last ten years. But it does not address those safety problems which have been treated and possibly closed during the last ten years. Therefore, these findings are not a representative summary of all problems.

Seq. No 8	Article 7	Ref. in National Report
Question/ Comment	It is necessary to revise regularly the regulatory framework for adaptation of the rules and recommendations to safety related improvements. What measures are implemented to guarantee the state-of-the-art of the regulatory framework? What is the time-table for implementation? Who in Switzerland defines the "state-of-the-art" and what is the standard of comparison (e.g., IAEA standards, European state-of-the-art, best practices)?	
Answer	The "state-of-the-art" in nuclear safety and radiation protection evolves permanently. At the Inspectorate, a number of processes are in places, which together ensure that compliance Swiss regulations are in line with the state of the art. The first set of processes aims at monitoring new developments and identifying in areas relevant to safety and regulation: - Representations in international (multilateral) working groups for	

harmonization of safety standards. A strong presence in international working groups for the development and harmonization of safety standards, such as those of the IAEA and the OECD/NEA, allows the Inspectorate to monitor the evolution of the state-of-the-art, apply relevant findings to supervision and to amend its regulations as necessary and appropriate.

- Bilateral collaboration with nuclear regulators around the world. The Inspectorate maintains close collaboration with nuclear regulators in neighbouring countries (France, Germany) but also with others whose nuclear programmes share commonalities with the Swiss programme. The US NRC has always been an important partner as four out of five nuclear power plants operated in Switzerland are from US vendors. The bilateral collaboration includes collaborative research, the sharing of operational experience, peer reviews of selected safety guides, as well as the exchange of technical staff.
- Regulatory safety research, including collaborative research on an international level. The regulatory research sponsored or co-sponsored by the Inspectorate serves to provide new or update existing technical bases for regulation. The research priorities are laid down in a strategy paper which is reviewed periodically and, if necessary, amended accordingly based on current and expected regulatory challenges.

Drawing input from the monitoring processes described above, two formal mechanisms are in place to ensure Swiss regulations are updated on a regular basis:

- Comprehensive review of regulations, including ordinances and laws. Comprehensive reviews of Swiss nuclear regulations are performed by the Inspectorate whenever laws, ordinances, or regulatory guides undergo substantial changes. This was last the case for the introduction of the Nuclear Energy Act and the Nuclear Energy Ordinance in 2005. The Nuclear Energy Ordinance was checked for compliance with IAEA safety requirements and safety standards.
- Periodic review of the Inspectorate's Guidelines (HSK-Richtlinien): each guideline is reviewed for compliance with the state of the art of international rules in nuclear safety every 3 years. The references against which the guides are checked include IAEA safety requirements and safety standards, as appropriate.

Seq. No 9	Article 7	Ref. in National Report: clause 2 (ii), p 21
Question/ Comment	With respect to permit procedure described and permit itself, could you please explain: - Who issues the permit (HSK?) and - Could the licensee appeal against the permit issued and if so, what are the consequences to the licence if the licensee wins the case (since the permits are meant to control the licence conditions)?	
Answer	By virtue of Article 65 of the Nuclear Energy Act, the Inspectorate is competent to approve safety-relevant amendments to the operating license when they do not	

deviate significantly from the current licensing basis. This is typically the case for changes to the plant including changes to safety grade systems, structures or components, as long as existing safety functions are maintained or improved and such fundamental plant characteristics as rated thermal power or the safety concept remain unaltered. In addition, the individual operating license may specify selected activities to be subjected to the permit procedure. This is typically the case for certain stages of commissioning and decommissioning of a nuclear power plant, whereby an approval by the Inspectorate is required before the license holder may proceed to the next stage.

The licensee alone can appeal against a ruling issued by the Inspectorate under a permit procedure. He does so to a special administrative court dealing with matters of infrastructure and environment cases at the federal level. For an appeal against a ruling under the permit procedure, the administrative court's decision is final. Note that the permit procedure, including the possibility for the licensee to appeal, already existed under the atomic energy act. This was made use of once before, and the dispute between the Inspectorate and licensee was settled by the arbitration board.

Seq. No 10	Article 7.1	Ref. in National Report

Question/ Comment

[The following questions relate to Articles 7 and 8]

Australia notes the past good performance of the Swiss nuclear power plants with respect both to safe operation and effective regulatory oversight (licensing and supervision). Australia notes that modifications to previous legal and supervisory practices are in process of implementation (for example, the Nuclear Energy Act and Nuclear Energy Ordinance).

In the new arrangements how will adequate practical experience and independent advice be assured at each level of the licensing and supervisory (inspection) process?

How are the new arrangements expected to improve past safety practices and outcomes?

Answer

Many of the rules contained in the Nuclear Energy Act (KEG) and Nuclear Energy Ordinance (KEV) were already established in the supervisory practice under the Atomic Energy Act (AtG). In particular, the great majority of rules regulating the safe operation of nuclear installations were available under the atomic energy act (AtG) in regulatory guides of the Inspectorate. Thus, the Inspectorate already acquired substantial practical experience in the application of those rules even before the KEG and KEV came into force.

On the other hand, a number of novel rules were introduced with the new legislation, and they represent indeed substantial improvements over past safety practices. This is true, in particular, for all requirements relevant to decommissioning nuclear installations and for the majority of the rules governing the treatment and storage of radioactive waste. Also, the backfitting requirements were extended to include criteria for temporary shutdown. Finally, the KEG and KEV explicitly and comprehensively define the obligations of the licence holder as the primary instance responsible for safety, as well as the duties and the authority of the supervisory body.

The licensing process calls for input by independent experts and by the general public at every step of the procedure, from the application for the general license to commissioning the installation. Upon submittal of the application for a general license, the Swiss Federal Office of Energy commissions the necessary expertise and invites the cantons, in particular those where the installation is to be located, to give their opinion (KEG 43). The complete file is published for a three-month public inquiry during which anyone may submit objections (KEG 46). The decision, by the Federal Council, to grant or deny the general licence has to be confirmed by the parliament and can further be challenged by the people in a public referendum. The involvement of expert opinions and public participation are similar for the construction and operating licenses, with the exception that corresponding decisions are taken by the Department and cannot be challenged by public referendum.

(Independent expert advice in supervisory process) The Inspectorate involves a number of independent experts from which it receives support in its supervisory activities (see also answer to question Seq. No. 19). In addition, the Inspectorate has undergone and completed both the primary and follow-up missions of the International Regulatory Review Team (IRRT).

Seq. No 11	Article 8	Ref. in National Report: Clause 1, p. 26-27

Question/ Comment

The report states the implementation of a New Public Management System (FLAG). The FLAG regime has become effective in January 2004 and helps the Inspectorate to improve its flexibility for budget decisions and recruiting of personnel. Knowledge Management provisions have been incorporated into the Inspectorate's Quality Management System. These serve to continuously review competency requirements for staff members and ensure staff development and succession planning.

- Could Switzerland provide information about the implementation of the New Public Management System (FLAG) that helps the inspectorate to improve its flexibility for budget decisions and recruiting of personnel enabling the inspectorate to make a clear step towards more administrative independence between the inspectorate and the licensing authorities?
- Which are the knowledge management provisions incorporated into the Inspectorate’s Quality Management System which serves to continuously review competency requirements for staff members and ensure staff development and succession planning?

Answer

By introducing the FLAG-System the Inspectorate was separated from the Federal Office of Energy from a financial point of view, and therefore its independence was increased. FLAG stands for "Management with Performance Mandate and Global Budget". The Inspectorate's Performance Mandate was enacted by the Federal Council and provides for requirements, goals and the corresponding controlling procedures, including performance indicators, for a period of four years. On the other hand the Inspectorate got its own Global Budget. Within this budget it is free to decide where to invest its financial means. Especially the restrictions on personal budgets are omitted. This gives more flexibility than a classical budget where every expense is specified.

The mentioned Knowledge Management provisions include a systematic

compilation of the competence and knowledge need of every organizational unit which is annually required by the management. The training of the staff members is based on this compilation. There is a career development programme making use of personal potential assessments. The Inspectorate elicits the knowledge of leaving staff members by means of structured interviews and tries to get an overlap with the successor of the position.

Seq. No 12	Article 8	Ref. in National Report: p. 27
Question/ Comment	Upon request of the Swiss Government authorities, an International Regulatory Review Team (IRRT) from IAEA performed a follow-up in January 2003. As a result, only 4 recommendations among the overall findings of the IRRT mission still are pending. Do the pending recommendations have some safety impact?	
Answer	The IRRT mission stated that the legal framework at the time of the mission did not provide an effective de jure independence of the Swiss regulatory body as is internationally required through the IAEA Safety Standards nor has a licensing authority/function been delegated to the Inspectorate. The team understood that this deficiency is supposed to be resolved through the introduction of a new Swiss Nuclear Energy Act and the establishment of a Swiss Agency for Technical Safety. The four recommendations of the IRRT follow up (for the exact wording of the recommendations see answer to Seq. No 21) reference to this ongoing process of developing the new nuclear energy legislation and the establishment of an independent supervisory authority. They have no direct safety impact. The IRRT-Report is available on the web site of the Inspectorate (www.hsk.ch).	

Seq. No 13	Article 8	Ref. in National Report
Question/ Comment	In which form is the regulatory framework of the Swiss Safety Authorities financed?	
Answer	The development and the maintenance of the regulatory framework are financed by the government. All other expenses of the safety authorities, with exception of the regulatory framework and the information given to the public, are covered by fees from license holders. The establishment of a regulatory framework and public information distribution are public tasks, and are therefore financed by the government.	

Seq. No 14	Article 8	Ref. in National Report
Question/ Comment	How is it ensured that inspections performed by the SVTI are performed properly and not under time pressure concerning the manning level of the SVTI? What standard of inspection is used by SVTI – what criteria are used (IAEA, ISO, ASME, etc.)?	
Answer	The duties of SVTI are laid down in a contract between BFE and SVTI. This contract places SVTI under a legal obligation to operate a nuclear inspectorate	

which is properly staffed with respect to the number and qualification of personnel. SVTI works on a yearly financial budget based on forecasts of the expected workload. The inspection body reports to the Inspectorate in the form of inspection reports. The Inspectorate supervises SVTI's performance in regular meetings and audits on different management levels.

Inspections by SVTI are based on the rules specified by the Inspectorate, namely Inspectorate's Guidelines and ASME-Code for mechanical equipment and testing. SVTI as an accredited inspection body Type A operates under a certified quality management system based on both ISO 9001 and 17020, which is subjected to regular auditing by the Inspectorate.

Seq. No 15	Article 8	Ref. in National Report: p. 27
Question/ Comment	Is there a system of internal audit within the regulatory body? How does the regulatory body promote safety culture within the organization? Please, elaborate.	
Answer	The Inspectorate uses a Management System (MS) which is certified according to ISO-9001:2000.This standard requires regular internal audits and review of the system at least once a year to see whether improvements may be necessary and then accordingly implemented. By this process, it is assured that the Inspectorate's employees work in a structured way, following the well-defined working processes for each activity. The MS includes the Inspectorate's safety policy as well as the Inspectorate's strategy for the next working period. The MS is completely computerized and every Inspectorate's employee uses it as one of the important working tools to perform their duties. By this MS a common understanding of the safety strategy of the Inspectorate's oversight is guaranteed. In addition to the MS, the Inspectorate is developing a structured decision making process so that resulting measures are transparent and comprehensible. Decisions are based on indicators and on the associated decision criteria. This process will be incorporated into the Inspectorate's MS in the near future. These measures are elements to increase the common understanding inside the Inspectorate on safety – an important aspect of a good safety culture. Otherwise there is no specific programme to promote safety culture inside the Inspectorate.	

Seq. No 16	Article 8	Ref. in National Report: p. 27
Question/ Comment	Swiss NPPs are operated by private companies. Individuals as well as cantons and municipalities hold a major part of the shares of these companies. Assuming that the utilities have a board of directors to run the plant, please clarify that who is the license holder and has the primary responsibility for nuclear safety?	
Answer	The license holder is the utility that owns the nuclear installation (article 20 I a Nuclear Energy Act). It is responsible for the safety of the installation and for its operation (Article 22 I Nuclear Energy Act). The licence holder designates a plant manager leading the technical operation of the nuclear installation, who is given the necessary competences and means and who is responsible for decisions concerning safety and security (article 30 Nuclear Energy Ordinance).	

Seq. No 17	Article 8	Ref. in National Report
Question/ Comment	Could you explain who appoints the member of the KSA and what is their background (industry, science, public administration)?	
Answer	The Swiss Federal Nuclear Safety Commission (KSA) is an advisory commission to the Federal Council and to the Department. Its members are appointed by the Federal Council upon proposition by the Committee itself. All thirteen members are appointed "ad Personam", that is they do not represent their organizations. The Committee members cover a broad range of expertise including most if not all disciplines related to reactor safety, radiation protection, emergency preparedness, and waste management and transport safety. Currently, the Committee is composed of the following professionals: 1 geologist, 5 physicists, 2 chemists, 1 biophysicist, 1 electrical engineer, 1 mechanical engineer, 1 psychologist, and 1 metallurgist.	

Seq. No 18	Article 8.1	Ref. in National Report: p. 26
Question/ Comment	The inspectorate currently has a staff of about 70 specialists. How are these specialists distributed over the different branches of the inspectorate to cover the basic functions of the regulatory authority?	
Answer	The distribution of specialists over the different branches is: 29 reactor safety, 24 radiation protection and emergency preparedness, 10 waste management and transport safety, 10 inspection management and international affairs.	

Seq. No 19	Article 8.1	Ref. in National Report: p. 26
Question/ Comment	To what extent does the Swiss Nuclear Inspectorate make use of external independent expert organisations (mean annual budget)?	
Answer	The most important independent expert's organizations of the Inspectorate are the Swiss Association for Technical Inspections (SVTI) an independent private organization, the research facility Paul Scherrer Institute (PSI) and Basler & Hofman and ERI (two engineering companies). Annual budget for the above mentioned expert organizations is about 5 Mio CHF. The total annual budget for external experts is 8 Mio CHF.	

Seq. No 20	Article 8.2	Ref. in National Report: p. 28
Question/ Comment	(Regulatory body) is therefore independent from other governmental bodies concerned with the use of nuclear energy. Please see question related to introduction (p.2.).	
Answer	See answer to Seq. No 2.	

Seq. No 21	Article 8.2	Ref. in National Report

Question/ Comment: Page 27 discusses a recent IRRT mission. What were the 4 recommendations of the IRRT that you have not implemented, and do you intend to implement them?

Answer: The 4 recommendations of the IRRT follow up are:

R.1: In order to achieve independence of the Regulatory Body government action to promulgate the new Act (KEG) is necessary as soon as possible. It is recommended that the Ordinances implementing the KEG specify the requirement of IAEA Safety Standards Requirements Document No. GS-R-1, paragraph 2.5, ensuring that the safety requirements of the regulatory body remain in force and are not modified in the regulatory process. In the short term the FLAG project by the Inspectorate (HSK) is viewed as a positive step towards more administrative independence. Additionally, pending implementation of KEG or SATS, it is recommended that a means be established and implemented by which any concerns by HSK, based on the FOE dispositioning of the Safety Evaluation in support of the licensing process, would be elevated to the Department Level for resolution and transparency of the process. This would address the current position of HSK as a division of the FOE and the perception of a lack of independence of the supervisory authority in licensing matters.

R.2: In consideration of the existing and pending challenges represented by the pending development and implementation of changes in Energy Act legislation, the BGTS/SATS organizational initiative, the continued development of a more structured inspection and enforcement policy, and the management challenges represented by FLAG, it is recommended that independent legal expertise be provided within HSK.

R.3: The Federal Office should consider the consultation and involvement of HSK in international matters promoting co-operation and exchange of information, particularly involving nuclear safety experiences and international programme policy relevant to HSK's supervisory body responsibilities. For clarity of roles and responsibilities a formal delegation should be established between the Federal Office and HSK in respect to these matters.

R.4: HSK and Federal Office of Energy (BFE/UVEK) should take rapid co-ordinated action to introduce at the level of "ordinances" the general safety requirements and the clear assignment to HSK of Guidelines issuing responsibility, that are similar to what is presently contained in the draft of the KEG and its ordinances. To make sure that these new ordinances resolve all present limitations HSK should provide a detailed proposal based on a comparison with IAEA Safety Standards Requirements Document No. GS-R-1, GS-G-1.2, GS-G-1.4, GS-G-2.3 and others that may be in the lasts stages of development. To perform this activity HSK should have within staff the legal support needed.

The recommendation R. 2 requiring independent legal expertise for the Inspectorate has been implemented. The other recommendations R. 1, R. 3 and R.4 could be partially implemented by setting into force the new Nuclear Energy Act. The elaboration of the corresponding ordinances and the establishment of an independent supervisory authority are still ongoing. The IRRT-recommendations are taken into account during these steps.

Seq. No 22	Article 10	Ref. in National Report: p. 30

Question/ Comment

One of the OSART findings was a tendency towards complacency. The NPPs concerned have initiated programmes to make the staff aware of this problem and to foster a better developed questioning attitude.

Could Switzerland provide information about such programs?

Answer

Answer to question Seq. No 22, 26 and 33.

As a consequence of the OSART-Missions, all plants invite an external expert in nuclear safety from another NPP to the meetings of the internal safety committee in order to introduce an external view into the discussions on safety issues.

In addition, all plants improved their contacts to external nuclear organizations. All Swiss plants invited WANO for a peer review, which will be completed by 2006.

All plants have persons or groups assigned to deal with safety culture issues. These groups or persons develop plant-specific programmes to sensitise the staff on safety awareness in their daily job. These are e.g. Workshops on the use of TechSpecs, on conflict situations between economy and safety, special lectures on the danger of routine work etc. All plants apply the STAR (Stop, Think, Act, and Review) principles and do regular refresher training in this area. In order to keep the constant attention of the staff to these issues, the plants use posters with a message how to behave in certain safety challenging situations.

Seq. No 23	Article 10	Ref. in National Report: p. 31|

Question/ Comment

The Inspectorate is aware of the fact that the impending liberalization of the electricity market is putting an economic pressure on the utilities. This might affect nuclear safety over time. Discussions between the Inspectorate and the operators about this issue and related problems are ongoing.

- Which are the safety indicators developed to detect early deteriorating signs of safety-levels in a plant?
- What is the regulatory body criteria used to focus the discussions between the Inspectorate and the operators about the relationship between nuclear safety and the liberalization of the electricity market?

Answer

Answer to question Seq. No 23, 24, 31, 32 and 34.

In the final editing of the 3rd Swiss report on the "Implementations of the Obligations of the Convention on Nuclear Safety" two paragraphs at the end of page 31 were exchanged by mistake. The end of Article 10 should read:

"The Inspectorate is aware of the fact that the impending liberalisation of the electricity market is putting an economic pressure on the utilities. This might affect nuclear safety over time. Discussions between the Inspectorate and the operators about this issue and related problems are ongoing. In general, the operators of NPPs emphasise that the priority given to safety is not influenced by economic pressure.

To ensure that organizational changes do not have a negative impact on safety, the Inspectorate requires the following "management of change" (Requirement of Inspectorate's Guideline R-17, Organization of NPPs):

- *Examination of the safety impact of organizational changes prior to their implementation.*
- *Implementation of changes with the help of a project management where personnel-related aspects will be considered.*
- *In-house evaluation of change processes to ensure that the expected safety-related effects will be valid once the change becomes effective.*

The Inspectorate's Guideline R-15 requires that intended organizational changes at NPPs are reported well in advance. The Inspectorate then contacts the plant in order to review their management of change project."

The application of the Inspectorate's Guideline R-17 in inspections is a proactive tool to prevent an inadvertent change of organizational performance of NPPs due to any external or internal influence.

The new Nuclear Energy Ordinance requires that changes in the nuclear power plant's rules of operation (description of the organizational structure, assignments and responsibilities etc.) need the approval of the Inspectorate.

Instead of using indicators, the Inspectorate inspects elements (e.g. organizational structure, processes and safety management) stated in the Inspectorate's Guideline R-17 (Organization of NPPs, i.e. Safety Management). Relevant findings in inspections are either directly addressed or are put on the agenda of the top management meetings between the Inspectorate and the NPPs.

The criteria to focus the discussions do not only relate to the liberalization of the electricity market. Any potential external influence (political, economical, regulations, etc) may trigger the discussions. During the meetings, the annual objectives of the plants, the budget (especially investments in the area of safety relevant issues like staffing, personnel costs, training, replacement of equipment, systems upgrading, etc.), organizational and safety culture development are regularly discussed, as well as long-term issues like lifetime extension, etc. When concerns arise, the Inspectorate (the Inspectorate) requires detailed programmes to be presented to it, for scrutiny. These programmes have to demonstrate that safety is not affected by the plant's intended activities.

Seq. No 24	Article 10	Ref. in National Report
Question/ Comment	Which measures are taken to guarantee the priority the safety of NPPs in the context of the deregulation of the electricity markets and increasing cost pressure on the operation of the NPPs?	
Answer	See answer to Seq. No 23.	

Seq. No 25	Article 10	Ref. in National Report
Question/ Comment	One finding of the OSART mission was the tendency towards complacency in the Swiss NPPs. What are the other findings of the OSART mission and what were measures taken by the Swiss NPPs?	
Answer	A detailed answer to this question would go far beyond the scope of this report. The results of the OSART Missions and the corresponding follow-up Missions	

are published on the Inspectorate's web site: www.hsk.ch.

Each of the Swiss NPPs developed a programme to resolve the recommendations and suggestions given by the OSART team. The Inspectorate and the Swiss Federal Nuclear Safety Commission (KSA) followed closely the actions taken by the plants to resolve the issues. At this time, all issues of all plants are resolved or are still in good progress for issues that need continuous attention.

For the complacency aspect of the question, see answer to Seq. No 22.

Seq. No 26	Article 10	Ref. in National Report
Question/ Comment	It is commonly accepted that the attitude of the staff is significant for safety maintenance and its improvement. Programs to foster a better developed questioning attitude have been stated. What were the essential aspects in these programs? Are there preliminary results of these programs?	
Answer	For programmes and their aspects see answer to Seq. No 22. Since no causal direct link between safety culture developments (e.g. programmes to improve a questioning attitude) and safety has been demonstrated so far, it is not possible to show this effect directly by e.g. a numerical value. However, the major effect observed by the Inspectorate is that the staffs of the plants consider Human and Organizational Factors (HOF) as an important area for safety improvement. This is shown by the increasing depth in event analysis, where an increasing amount of organizational and human contributors are investigated. In addition, the programmes mentioned in the answer to Seq. No 22 also lead to a better communication and common understanding of HOF issues within the plants. As an example, one plant introduced in the event analysis an indicator showing if a specific event may have been prevented by an increased questioning attitude.	

Seq. No 27	Article 10	Ref. in National Report
Question/ Comment	What is HSK's cost/benefit criterion which is used to evaluate backfitting measures (as discussed on page 31 of the CNS report)? How is this criterion applied taking into account uncertainties? What is the analytical basis of cost/benefit calculations (i.e., PSA level 1, PSA level 2, internal events only or including external events, full power only or including low power & shutdown accidents, etc.)?	
Answer	Cost/benefit considerations are not used in a systematic manner. In HSK's Integrated Oversight Process, the overall approach to decision-making is based on a few principle elements, including PSA results, deterministic rules and methods, and operational experience. PSA is used in order to assess the benefit only (as opposed to the costs). Mainly CDF values obtained from complete internal and external event analyses are considered. The uncertainty is not taken into account quantitatively; however, it shall be covered by robust decisions. The principles for the use of PSA in HSK's decision-making process are shown in Schmocker et al, "Introduction of an Integrated Regulatory Safety Oversight in Switzerland",	

PSAM 7 – ESREL '04, Berlin, June 14-18, 2004.

Additional information related to this question is provided in the answer to Seq. No 65.

Seq. No 28	Article 10	Ref. in National Report: p. 30
Question/ Comment	Could Switzerland give more details on the recommended "special training for maintenance personnel and contractors"?	
Answer	Before staff of contractors can start work in a plant, they receive a few hours of training about safety at work, radiation protection and plant specific information relevant to their job. Every external person is assigned an internal person in charge who provides all information necessary for doing the job properly and safely. This person in charge also monitors the way the external person works and does a final assessment after the job is done. On the basis of this assessment, the plant decides if an external person will be accepted for new contracts.	

Seq. No 29	Article 10	Ref. in National Report: p. 30
Question/ Comment	All Swiss NPPs have established a policy that is also submitted to the inspectorate. To what extent does the inspectorate review this policy and check whether the policy is appropriately reviewed?	
Answer	The policy of safe operation (prior to economical aspects) is a continuing objective of all plants. The inspectorate is in discussions and during inspections at the plant, observes if and how this policy is consistently broken down into procedures and applied in decisions. A good indicator for the application of this policy is the behaviour of NPPs concerning minor deficiencies (e.g. small leakages, utilization of Tech. Spec. Margins, etc.). As a recent example, one of the Swiss NPPs shut down for the repair of a leakage far below TS limits in order to have the installation well controlled.	

Seq. No 30	Article 10	Ref. in National Report: p. 31
Question/ Comment	Have the regulatory requirements regarding “Management of change” already been applied? Are there inspection guidelines to monitor compliance with these requirements? What has been the experience so far?	
Answer	Since the introduction of the Inspectorate's Guideline R-17 no major reorganization (i.e. changes of the organisational structure, decrease in staffing) has taken place in any of the Swiss nuclear installations. So, the procedure for the Management of Change has not been applied yet. An inspection manual to the Inspectorate's Guideline R-17 (Organisation of NPPs) is in preparation for inspecting and reviewing such processes.	

Seq. No 31	Article 10	Ref. in National Report: p. 31

Question/ Comment	How does the inspectorate ensure that the operators of the NPPs really give priority to safety under increasing economic pressure? Are there key requirements regarding organisational structure and staffing?
Answer	There are no requirements on the organisational structure and staffing. Instead of this, changes in the organizational structure and in staffing have to be reported well in advance to the Inspectorate. See answer to Seq. No 23.

Seq. No 32	Article 10	Ref. in National Report: p. 30
Question/ Comment	It is stated that operation and maintenance of NPP may be influenced by economic and social changes. Please elaborate the statement. How does the regulatory authority assure that safety is not compromised due to these changes?	
Answer	See answer to Seq. No 23.	

Seq. No 33	Article 10	Ref. in National Report: p. 30
Question/ Comment	It is mentioned that one of the findings of OSART was a tendency towards complacency. The NPPs concerned have initiated programs to make the staff aware of this problem and to foster a better developed questioning attitude. What programs have been initiated at NPPs to develop better questioning attitude? What yardstick is used to judge a successful outcome of these programs?	
Answer	For programmes see answer to Seq. No 22. Concerning the "yardstick", complacency cannot be "measured". It was an impression of the OSART team and an interpretation of the essence of answers given by the plants staff. However, the effects mentioned in the answer to Seq. No 26 are – in the view of the Inspectorate – indicators for the effectiveness of the measures taken by the plants.	

Seq. No 34	Article 10	Ref. in National Report: p. 31
Question/ Comment	It is stated that liberalisation of the electricity market is putting an economic pressure on the utilities, which might affect nuclear safety over time. Please elaborate what measures are being taken to ensure continued nuclear safety?	
Answer	See answer to Seq. No 23.	

Seq. No 35	Article 10	Ref. in National Report: p. 30
Question/ Comment	Section 10 describes the decision process and in order to be transparent, the Inspectorate uses the following graded approach to decide on the justification of safety measures: - Safety measures required by the legislation (this includes licence conditions) - Recommendable safety measures based on the state of science and technology - Safety measures appearing desirable from the viewpoint of experience and the state of backfitting technology and simultaneously reasonable on the basis of cost/benefit ratio. Does this graded approach means that NPPs are required to perform only first set	

of safety measures, while adoption of the last two is up to the discretion of the licensee?

Answer The requirements of the Inspectorate are always mandatory for the licensee, regardless of whether they are mentioned specifically by the law or whether they result from a decision based on a general clause such as the backfitting rule.

Seq. No 36	Article 11	Ref. in National Report

Question/ Comment How is determined what constitutes sufficient funding for decommissioning? What is the technical basis for this determination and what are the principal technical and financial assumptions which underlie the methodology? If the basis is licensee estimates, against what criteria does HSK review the estimates to ensure that they are adequate? How does Swiss law provide for completion of decommissioning in case of the bankrupt of a licensee concerning that the owners of the other NPPs are also liable for the amount in debt?

Answer The goal of the decommissioning fund is to secure sufficient financial resources. The question to be answered is: How much money will be needed? To answer this question, concrete plans for the decommissioning and dismantling of the nuclear power plants and for the management, including disposal of the waste arising from dismantling, are needed. It is the task of the nuclear power plant owners to elaborate these plans and to evaluate the corresponding costs. The plans and the cost estimates are then reviewed by the authorities.

The owners presented totally new studies for the decommissioning of each Swiss nuclear power plant in 2001. The corresponding costs were evaluated to amount 1.8 billion CHF (about 1.2 billion EUR). From the review the Inspectorate found out that the studies were clear and comprehensible; the technical aspects were found to be up-to-date. The cost estimates appeared to be plausible and prudent. Additionally, a comparison of the data from the Swiss studies with the estimations which were done in other countries shows that the costs are comparable. The Inspectorate thus concluded that these cost estimates constituted a good basis for the decommissioning fund. The management board of the decommissioning fund then revised the yearly contributions to be paid by the owners on that basis.

Seq. No 37	Article 11	Ref. in National Report

Question/ Comment In the report it is stated that an ordinance on Training and Qualification of the Personnel will be issued. What is the planned time schedule for issuing?

Answer The draft will be ready for review by mid 2005. It will be issued probably at the beginning of 2006.

Seq. No 38	Article 11.1	Ref. in National Report

Question/ Comment The last paragraph of clause 1 indicates that if the decommissioning fund for one NPP is found not to be sufficient the owners of other NPPs are also liable for the amount in debt. How is this requirement legally underpinned?

Answer A new Nuclear Energy Act has been passed by Parliament in March 2003 and was

put into force on 1st February 2005. This legislation defines provisions to secure the financing of nuclear power plant decommissioning on four levels:

1. The amount paid by an owner to the decommissioning fund should be sufficient to cover the costs arising from the decommissioning of its nuclear power plant.
2. If this amount of money would not be sufficient, the owner would have to pay the extra costs.
3. If the owner would not have the necessary resources, then the extra costs would be paid from the part of the decommissioning fund foreseen for the decommissioning of the other nuclear power plants.
4. If this also would appear to be not sufficient, then the owners of the other nuclear power plants would have to pay the extra costs.

Seq. No 39	Article 11.2	Ref. in National Report: p. 33, 34, E&T
Question/ Comment	Which qualification and retraining is required for the management personnel of the operating organisation? How is compliance assessed by the regulator? According to Sec. 2.2.4 of the guideline HSK-R-17 the qualification and training of the NPP personnel is prescribed in the guidelines HSK-R-27, 37 and 45. HSK-R-27 deals with the reactor operators, shift supervisors and pikett-engineers. HSK-R-37 deals with radiation protection personnel. HSK-R-45 covers planning and performance of emergency exercises. So there is no information on the qualification and retraining requirements of NPP management personnel like plant manager, operation manager, maintenance manager etc.	
Answer	The new ordinance on Q&T (in preparation) states several initial qualification requirements for NPP managers. The ordinance requires that details for training are specified in guidelines (to be developed; time frame: 2007/08).	

Seq. No 40	Article 11.2	Ref. in National Report: p. 33, E&T
Question/ Comment	What are the essential topics of the aptitude tests that are included in the selection procedure for all licensed control room personnel?	
Answer	The evaluation is performed by the Institute of Applied Psychology. The main topics are listed in appendix B of the Inspectorate's Guideline R-27 (Training of Licensed Personnel) which you find below.	

Appendix B of the Inspectorate's Guideline R-27: Suitability tests concerning the employment of operational personnel in the Swiss nuclear power plants: required abilities.

Scale: A = very good B = good C = sufficient

According to the judgement by the psychological suitability examination

R-Op = reactor operator, SS = shift supervisor, PI = picket engineer

Capabilities	**R-Op**	**SS**	**PI**
Intelligence-learning ability	C/B	B	A
Way of thinking	C/B	B	A
Technical comprehension	B	B	A
Ability to express onesself	C/B	B/A	B/A
Behaviour at work	B	B/A	B/A
Ability to decide, take responsibility,independence.	B	B/A	A
Ability to take pressures	C	B	B/A
Societal-social competence	C	B	B/A
Attitude towards immediate chiefs	C	B	B/A
Attitude toward superiors at the place of work	C/B	B	B/A
Attitude towards colleages	C	B	B/A
Leadership qualities	--	B/A	A

In addition to the psychological evaluation, a medical test shows the ability to fulfil the requirements for the specific tasks (visual, auditive tests, general medical status concerning the requirements to work as a person exposed to radiation).

Seq. No 41	Article 11.2	Ref. in National Report: p. 34, E&T
Question/ Comment	Are the plant specific full scope simulators able to simulate beyond-design-base conditions? Are they used to verify EOPs and SAMGs?	
Answer	The Swiss full scope simulators are able to go far beyond design-base concerning multiple failures. Since EOPs are limited to the design-base, the simulators are able to cover this part and they are used sometimes for verification and validation of EOPs, but not as the only means. The simulators are not designed to simulate core damage conditions or severe accident phenomena. Therefore, the simulators cannot be used for SAMG verification.	

Seq. No 42	Article 12	Ref. in National Report: p. 35

Question/ Comment

The modernization of the control rooms at the Beznau NPP brought additional ways of HSI based on a sophisticated computerized plant information system. Based on this, a computerized alarm system and a computerized emergency operating procedures system were installed in both units. The Inspectorate granted the approval for the systems.

- Could Switzerland provide more details of the computerized plant information system?
- Which criteria were used by the Regulators for granted the approval?

Answer

The detailed description of the systems would go far beyond the scope of the NSC report.

The plant information system collects information from the same sensors at the plant as the classical instrumentation. The system is highly redundant and therefore shows a very high availability. Plausibility checks assure a high reliability of data. E.g. in the case of one or more failed sensors for the same parameter, the systems gives a warning to the operators, indicating the reduced reliability of the data. In using the system, control room operators are able to follow multiple trends on different screens depending on their specific tasks.

The system is also used to feed the computerised emergency procedure COMPRO and the advanced filtered alarm system AWARE.

The plant information system is not a safety system. This applies also to AWARE and COMPRO, which are used by the control room crew during emergencies.

In order to assure a high reliability of the system and to prevent complications in the case of system failures, the Inspectorate required the following:

1. AWARE and COMPRO had to be verified and validated. This applied for the technical issues and for the Human Factor issues as well. To do so, three control room shift crews had to run five different scenarios on the simulator. Results from observations (each member of the crew had an observer) and interviews during the debriefing were used to identify potentials for improvements. The implementation of these improvements was closely followed by the Inspectorate.
2. Important steps in the emergency procedures ("key steps") have to be verified independently by the pickett engineer using a short paper procedure. This assures that possible system failures do not affect the correct procedures during an event.

After completion of the two steps above, the Inspectorate granted its approval for the s

The Inspectorate used, as a basis for review of the V&V programmes, the NUREG 700 and NUREG 711 Reports. For the review of the application of the V&V method the Inspectorate was consulted by IPSN and a consultant with experience in similar activities in the validation of the French N4 control rooms.

More details on the Human Factor V&V process are described in the paper: "Insights from a Validation Process for a Swiss Nuclear Power Plant", Conference Proceedings "Ergonomics for the New Millennium" of the International Ergonomics Association and the Human Factor and Ergonomics Society, July/August 2000, San Diego, USA.

Seq. No 43	Article 12	Ref. in National Report: p. 36

Question/ Comment: MOSAIK inspection procedure is used at the Inspectorate as an instrument for monitoring of organizational aspects of the licensees' work processes such as documentation, communication and co-ordination, safety rules, availability of appropriate work equipment, housekeeping, etc.

- Could Switzerland explain under which basis such MOSAIK procedure was developed?
- Could Switzerland provide the most significant findings as a consequence of the recent revision performed?

Answer: In a first version the catalogue of items was developed using different literature sources, event investigation programmes, OSART guidelines, the OECD/NEA/CSNI Report "IMPROVING REPORTING AND CODING OF HUMAN AND ORGANISATIONAL FACTORS IN EVENT REPORT" NEA/CSNI/R(97)15/PART1 but also the experience of inspectors and the knowledge of a former manager for operations of an NPP.

In a recent review, the experience gained by the inspectors in applying MOSAIK was considered: Several questions with potential for ambiguous interpretations were removed, some questions were reformulated in order to get a better understanding and the user friendliness of the catalogue was improved.

The first results of the application of the new catalogue show that it is applied more consequently and more consistently.

As expected, the inspection results did not change significantly: Since all plants have implemented quality assurance systems, which guide the activities of the personnel very thoroughly, the findings are very positive. Detected deviations are still in the order of less than 1% of the observations.

The positive effect of applying MOSAIK is seen in an increased awareness of the plant's personnel and of the Inspectorate's inspectors on organizational issues in the work processes.

Seq. No 44	Article 12	Ref. in National Report

Question/ Comment: Analysing the causes of human factor based events it is described that involved Human-System-Interactions and organisational aspects are investigated. Which special operating states concerning PSA are identified with particular importance to Human Factors?

Answer: Three categories of operator actions are considered in the Swiss full power and shut down PSAs (latent human errors leading to system unavailabilities, active human errors leading to an initiating event, and errors of omission in the course of an event). The importance of operator actions turns out to be very plant specific. As expected, operator actions generally play a more important role during shut down than in full power operation.

Seq. No 45	Article 12	Ref. in National Report

Question/: It is stated that in Swiss NPPs the safety culture is implemented and is constantly improved. What are the results of the measures and programs to foster the safety

Comment culture in the Swiss NPPs? What are the effects of the improvements of safety culture in advancement of the results of safety indicators e.g. decrease of incidents?

Answer Each plant has its own programme for safety culture development. These may include workshops, training sessions, posters, etc. They are organized either by the plant themselves but also together with professional external consultants.

The positive effect of such programmes is the fact that discussions about HF issues in events are fostered, resulting in organizational learning. The effect on event reduction is not directly visible in the low number of reportable events.

On the contrary, improving the questioning attitude could even result in an increase of events due to a lower threshold for reporting. So, for the Inspectorate the number of incidents is not an indicator for Safety Culture.

Seq. No 46	Article 12	Ref. in National Report

Question/ Comment An essential aspect in safety culture is the cooperation of all involved organisations. What is the status of the planned guideline on safety culture?

Answer The draft should be ready end of 2005.

Seq. No 47	Article 12	Ref. in National Report: p. 36

Question/ Comment Major activities have been raised regarding safety management and safety culture including a self assessment program. Indicators have not been mentioned in this context. Are there related indicators? What is the experience so far?

Answer The Inspectorate is introducing an indicator system. There are only few indicators in the area of Human and Organizational Factors. Examples are:

- Ratio of hours used for training versus total working hours.
- Number of staff who resign.
- Ratio of internally analysed events versus notified events.
- Number of QA audits.

The Inspectorate does not use any indicator for Safety Culture evaluation (see also answers to Seq. No 3 and Seq. No 45). Much more information may be gathered by inspections and discussions with the plant. This is performed by Social Scientists working at the Inspectorate and will be improved in the future by applying the inspection manual to the Inspectorate's Guideline R-17 (Organisation of NPPs).

The Swiss NPPs are about to introduce an indicator system. One basis of this system is IAEA TECDOC 1144 that mentions also indicators in the area of Human and Organizational Factors (HOF). These HOF indicators are for the plant's internal use; they are not reported to the Inspectorate. However, the Inspectorate has the possibility to have a view on the consistent application of these indicators.

Seq. No 48	Article 13	Ref. in National Report: p. 39

Question/ Comment

Performance indicators have been defined for each process. The results are evaluated by the process owners and reviewed in conjunction with the management review.

What are the performance indicators defined for each process and the associated criteria used to chose each indicator?

Answer

Performance indicators are defined on the following basis:

- Performance mandate from the government.
- Management objectives.
- Internal needs.

They can be grouped as follows:

- Output indicators.
- Outcome indicators.
- Impact indicators.
- Efficiency indicators.

Between 2 and 5 indicators are defined for each process resulting in approx. 50 indicators for the entire Inspectorate. They are either defined by the Inspectorate's leadership or by the process owners. The actual indicators reflect the current result of a long trial period during which the number of indicators has been significantly reduced and their expressiveness has been increased. Some examples are provided in Seq. No 52.

Seq. No 49	Article 13	Ref. in National Report

Question/ Comment

Australia notes the developments in Quality Management Systems outlined in Article 13 both in the nuclear power plants and in the Nuclear Safety Inspectorate (HSK).

In the NPPs, how are the separate requirements of ISO 9001:2000 standards and IAEA Quality Assurance standards integrated and certified?

What are the respective roles of the HSK and any external certifying body?

Does any external certifying body address IAEA based requirements as well as certifying measures to meet ISO requirements?

Is any such external body involved in the periodic inspection of the self-assessment function?

Are the Quality Management requirements covered by licence requirements and/or HSK permits?

What body undertakes certification and renewal of the Inspectorate’s Quality Management System? Does this body inspect outcomes of the internal audit process?

Answer

Answer to question Seq. No 49, 51 and 53.

The Inspectorate was actively involved in the development of IAEA Safety Report Series Nr 22 "Comparison ISO-9001:2000 and the IAEA QA Standard".

The new Nuclear Energy Act Article 22 requires that all activities at a nuclear installation need quality assurance and the Nuclear Energy Ordinance (Article 31) requires that Swiss NPPs have implemented QM systems in compliance with international (including IAEA) standards. The Inspectorate's Guideline R-17 (Organisation of NPPs) requires that the QA-Systems of the Swiss NPPs are in compliance with IAEA 50-C/SG-Q.

All Swiss NPPs hold a certificate ISO9001:2000. The compliance with this Standard is regularly verified by a nationally approved certifying body. The inspectorate relies on the results of the certificate concerning the formal requirements of the Standard.

However, the Inspectorate, in its reviews and inspections, focuses on the nuclear safety aspects required in the regulation or other applicable nuclear standards like IAEA documents. The Inspectorate has reviewed the contents of QM systems of the Swiss NPPs. They comply with the IAEA 50-C/SG-Q Document.

The Inspectorate reviews the procedure of self-assessment at NPPs and has insights into the results of such assessments.

In addition, the application of the QM system in daily life is inspected by the Inspectorate. This applies for all inspections of the nuclear and radiological fields and specifically regarding the inspections on safety management (Inspectorate's Guideline R-17 "Organisation of NPPs").

In the Periodic Safety Reviews, the plants have to do a self-assessment of the performance of their QM systems. This self-assessment is reviewed by The Inspectorate.

The last two questions are answered together with Seq. No 54.

Seq. No 50	Article 13	Ref. in National Report
Question/ Comment	What is the reason for not implementing the aspects of ISO 14001 at the Leibstadt NPP quality management?	
Answer	They are in preparation for the certification 2005/2006.	

Seq. No 51	Article 13	Ref. in National Report
Question/ Comment	It is stated in the report that all QA-Systems are acknowledged by the inspectorate. What procedures are implemented according the acknowledgement and to which standards the acknowledgement is performed?	
Answer	See answer to Seq. No 49.	

Seq. No 52	Article 13	Ref. in National Report: p. 38
Question/ Comment	Could Switzerland provide some examples of performance indicators actually used to assess the Inspectorate QM system?	

Answer	Here are some typical examples: Process Management: Degree of financing Receipts / expenses [measured in %] Process Human Resources: Training level of staff members Number of training days per year per person [days] Process Project Co-ordination: Reports are issued on time Delay of issuing according to planning [days] Process Inspection and Licensing: Inspection Performance Number of Inspections according to planning [number] Process Statements: Imposed measures are implemented Measures implemented correctly and on time [%] Process Radiation measurement: Radiation limits and threshold values are respected Number of exceeded radiation limits per year[number] Process Information & Logistics: IT System availability Operating time – system down time / total time [%] All indicators related to the performance mandate can be found at the FLAG homepage of the Swiss government (German or French): www.flag.admin.ch -> Aktuell/actualités -> FLAG Ämter/offices GMEB

Seq. No 53	Article 13	Ref. in National Report: p. 37-38
Question/ Comment	How does the HSK supervise the adequate performance of the utilities' QM systems?	
Answer	See answer to Seq. No 49.	

Seq. No 54	Article 13	Ref. in National Report: p.38
Question/ Comment	A quality management system has been established and implemented; the ISO 9001:2000 certificate was obtained in December 2001. It should be considered as a good practice. To provide further use of experience in other countries the questions are: What is your experience from the use of ISO 9001:2000 within regulatory authority? What are the main benefits from accreditation?	
Answer	The answer to Seq. No 54 and to the last two question of Seq. No 49. Inspectorate's experience with its certified management systems is very good. The management system helps to make the work more systematic, to keep a structured documentation and to steadily increase efficiency. New staff members have an	

excellent way to learn how the Inspectorate works. All these advantages are common to all management systems and not linked to the ISO certification. The advantage of an ISO certification is to demonstrate to the outside world, that the management system is in conformity with international standards and can therefore help to improve the confidence of the public.

The certification and renewal of the Inspectorate's Quality Management System is performed by the Swiss Association for Quality and Managements Systems (SQS). The certification process covers only formal aspects of the ISO Standard and not the outcomes of the internal audit process.

Seq. No 55	Article 14	Ref. in National Report: Clause (i), p. 42
Question/ Comment	It is clear that Switzerland has a strong program in connection with probabilistic assessments. Regarding the PSAs performed, Were carried out independent reviews (such as IAEA IPSAT missions) in addition to the regulatory review?	
Answer	The regulatory reviews and the development of the related review guidance documents are substantially supported by foreign consultants with broad knowledge of international PSA standards and practices. In addition to the regulatory reviews, IAEA reviews of licensee PSAs have been performed in two cases. In one instance, a fire PSA was reviewed on HSKs request. In the other case a general review of the full PSA study was ordered by the licensee.	

Seq. No 56	Article 14	Ref. in National Report: Clause (i), p. 43
Question/ Comment	The Inspectorate has prepared its own guideline concerning ASPs, scheduled to be issued in 2004. In this guideline, the Inspectorate presents the way it assesses the appropriateness of the NPP's ASPs. What are the main aspects covering by such guideline?	
Answer	The Inspectorate's Guideline R-51/d "Ageing Surveillance of Mechanical and Electrical Equipment and Civil Structures in Nuclear Installations" was issued in November 2004. The basic aspects of the Guideline show the way in which the Inspectorate assesses the manner by which the NPP operators approach their tasks regarding their ageing surveillance programmes. The Guideline covers safety-relevant systems, structures and components (SSCs). The ASPs are based on plant-specific dossiers relating to all relevant SSCs. The ageing mechanisms of the given structures and components, relative to their operating conditions and media are identified, based on experience and scientific knowledge. Existing methods of ageing surveillance and their applications are evaluated with respect to their effectiveness to detect possible ageing mechanisms in time so that ageing damage does not influence the safe operation of the nuclear installation. If necessary supplementary measures of ageing surveillance including preventive maintenance have to be carried out.	

Seq. No 57	Article 14	Ref. in National Report: Clause (i), p. 43-44
Question/ Comment	It is stated that plant-specific ASPs provide a systematic and knowledge-based approach to monitoring ageing in NPPs. It is, however, also necessary to follow NPP experiences worldwide, and to check for any potential generic problems or to implement best practices as the state of knowledge evolves. How the Inspectorate control the properly application of ASP?	
Answer	According to the Inspectorate's Guideline R-51 the plant operators have to present their ASP-documentation to Inspectorate. The Inspectorate reviews the ASP-documentation and forms an opinion by using other knowledge bases such as international experience and research, inspection results and meetings with plant operators.	

Seq. No 58	Article 14	Ref. in National Report, Clause (i), p. 44
Question/ Comment	The Inspectorate has reviewed and approved the current plant-specific dossiers concerning the ASPs for Safety Class 1 SSCs and has found them to be practically complete. For the Safety Class 2 SSCs, some minor aspects remain to be approved. Could Switzerland indicate why some the minor aspects remaining to be approved ?	
Answer	The Inspectorate's Guideline R-51 gives instructions regarding the extent all classified, safety and risk relevant systems, structures, and components have to be dealt with in the ASP. Risk relevance of components is evaluated by using the results of Probabilistic Safety Analysis (PSA). The existing ASP-documentation already satisfies virtually all of these requirements. A completed detailed documentation now has to be provided for the primary pressure retaining boundary, for core internals and for the containment system. Selection criteria apply for the other systems and components, including minor aspects of the treatment of Safety Class 2 and other safety-relevant systems, structures and components (SCCs). Since safety is, and remains, a priority, Safety Class 1 SSCs were first dealt with in the ASPs. Safety Class 2 and other SSCs may be replaceable, even if severely degraded through operation.	

Seq. No 59	Article 14	Ref. in National Report: Clause (ii), p. 48
Question/ Comment	The approach the regulatory activities are more focused on the impact of their work and less on the output of the work. It helps to focus regulator's activities on the key and safety relevant aspects. At the same time it forces the regulator to have a questioning attitude towards its own work in respect to safety. Could Switzerland provides more details of the integrated oversight approach that is being developed by the Inspectorate. How do you focus the impact of the regulatory activities on the safety of the nuclear installation?	
Answer	The integrated oversight approach has been developed on already existing elements and supporting ideas. To put it into concrete terms, existing elements of the Inspectorate's Management System, the New Public Management concept of the Swiss administration, the CNRA-Task-Group on Regulatory Effectiveness	

and the risk-informed oversight were combined and summarized in a comprehensive manner.

The key elements of the Integrated Oversight are effectiveness, balance and traceability:

- Effectiveness - Control Loop: Effective oversight is guaranteed by using control loops and by consistently enforcing and monitoring requirements. Based on the New Public Management effect model, oversight effectiveness is determined by a set of safety indicators.
- Balance - Requirements: Oversight takes into account all the safety aspects of an installation. Apart from deterministic and probabilistic factors, also operational aspects, maintenance and organisation, should be considered. Oversight concentrates on key aspects. The safety requirements and the level of supervision will be reviewed periodically and adjusted if necessary.
- Traceability - Decision Making Process: A consistent and comprehensive oversight plan and set of regulations are applied. A standardised decision making procedure is followed and resulting measures are transparent and comprehensible. Decisions are based on indicators and on the associated decision criteria.

The elements summarized in the Integrated Oversight are basically not new. Most of the elements of the Integrated Oversight are already used in practice. In order to fully implement the Integrated Oversight, Inspectorate's regulations in particular will need to be completed and regularly updated. This is the only way to ensure that decisions are perceived as transparent and comprehensible by external parties.

Seq. No 60	Article 14	Ref. in National Report
Question/ Comment	In which Swiss NPPs is living PSA not yet implemented, and what are the plans (if any) for implementing living PSA in these units in the future?	
Answer	The living PSA process is implemented in all NPPs as of January 2005. The process requires periodic updates of the PSA study (a) every ten years, to account for developments of PSA methodologies, (b) every five years, to account for plant changes and new data, and (c) every year, to account for plant changes with substantial risk significance. In addition, all potentially PSA relevant plant changes are continuously documented together with a rough estimate of their risk impact. The whole process is embodied in a licensee procedure.	

Seq. No 61	Article 14	Ref. in National Report
Question/ Comment	The Report mentions that concerning PSA low power and shutdown modes are considered in the level 1 analyses only. Why are low power and shutdown modes not considered in the PSA level 2 analyses?	
Answer	PSA in general, and in particular the aspect of considering low power and shutdown modes in the PSA level 2 analyses, has matured in recent years.	

According to international experience, this particular aspect is now considered state-of-the-art. In Switzerland it is legally required since January 2005 (Nuclear Energy Ordinance, Appendix 3, Section 2). The specific scope of the PSA level 2 analyses for low power and shutdown modes is currently under discussion.

Seq. No 62	Article 14	Ref. in National Report
Question/ Comment	How are trend analyses currently performed? What are the experiences with the trend analyses? How will the results of trend analyses be used for the development in nuclear safety e.g. improvement of the regulatory framework?	
Answer	Upon Inspectorate's request, Austria elaborated their question as follows (E-mail March 3, 2005): "On page 48 of the Swiss national report an "assessment of the future safety status [which] must be included in the PSR" is mentioned. In this context also "trend analyses" which "may be used" are mentioned. There is no further information about the implementation or the performance of these trend analyses. Austria is interested to see the Swiss (especially Inspectorate´s) answer to this question, as we do not see a necessary linkage between trend analysis and risk/safety. Of course also the difference between time dependent developments (trend analyses) and developments independent of time (like PSA) would be of interest, especially as regards their respective regulatory assessment." Trend analyses are used primarily by the licensees to monitor and improve nuclear safety-related plant parameters. Those parameters include the performance of components and systems as well as the conditions of components and structures with respect to monitored degradation and ageing mechanisms. Licensees are required to assess the safety-significance of trends and to periodically report their findings, as well as possible corrective actions derived from those findings, to the Inspectorate ("systematic safety assessments and subsequent controls", KEG 22/2/d-f). The Inspectorate uses the information reported by the licensee for its annual safety assessments as well as for its periodic safety reviews for nuclear power plants which take place every 10 years. We can see two ways in which trending is relevant to risk and safety. Firstly, trending of safety-relevant plant parameters and equipment condition can help the licensee take corrective action before a safety concern becomes acute or an incident occurs. Second, as Austria correctly points out, PSA and other safety-assessment tools do not always explicitly take into account time-dependent mechanisms such as component fatigue, degradation or ageing. However, PSA models can be used (and are, in fact, used) to perform sensitivity studies in order to estimate the impact of such mechanisms on risk. Those sensitivity studies are typically based on component and equipment performance trends.	

Seq. No 63	Article 14	Ref. in National Report: p. 6

Question/ Comment	A plant review has to be carried out after each refuelling outage Further on pages 40-48 you describe activities uder assessment and verification, but concept "plant review" was not used. What is a scope for plant review and what importance this activity has among others in review and assessment system?
Answer	Refuelling and outage activities are described on page 45 of the Swiss Report. These activities are also on page 6 identified as "a plant review carried out after each refuelling outage".

Seq. No 64	Article 14.1	Ref. in National Report: p. 41

Question/ Comment	The section on “Review and Assessment of Safety Analyses” mentions the following on p. 41: “… existing installations, for which a renewal of the license is necessary from time to time (Beznau unit II and Mühleberg), …”. This suggests that those two plants have a different type of license than the other units (other period of validity, …?). Is this correct? If yes, what is the reason for this difference? What are the implications?
Answer	The licensing authorities can reprieve an operating license by virtue of Nuclear Energy Act Article 21. This possibility existed already under the atomic energy act and was used twice, in 1971 for the Beznau unit II operated by NOK and in 1972 for the Mühleberg operated by BKW. Both reprievals were motivated by concerns about the effectiveness of the emergency core cooling systems (ECCS) in light water reactors raised in late 1971 in the United States. (Note that the technically identical unit I of Beznau, commissioned in 1970 and thus before the ECCS concerns were raised, received an unlimited operating license from the beginning of its operation. Even after successful technical resolution of the mentioned concerns, and despite repeated applications by both utilities for an unlimited license, the reprievals were maintained for political reasons. On December 3. 2004, NOK finally received an unlimited license for Beznau unit II from the Federal Council. BKW's application is still pending and thus at the time of reporting, the Mühleberg NPP is the only Swiss nuclear installation still operating on a license limited in time. All NPPs must comply with the same safety standards, regardless of the duration of the licenses. In particular, every 10 years, they must undergo a periodic safety review as required by Nuclear Energy Act Article 22/2/e, which involves an expert report by the safety inspectorate. NPPs with a limited license must apply for license renewal according to the same procedure as for the issue of the license. This procedure too involves an expert report by the safety authority. There is thus no safety implications related to the validity of the license. The implications are legal/procedural only.

Seq. No 65	Article 14.1	Ref. in National Report: p. 42
Question/ Comment	Switzerland indicates that a PSA is required and performed for the different plants. Could Switzerland indicate if there are required Probabilistic Safety Goals to be complied with?	
Answer	For new NPPs, the Swiss legislation (Article 24 I b Nuclear Energy Ordinance) that became effective in January 2005 requires an upper limit CDF of 10-5 per year for the total contribution of internal and external events. For existing NPPs, this Safety Goal only applies if it is reasonably achievable. According to the legislation (Article 82 Nuclear Energy Ordinance), the licensee of an existing NPP has to implement all backfitting measures that are necessary according to the experience and to the "state of the backfitting technology". Furthermore, he has to implement backfittings to the extent that (a) leads to an additional risk reduction and (b) is adequate.	

Seq. No 66	Article 14.1	Ref. in National Report: p. 40
Question/ Comment	Is the current “living PSA” practice sufficient for “risk-informed” applications as for example for modification of maintenance and testing? Which experience has been made with the pilot projects mentioned on page 73?	
Answer	PSA results are one of the fundamental elements that constitute the basis of HSK's Integrated Oversight Process. In general, the current "living PSA" practice is adequate to serve this purpose. In particular, it is adequate, e.g., to support justifying the modification of maintenance and testing procedures. The Swiss PSA practice will be further harmonized by a PSA quality guideline currently under development. Two pilot studies have been performed in the field of risk informed in-service inspection. Both studies confirmed that consideration of PSA insights leads to a broader technical basis for redefining the current in-service inspection programmes. Depending on the methodology applied, the existing PSA model has to be reviewed in order to make sure that all in-service inspection specific issues (e.g. indirect effects of pipe ruptures, risk impact of different piping segments) are properly addressed.	

Seq. No 67	Article 14.1	Ref. in National Report: p. 42
Question/ Comment	How has sump clogging been modelled in the full-power PSAs?	
Answer	Sump clogging is modelled as single as well as multiple (common cause) failure of suction strainers. As an example, in one plant a risk reduction of approximately 25% was achieved as a result of suction strainer backfits.	

Seq. No 68	Article 14.1	Ref. in National Report: p. 43
Question/ Comment	Which operating phases and related initiating events have been analysed in the low-power and shutdown PSAs?	

Answer	All relevant internal and external events (fire, flood, earthquake, aircraft crash, wind, etc.) are analyzed in the low-power and shutdown PSAs. For each full power and shutdown PSA more than 100 initiating events are considered.

Seq. No 69	Article 14.1	Ref. in National Report: p. 44
Question/ Comment	It is said that the SAR shall correspond to the current licensing basis. What is the relation between the PSR documentation and the updating of the SAR?	
Answer	The SAR is a part of the licensee's PSR documentation. It is the basic document for the description of the safety concept of the plant and must correspond to the plant state of the PSR deadline. Otherwise, the SAR has to be checked for correctness every year and has to be updated in time intervals of not more than 4 years. In general, the detailed regulatory PSR documentation, and the detailed regulatory findings of a PSR do not influence the updating of the SAR. However, if the regulatory evaluation of the PSR leads to a plant modification, the SAR has to be modified after the backfitting has been performed.	

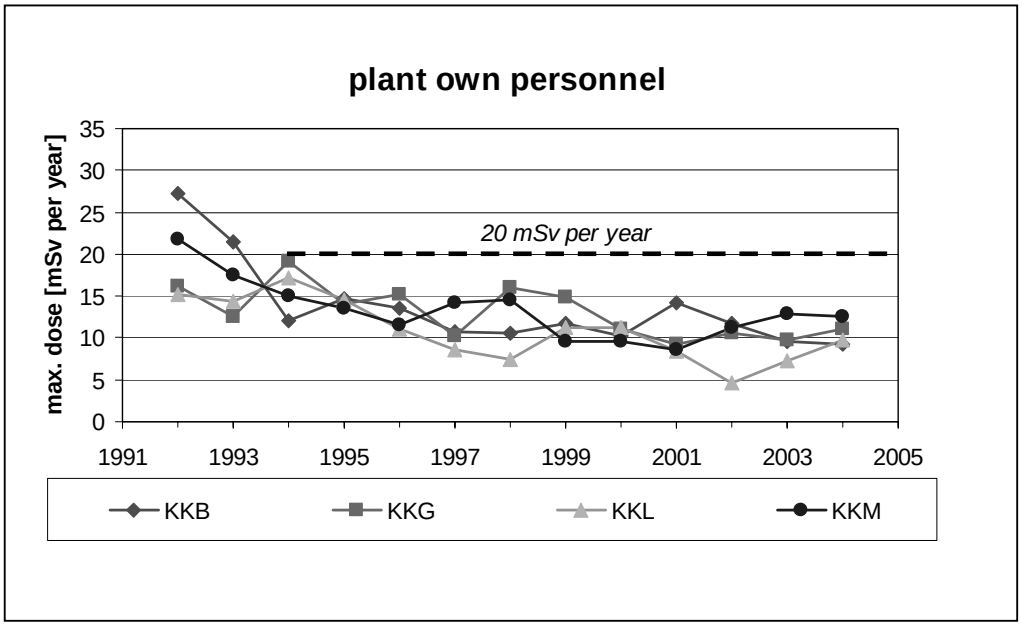
Seq. No 70	Article 14.2	Ref. in National Report: p. 46
Question/ Comment	The section on “Inspection, reporting and information meetings” mentions the following on p. 46: “… The inspection intervals suggested in the BIP are based on … public interest issues …” Can you clarify how public interest issues are taken into account in determining inspection intervals? Can examples be given of such issues and of their impact on the inspection intervals?	
Answer	The Inspectorate also supervises the transport of radioactive materials. According to the associated risk, only spot check inspections were conducted. However, due to the public reaction concerned with the occurrence of radioactive contaminated transport equipments, the political meaning changed. Since that time, the public attention has increased, and the Inspectorate has correspondingly increased the frequency of its inspections concerned with radioactive materials transport.	

Seq. No 71	Article 14.2	Ref. in National Report: p. 46
Question/ Comment	In this Chapter reinforcement of brick walls was mentioned. Please explain reasons leading to this action – have the walls been found lacking in required seismic resistance or has the seismic hazard been re-evaluated (seismic is mentioned again on p. 67, but without reference to this specific measure)?	
Answer	These masonry walls have been found lacking in seismic resistance. The walls were identified as a result of a seismic PSA review walkdown conducted in 1997. Essentially, the walls served as fire barriers. They had a low seismic capacity and were not intended to be part of the seismic design of the building. However, in some instances cable trays with safety relevant cables were mounted on the walls or safety relevant equipment was located next to the walls.	

Seq. No 72	Article 15	Ref. in National Report: p. 49
Question/ Comment	The Radiological Protection Ordinance was reviewed on October 2001 introducing minor improvements. Could Switzerland indicate what are such minor improvements introduced?	
Answer	When the new law concerning medicinal substances came into force in October 2001, certain changes to earlier practices were evident. In particular, section 3 "Particular requirements for radio-pharmaceuticals" of the radiation protection ordinance. The resulting changes were basically administrative in nature. Three examples are given below: - By clinical tests with radio-pharmaceuticals, it now cites application of a new ordinance on clinical trials with medicines. - The announcement of clinical tests with radio-pharmaceuticals has now to be done at the Swiss Medicine Institute instead of the Federal Office of Public Health (BAG). - The Swiss Medicine Institute is the named approval authority for radio-pharmaceuticals and not any more the BAG. However, an agreement with the BAG is still necessary for an approval.	

Seq. No 73	Article 15	Ref. in National Report: p. 51
Question/ Comment	The report mentions the average dose received by the plant personnel and contractors (p. 51 and Figure 5 p. 52) and shows their decreasing trend with the year. However there is no figure about the maximum dose received by a worker, which is an other indicator useful to check that radiation exposure is kept to the minimum. Could Switzerland provide some indication bout these maximum doses during the review period?	
Answer	The highest maximum annual individual dose of the last ten years received in Swiss nuclear facilities was 17.0 mSv per year (2004 NPP Leibstadt). The reason for this value was a lot of work on fittings with high dose rates in the shutdown phase in 2004, which could only be done by a small number of specialists. There was nobody, whose annual dose exceeded the individual dose limit of 20 mSv per year for occupational exposure since 1994, when the Radiological Protection Ordinance came into force. The figure, which you find in the Appendix to the answer shows the chronological trend of maximum annual doses per facility separated for plant own personnel and for external personnel.	

Appendix:



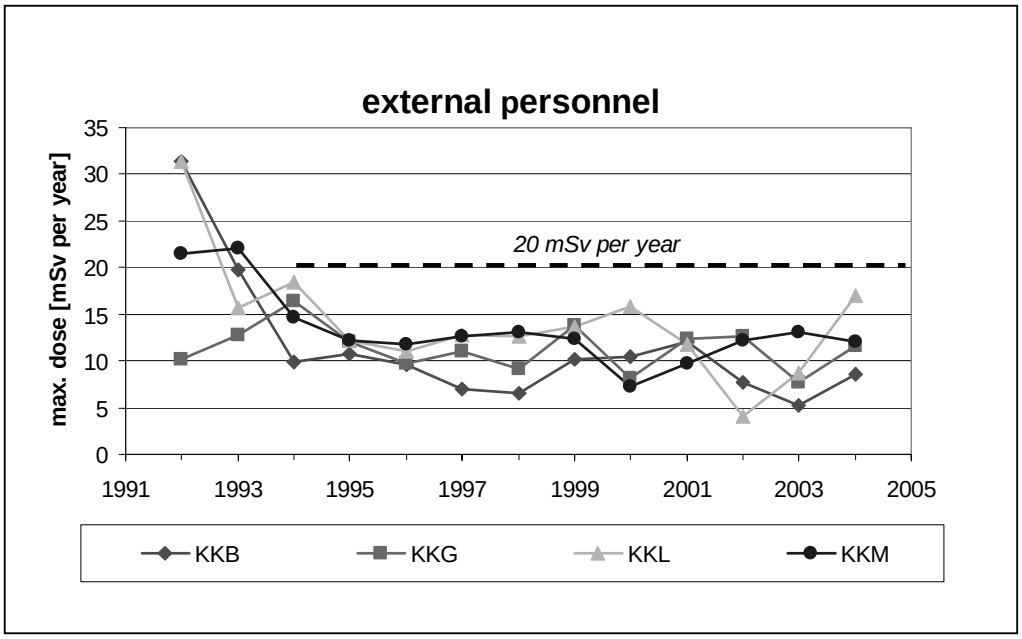


Figure: The chronological trend of maximum annual doses per facility separated for plant own personnel and for external personnel.

Legend: KKB = NPP Beznau KKM= NPP Mühleberg
KKG = NPP Gösgen KKL = NPP Leibstadt

Seq. No 74	Article 16	Ref. in National Report: Clause (i) p. 56
Question/ Comment	The population in the vicinity of the Swiss NPPs has received a leaflet from the cantonal authorities describing possible dangers associated with a nuclear accident and explaining the prepared countermeasures to cope with the consequences. Could Switzerland provide detailed information about the participation of the NPPs neighbour population during the emergency exercises and the dissemination of information to the population?	
Answer	The leaflet has the function to give information on radiation protection and emergency planning in the preparatory phase. In an accident situation, the population is ordered by a short message via radio, after the sirens have been triggered, to go to defined shelter areas and to take iodine (i.e. potassium iodide) tablets. Participation of the population in emergency exercises is not foreseen. Every two years a combined exercise takes place, in which the co-operation between the different emergency organisations on federal, cantonal and community level is exercised and practiced.	

Seq. No 75	Article 16	Ref. in National Report
Question/ Comment	Australia notes the comprehensive emergency plans and organisations. In the event of an emergency with off-site consequences, the National Emergency Operation Centre (NEOC) has operational control and authority. Under Article 8 it is stated that NEOC has no authority over the NPPs. What role does the NEOC have in the formulation of NPP on-site emergency plans and in the control of on-site activities in an emergency?	
Answer	The on-site emergency plans must be approved by the Inspectorate, which has also the role of surveillance of the on-site management of the accident and has to advise the National Emergency Operation Centre (NEOC). The NEOC has no responsibility on-site.	

Seq. No 76	Article 16	Ref. in National Report
Question/ Comment	What is the expected schedule for implementation for SAMGs for low power and shutdown operations for Swiss NPPs?	
Answer	The expected schedule for the non-power SAMG implementation is as follows: NPP Beznau: June 2005 NPP Goesgen: May 2005 NPP Leibstadt: not yet decided, probably end of 2005 NPP Mühleberg: not yet decided, probably end of 2005	

Seq. No 77	Article 16	Ref. in National Report
Question/ Comment	What is the time schedule for the implementation of the SAMG at Gösgen NPP?	
Answer	The expected schedule for the full-power and the non-power/shutdown SAMG implementation is at NPP Goesgen in May 2005.	

Seq. No 78	Article 16	Ref. in National Report
Question/ Comment	Is the off site emergency planning in Switzerland considering insights of probabilistic evaluation of accidents sequences and expected release categories? Are you prepared to share those information with your neighbouring states in order to enable optimization of their (i.e. neighbour's) emergency preparedness for nuclear accidents?	
Answer	Results from probabilistic safety studies have been used for off-site emergency planning in Switzerland since the early 1980's, when reference accident source terms were defined based on the Reactor Safety Study WASH-1400. Starting from the early 1990's, plant-specific probabilistic safety studies for the Swiss nuclear power plants have resulted in revised reference accident source terms. The latest source terms used for emergency planning are based on the most recent information from probabilistic safety studies. The basic principles of emergency planning in Switzerland are contained in the KomABC (Commission for ABC-Protection) concept paper from March 1998 "Concept for the Emergency Protection in the Vicinity of Nuclear Power Plants". For emergency planning, different types of accident scenarios are needed to ensure that the emergency organisation can fulfil its duty in an accident situation. However, for each plant there are many possible accident sequences. A specific planning for each sequence is not achievable and is also not meaningful. Therefore a limited number of typical accident scenarios, with corresponding reference source terms, are needed. Within this context IAEA Safety Series 109 states: *"Intervention Criteria in a Nuclear or Radiation Emergency" Paragraph 206....."These consequences will be specific to each type of accident, in both nature und degree, and there is unlikely to be a unique accident sequence upon which to base emergency response plans..... For planning purposes, accident scenarios should therefore be considered that cover a wide range, from those which are unlikely to require off-site action, or for which the off-site consequences are expected to be minor, to those having significant consequences off the site..... The level of detail of such planning should correspond to the probability of occurrence, to avoid the wastage of resources."* To cover a wide range of possible accident sequences the following three representative scenarios have been defined as a basis for emergency planning in Switzerland: - Accidents without core damage. - Accidents with core damage and correct functioning of the containment and the filtered venting system.	

- Accidents with core damage and without correct functioning of the containment.

These reference scenarios include the most probable accident sequences that could lead to significant off-site consequences. Extreme scenarios with a very low probability of occurrence and with large potential off-site consequences are not explicitly included in the planning (e.g. severe earthquakes, massive containment by-pass sequences etc.). Nevertheless, emergency preparedness based on the above- mentioned reference scenarios would still allow mitigation of off-site consequences even for these worst-case scenarios.

Information exchange on this topic is possible within the framework of the established bilateral contacts with the neighbouring countries.

Seq. No 79	Article 16	Ref. in National Report
Question/ Comment	Apart from the notification of an accident as required by the Convention on Early notification will the Swiss emergency authorities and/or NPPs in Switzerland be able to provide estimates of expected source term before the release (i.e. during an accident, when a release becomes imminent) as well as actual source term and the local weather data at the time of release?	
Answer	The NPP-staff (radiation protection officer) and the Inspectorate's emergency organisation have procedures to estimate the possible source term from actual plant data. Release data at the stack and meteorological data are transmitted on-line to the Inspectorate, which is also responsible for atmospheric dispersion and dose calculations within the EPZ 1+2 (20 km). As an example, the dose-rate inside the containment gives an indication of the total amount of radioactivity inside the containment and therefore also an estimation of the maximum source term, if the containment fails.	

Seq. No 80	Article 16	Ref. in National Report
Question/ Comment	In case of emergency it is necessary to have an exact information of the radiation outside the NPPs to take appropriate emergency measures. Has a radiation monitoring network been established over the whole of Switzerland? How are the acquired data used for emergency response and planning regarding also neighbouring states?	
Answer	In Switzerland 3 permanent monitoring networks are installed: - NADAM: With 58 dose-rate monitoring stations covering the whole of Switzerland. - MADUK: With 15 additional dose-rate monitoring stations surrounding each Nuclear Power Plant (up to about 5 km). - RADAIR: With 10 stations, measuring the Alpha and Beta activity in the air (3 stations also with iodine-monitoring). For all stations an alert level was set. Should the actually measured level of radioactivity be reaching the defined alert level, the alert will be actively communicated to the NEOC and moreover the NEOC always has direct access to	

the online data.

In the environment of the Nuclear Power Plants Leibstadt and Beznau (near the border to Germany) the Swiss MADUK and the German KFÜ (dose-rate monitoring system) are linked together.

The actual dose rate values of the MADUK monitoring stations are shown on the Inspectorate's homepage (in the German language). (http://www.hsk.ch/deutsch/messen/start6.htm).

Seq. No 81	Article 16.1	Ref. in National Report: p. 60, line 28

Question/ Comment: Concerning the siren alert issuance, it was described that "This action is announced by the plant operator and the alert is initiated by the regional public authority ", this procedure seems very practical one.

Could you explain about the procedure in detail? We presume some communication route between plant operator and regional public authority must be standing and some exercise must be practiced.

Answer: In an accident situation with no or only a very short (<1 hour) pre-release phase, the plant operator has to alert the police stations, which are manned 24 hours a day and are able to initiate the alert of the public within the EPZ 1 (up to about 5 km) and to disseminate the first countermeasures, namely to stay at home/indoors.

The procedures are set in accordance with the National Emergency Operation Centre (NEOC) and are tested in emergency exercises.

The content of the information given by radio is predetermined and fixed at the police stations. The police have only to add the time of the accident.

Seq. No 82	Article 16.1	Ref. in National Report: p. 59

Question/ Comment: Do the intervention levels quoted in the Table 3 on the page 59 assume any duration of the protective measure?

Answer: Derived intervention levels are available and will be used in an accident situation:

- For the cloud passage.
- For the dose-rate immediately after the cloud passage.

As an example: if the dose integrated over the cloud passage is larger than 1 mSv then "stay in the house"; if the dose is larger than 10 mSv then "go to shelter". The total cloud passage dose can be estimated from the activity inside the containment.

If, after the plume passage, the dose-rate from the ground is less than 5 microSv/h, the integrated dose over the first year will be less than 1 mSv so that all (external) restrictions can be cancelled. Restriction for food will be determined by direct measurement of the activity concentration in the food.

Note: The reference level doses are set up for an exposure time of 1 year (integration for inhalation and ingestion is 50 years).

Seq. No 83	Article 17.1	Ref. in National Report: p. 63

Question/ Comment: Could Switzerland give more details about "additional requirements on the design of the plant", resulting of the evaluation of all relevant site factors likely to affect the safety of the nuclear installations?

Answer: The text states "if necessary". We have two examples:

1. Earthquake: The seismic design of the first generation plants (Beznau and Mühleberg) was based on deterministic criteria. A re-evaluation of the earthquake hazard in Switzerland was done in the late 1970's, resulting in higher accelerations and a safe shut-down earthquake with an occurrence frequency of 10-4/year. A further re-evaluation of the site-specific earthquake hazard is currently underway as indicated in Art. 17.iii.
2. Aircraft crash: For the first generation plants (Beznau and Mühleberg) an evaluation of the protection against an aircraft crash was done in the 1980's. The requirement was that the plant concerned had an adequate debris protection. In this context, the first generation plants were backfitted against different external events (see Art. 6). A second evaluation of the protection against an aircraft crash was done for all plants after the terrorist attacks of 2001/9/11. Results are provided in the answer to Seq. No 85.

Seq. No 84	Article 17.3	Ref. in National Report: p. 64

Question/ Comment: Considering the reassessment of seismic hazards:
What are the preliminary results mentioned that initiated the technical review?
Which are the key technical issues to be treated in the site specific aspects?

Answer: The probabilistic seismic hazard analysis project that had jointly been sponsored by the licensees of the Swiss NPPs under the name PEGASOS ("Probabilistische Erdbebengefährdungsanalyse für die KKW-Standorte in der Schweiz") was completed in 2004. For the time being, the results of this project are referred to as preliminary. During the course of the project, the licensees had chosen a strict hands-off approach in order not to challenge the independence of the many experts involved in PEGASOS. The licensees are now conducting their own review in order to be able to consider the results in the plant specific safety analyses.

The key technical issues treated in the site-specific reassessment of seismic hazard for each NPP include probabilistic characterizations and evaluations of (i) seismic sources, (ii) seismic wave propagation through rock, and (iii) seismic response of site soil deposits.

Seq. No 85	Article 18	Ref. in National Report

Question/ Comment: The Report states that the first generation NPPs provide an "appropriate level of protection against aircraft impact". Does the "appropriate level" of the first generation NPPs comply with the level of protection of the second generation NPPs? Are further measures planned for the first generation NPPs to mitigate the consequences to terrorist attacks to converge the safety status to that of the newer build NPPs?

Answer: After the September 11, 2001 terrorist attacks, the Swiss utilities performed a detailed analysis of the consequences of an intentional aircraft crash on one of the Swiss NPPs. A summary report of the main insights have been published by the Inspectorate and is available on its website under http://www.hsk.ch/english/-start.php. The main insights gained from the study were:

- In order to generate local penetration of the reactor building, the impact must occur at an increased to high speed. With increasing speed, however, it becomes more difficult to strike the reactor building at a specific point so that massive damage occurs. This applies in particular to the Mühleberg plant which is embedded in a valley and can hardly be hit precisely at a specific point by a commercial aircraft at high velocities because of the surrounding hills.
- Since all Swiss nuclear power plants have autonomous, bunkered emergency systems, they possess a very high safety level when viewed on a worldwide basis. These additional safety systems also increase the degree of protection in the event of an intentional aircraft crash.
- The newer Swiss nuclear power plants, Gösgen and Leibstadt, are so well protected against an impact at all velocities considered that a penetration of the reactor building is not possible. Both plants thus offer complete protection against an impact. The probabilistic analyses using different possible aircraft types and impact velocities show that the probability of release of radioactivity following an aircraft crash is very low.
- For the older Swiss nuclear power plants Beznau and Mühleberg it was proven that the resistance of the reactor buildings against an aircraft crash is such that they meet the protection goals against an accidental aircraft crash such as was required for the design of the newer plants. In addition, further safety reserves exist for the reactor buildings of both plants.
- The operator of Beznau showed that the plant possesses complete protection at medium and increased velocities. The reactor building of Mühleberg possesses complete protection against penetration at medium velocities. Thanks to massive internal structures there is a high degree of protection against damage to the systems relevant for core cooling even in the event of penetration of the outer building.
- The analyses of the operators of the nuclear power plants Beznau and Mühleberg showed that the probability of release of radioactive material into the surroundings following an intentional aircraft crash is low.
- Improvement measures to further limit the effects of a fire must still be clarified or implemented. The Inspectorate has already commissioned the operators to do this.

Seq. No 86	Article 18	Ref. in National Report
Question/ Comment	For the ergonomic improvements of the control rooms there had to be made analyses in the field of ergonomics. Had analyses of the control rooms of all NPPs been performed? Which are the results of the two not improved NPPs? What improvement measures for the not yet improved control rooms are planned and how is the time schedule?	
Answer	Since the very beginning, all Swiss NPPs have well established concepts for the design of their control rooms. All plants reviewed the arrangement of working places (by considering the needs for the different activities), the illumination and the ventilation in the control rooms. Controls and instrumentations (control panels) were not affected by these modifications. In the context of operator support systems, replacement of old equipment and the introduction of new procedures, smaller modifications on the control panels were and still are performed by all plants. Ergonomic aspects are investigated by the installation, and validations of such modifications are performed at the simulator prior to implementing them at the plant.	

Seq. No 87	Article 18.1	Ref. in National Report: p. 68
Question/ Comment	The last paragraph discusses analyses of the safety for the case of a deliberate aircraft impact. Please explain the type and the level of analysis required (only PSA analysis or a deterministic methodology as described in DOE-STD-3014-96 or something else…).	
Answer	The design basis against an aircraft impact is given in Inspectorate's Guideline R-102 (see Inspectorate's webside http://www.hsk.ch/english/start.php). The basis for the design loads is the impact of a Boeing 707 with a residual fuel level and an impact velocity of 370 km/h. The Reg. Guide is currently under revision. For more details regarding the analysis performed by the Swiss utilities after the September 11, 2001 terrorist attack see the answer to the question 85 above.	

Seq. No 88	Article 19.1	Ref. in National Report: p. 71
Question/ Comment	Could Switzerland explain the main reasons that led to grant a step-by-step permit for the power uprate of the Leibstadt NPP?	
Answer	The step-by-step approach of the power up-rate would have allowed finding any problem at an early state after the start of the power up-rate. Another important aspect was the optimization of the different control systems. The power up-rate was implemented in 4 discrete steps, each step corresponding to a higher power level. At each step/power level a test and monitoring programme was required to assure that the plant behaviour was as expected. The various tests at each step (including non-safety related testing) are shown in the	

following Table.

Table: Incremental power up-rate process at NPP Leibstadt (KKL)

System/Test	Test Goal	1996 100 %	1998 106 %	1999 109 %	2000 112 %	2002 114.7%
Separator/Dryer	Performance				X	
Pressure controller	Performance, back-up controller	X	X	X	X	X
Feedwater controller	Level control	X		X		X
Feedwater pump trip	No scram	X		X		
Feedwater run-out	Maximum capacity	X	X			
Turbine control valves	no by-pass	X		X		X
Level controller	Level control	X	X	X	X	X
Turbine trip	No scram			X		X
Load reject	No scram	X	X			
Recirculation control	Performance	X		X		
Trip of one recirculation pump	No scram	X				
Trip of both recirculation pumps	Partial scram, stability performance	X		X		
(In)stability	Verification of exclusion regions					X

Also, prior to the next step, satisfactory plant operational (including fuel) performance during at least 6 months was required by the Inspectorate.

In general, the process of power up-rate implementation has been satisfactory; the testing was successfully completed, and no safety related operational problems were encountered during any of the up-rate phases.

Details on the power up-rate process are described in the paper "*Approach to Regulatory Assessment of Power Up-rates and Safety Margins*" by W. van Doesburg, U. Schmocker and M. Khatib-Rahbar, presented at the technical meeting on the "implications of power up-rates on safety margins of nuclear power plants," International Atomic Energy Agency (IAEA) 13 – 5 October 2003.

Seq. No 89	Article 19.3	Ref. in National Report: p. 73
Question/ Comment	Could Switzerland provide more information on the pilot projects concerning the field of in-service testing?	

Answer Two pilot projects on risk-informed in-service inspection have been carried out in two NPP's for specific scopes of Class 1 piping systems. One project concentrated on the full Class 1 scope of a PWR-Plant, making use of the so called WOG method. In the other project, a limited scope of Class 1 piping of a BWR-Plant has been assessed using the EPRI method. The driving force on the utilities' side was cost reduction in in-service inspection. The results out of both pilot projects did not lead to the cost reduction potential expected, mainly because the Swiss regulations for in-service inspection deviate from ASME Code Section XI. Contrary to the statement in the report, the Inspectorate did not assess the pilot projects, but was acting as an observer. Up to now, no official application to introduce risk-informed methods for in-service inspection has been received. Inspection programs are still based on the existing Guideline NE-14.