STATE OFFICE FOR NUCLEAR SAFETY

PRAGUE, CZECH REPUBLIC

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FOREWORD

The basic objective of all SÚJB activities is to protect an individual, population and the environment in all areas related to utilisation of nuclear energy and radiation practices. By carrying out State administration and supervision, the SÚJB contributes to enhancement of nuclear safety and reduction of radiological risks, it regulates exposures, ant takes part in prevention, limitation and mitigation of accidents with possible adverse ionising radiation effects. In 1999, similarly as before, the SÚJB effort was concentrated on achieving this basic purpose.

Results of its own inspections and evaluations allow the SÚJB to state that in 1999 the main requirements of nuclear safety and radiation protection were fulfilled not only by nuclear power plant Dukovany but also by other Czech nuclear facilities and workplaces with ionising radiation. None of nuclear facilities has met with serious failures resulting in such radioactivity release into the environment which would exceed the limiting values of occupational or public exposure.

Under the SÚJB supervision belongs also construction of nuclear power plant Temelín with two light-water reactors of VVER-1000 MW type. One of the SÚJB most significant tasks in 1999 was evaluation of the demonstrated safety and inspection of the plant preparedness for the commissioning.

The radiation set-up within the Czech Republic territory is continuously monitored by the National Radiation Monitoring Network. In 1999, the monitored contamination of the environment and food chain by artificial radionuclides did not increase. It is however necessary to point out that the number of emergencies did increase. However, this increase was in 90 % of the cases caused by significantly improved monitoring of radionuclide contamination in waste materials and scrap iron at the entries to iron works, incinerating facilities and at the border checkpoints.

In 1999, the SÚJB concentrated its effort on fulfilment of obligations following from the international agreements, on maintaining and extending contacts with the partner organisations, and on coordinating the international technical co-operation within its competence. The SÚJB participation in the process of the Czech Republic accession to the European Union was also a significant issue in its international co-operation activities.

We should acknowledge that all the SÚJB staff did their best to be frank and objective in informing the public on the Office activities, on the level of nuclear safety and radiation protection assurance, on events which had occurred, possible risks and on the related R&D results. Our objective is to look for and to find best tools for providing the general public with sufficient amount of understandable information which would enable to develop an rational opinion about nuclear safety issues and all activities relating to ionising radiation in our everyday life. Then, knowledgeable public can take an active part in deciding on power industry, protection of the environment, health care and other problems of our society into which nuclear safety and radiation protection issues somehow enter. I believe that the submitted Report will be a certain even if a small contribution to this area.

All mentioned activities were carried out on the background of significant organisational changes within the Office. So, concluding my foreword, I should like to use this opportunity to thank my predecessor, Mr. J. Štuller, for all that he had accomplished as the SÚJB Chairman and at the same time to wish him every success in his present work for the International Atomic Energy Agency.

Dana Drábová
SÚJB Chairman

INTRODUCTION

This report gives an overview of activities of the State Office for Nuclear Safety ("Státní úřad pro jadernou bezpečnost" – SÚJB) connected with the supervision of nuclear safety and radiation protection in the Czech Republic in 1999.

Major nuclear facilities currently in operation in the Czech Republic which come under the state supervision over nuclear safety and radiation protection are: 4 VVER 440/213 units of Dukovany NPP, two research reactors (LVR-15 reactor with maximum power of 15 MW and zero-power LR-0 reactor) at Nuclear Research Institute Řež, and school VR – 1P reactor of Czech Technical University in Prague.

Under supervision of the State Office for Nuclear Safety comes also construction of Temelín nuclear power plant (Temelín NPP) as to its nuclear safety and radiation protection issues. At the Temelín site inspection activities were focused mainly on the quality of construction and assembling, on the personnel training, reviewing of safety documentation and on the overall preparedness of the nuclear power plant for the commissioning and start-up.

The SÚJB also supervises the radioactive waste storage facility within the Dukovany NPP site, radioactive waste repository in "Richard" mine near town Litoměřice, interim spent fuel storage facility at Dukovany NPP and the high-level waste storage facility operated by Nuclear Research Institute Řež plc.

With respect to radiation protection the SÚJB is responsible for supervision of 7771 simple and significant ionising radiation generators, 5066 sealed radionuclide sources and 306 workplaces with unsealed simple and significant radionuclide sources.

In 1999, the SÚJB attention has been primarily focused on the safety assessment of nuclear facilities and on the assessment of the radiation protection level achieved in the Czech Republic. That was based on analyses of the documentation and information on the operation of the nuclear facilities and workplaces with ionising radiation sources as well as on results of its own inspections establishing compliance with the conditions and requirements set by the regulatory authority. Where analyses and inspections had shown that compliance was inadequate, the SÚJB specified requirements and conditions for continued operation of a facility or workplace concerned. Adequate attention was also paid to the assessment of physical security and protection of nuclear facilities and nuclear materials. Within its responsibility in the inspection regimes supporting the Treaty on Non-Proliferation of Nuclear Weapons (NPT), the SÚJB performed periodic inspections of nuclear materials and fulfilled other requirements following from the Czech Republic commitment under the safeguards application of the Agreement based on the NPT. Authorised by the Government, the SÚJB co-ordinated the Czech Republic participation in the 1st Evaluating Meeting of Parties to the Nuclear Safety Convention which took part in April in Vienna.

Based on the results of its activities, the SÚJB concludes that no serious failures causing radioactivity release to the environment and/or above-limit radiation endangerment of personnel and the public, or increase in the monitored contamination of components of the environment or the food chain by artificial radionuclides, compared with the preceding period, occurred in 1999.

No such shortcomings which would require suspension or withdrawal of a license granted by the SÚJB, were identified at any of nuclear facilities or workplaces under the SÚJB regulatory authority during the reported period.

On November 1, 1999, the Czech Republic government appointed Ms. Dana Drábová a Chairman of the SÚJB. Deputy Prime-Minister, Mr.. Pavel Mertlik, and Dana Drábová at the official ceremony

STATE OFFICE FOR NUCLEAR SAFETY

The State Office for Nuclear Safety is a central state administration body with its own budget. The SÚJB is headed by the SÚJB Chairman who is appointed by the Government of the Czech Republic.

The SÚJB performs the state administration and supervision of the utilisation of nuclear energy and ionising radiation and in the field of radiation protection. Under its authority, according to Act No. 18/1997 Coll., on Peaceful Utilisation of Nuclear Energy and Ionising Radiation (the Atomic Act), belong especially such issues as:

- State supervision of nuclear safety, nuclear items, physical protection, radiation protection and emergency preparedness on the premises of nuclear facilities or workplaces with ionising radiation sources;
- Licensing of activities as specified by Act No. 18/1997 Coll., e.g. for siting and operation of nuclear facilities and workplaces with very significant ionising radiation sources, for handling radionuclide sources and radioactive waste, transport of nuclear materials and ionising radiation sources;
- Approving documentation specified by the Atomic Act related to nuclear safety and radiation protection, Limits and Conditions for safe operation of nuclear facilities, methods of physical protection, emergency rules for transport of nuclear materials and selected radionuclide sources, on-site emergency plans of nuclear facilities and workplaces with ionising radiation sources;
- Establishing conditions and requirements for radiation protection of the public and personnel handling ionising radiation sources (e.g. establishing limits and defining "controlled areas"), specifying emergency planning zones and licensees' emergency preparedness requirements in compliance with the Atomic Act;
- Monitoring the status of the public and occupational exposures;
- Co-ordination of the National Radiation Monitoring Network activity within the Czech Republic territory and of the international exchange of radiation situation data;
- Maintaining the national system of accountancy and control of nuclear materials, national systems established for keeping records of licensees, imported and exported items, ionising radiation sources, public and professional exposures;
- Professional co-operation with the International Atomic Energy Agency;
- Providing relevant information on the radioactive waste management to the communities and the concerned district administration bodies as well as adequate information to the public and the Government of the Czech Republic concerning results of the SÚJB activities.

In accordance with the responsibilities and tasks performed, the Office organisational structure was in 1999 modified. The Office was divided into three Sections, headed by Deputy Chairmen, and two independent Departments.

Section of Nuclear Safety which includes Department of Nuclear Safety Assessment , Department of Nuclear Facilities Inspection and Department of Nuclear Materials;

Section of Radiation Protection which includes Department of Sources and Nuclear Power, Department of Exposure Regulation and Department of the Environment and Radioactive Waste Management and an independent Division for Licensing;

Section of Management and Technical Support which includes Department of International Co-operation, and Office Bureau;

Independent Emergency Preparedness Department (reporting directly to the SÚJB Chairman) which fulfils the function of the Emergency Response Centre and the Radiation Monitoring Network co-ordination;

Directly to the Office Chairman report Quality Manager Department and Internal Audit Department.

An integral part of the SÚJB are its **Regional Centres** in Praha, Plzeň, České Budějovice, Ústí nad Labem, Hradec Králové, Brno and Ostrava as well as two local offices at Dukovany and Temelín nuclear power plants.

The average number of the SÚJB personnel in 1999 was 153, 41 of them were nuclear safety inspectors, 49 – radiation protection inspectors and 9 – assistants (i.e. staff preparing for the inspector's examinations).
All expenditures connected with SÚJB activities are covered by the national budget. The funds actually allocated in 1999 to the SÚJB, including its budget organisation National Radiation protection Institute (SÚRO), were 207 546 thousand CZK.

Comparison of selected costs in chapter 375 – SÚJB:

Year	1996	1997	1998	1999
Current expenditures, total	155 526	155 246	157 419	175 548
Capital costs, total	137 731	21 429	38 789	31 998

The SÚJB Regional Centre building in Ostrava *(Photo SÚJB)*

STATE SUPERVISION OF NUCLEAR SAFETY

Dukovany Nuclear Power Plant

Operation of Dukovany NPP

In 1999 no event resulting in an unacceptable radioactivity leak to the environment occurred at Dukovany nuclear power plant. The SÚJB evaluated operation of all Dukovany units as reliable and safe. The total number of the events evaluated was low, the Limits and Conditions were complied with, there were no reactor scrams. Twenty-nine operational events could have been classified as of the INES level "0", i.e. events without violations of the Limits and Conditions, safely coped with by the appropriate procedures (in 1998 - 33 of so evaluated events). None of the events was of 1st or higher level (in 1998 – 3 events).

Mr. Karel Böhm, Deputy-Chairman for nuclear safety

In 1999, two Dukovany NPP units were operated in the baseload mode or in the primary frequency control regime. In the course of the year measures were implemented which ensured smooth rollover to the year 2000 (Y2K problem). One of such measures consisted in reducing the 1st unit power during the period covering last days of 1999 and first days of 2000 to the station service load while power supplied to the grid could have been changed operatively. The SÚJB was kept informed on all measures taken, two of its 1999 inspections were focused on Y2K related measures. However, no difficulties have arisen in this connection.

Likewise, the planned refuelling outages of all four units went through without problems.

A long-term process of harmonising and homogenising the secondary circuit structure materials was launched in the mid-1999 with the objective to eliminate corrosion erosion in the secondary circuits of Dukovany units. The measures taken should consequently lead to stopping effects of this phenomenon on the secondary circuit equipment and limiting other types of corrosion damage of the structural materials. These complex measures, together with the implementation of the adequate primary water chemistry which prevents an enhanced formation of the corrosion products as well as their transport and deposition on the primary side surfaces, lead to a significant increase in the reliability and efficiency of protection of the heat-exchanging surface between the primary and secondary circuits and thus – to a significant enhancement of nuclear safety.

Among the most significant Decisions issued by the SÚJB for Dukovany NPP in 1999 belong the continued operation permit for 3rd reactor unit. This permit was issued with regard to a number of the already implemented and especially planned changes which, while implemented, will result in further improvement of the Dukovany units operational safety, with the deadline of December 31, 2007.

Reactor protection systems interventions

No reactor scram due to the HO-1 emergency protection system intervention occurred in 1999 (in 1998 it happened once, in 1997 – twice and in 1996 – six times). Similarly as in 1998, there were no HO-2 interventions, HO-3 emergency protection intervened twice, i.e. one event less than in 1998.

The HO-4 protection system which interlocks the power increase in the automatic and manual mode of reactor power control was actuated in 7 cases.

Reactor protection systems interventions in 1999

No.	Date	Power	Type	Type Cause
				Unit 1
1	3.9.1999	0 %	HO-3	HO-3 intervention from SG 5, 6 level drop to –200 mm during dynamic tests of MCP, caused by incorrect action of the SG level control operator
				Unit 2
	–	–	–	No safety protection systems intervention
				Unit 3
1	18.9.1999	56 %	HO-3	HO-3 intervention for 3.5 s from ROM caused by defect of two Dp MCP2 instruments
2	17.2.1999	100 %	HO-4	HO-4 actuation from low frequency converter startup
3	2.8.1999	100 %	HO-4	HO-4 actuation from low frequency converter startup
4	8.8.1999	100 %	HO-4	HO-4 actuation from low frequency converter startup
5	19.9.1999	100 %	HO-4	HO-4 actuation from low frequency converter startup
6	19.10.1999	100 %	HO-4	Control rod assembly drop to the lower limit position
				Unit 4
1	14.10.1999	0 %	HO-4	Control rod assembly drop
2	30.10.1999	100 %	HO-4	Control rod assembly drop to the lower limit position

Operational events

As it has been mentioned, only 29 events occurred in 1999 at the plant, and all of them were rated as level "0" of the international INES scale (33 such events in 1998). There was no event of level "1" or higher (3 level "1" events in 1998).

Causes of these operational events which are always investigated by the Dukovany Event Committee were as follows: 62 % - due to defect of equipment (1998 – 69 %, 58 % - 1997), 17 % - caused by human factor (1998 – 14 %, 19 % - 19 %), 11 % - due to an error in the operating procedure (1998 – 7 %, 1997 – 8 %). The cause has been not identified in 10 % of the events investigated (1998 – 10 %, 1997 – 15 %).

Limits and Conditions

In 1999, no violation of the Limits and Conditions has been reported by the plant Operator, nor established by the SÚJB inspections (compared with three cases in 1996, 1997 and also in 1998).

In 1999, the plant Operator did not apply for any short-term change of Limits and Conditions, and so the SÚJB has not had to approve any.

Supervisory activities at Dukovany NPP

The SÚJB supervisory activities at Dukovany NPP in 1999 are documented in a total of 111 Inspection Protocols.

Routine inspections performed by the SÚJB local inspectors were focused on checking the limiting and safety parameters as specified in the "Periodical Inspection Plan". The results of these inspections confirmed that in 1999 the units were operated in compliance with the operating procedures and the operational parameters were conform to their design values. The safety margins and settings of the safety protection systems were in accordance with that established in the Limits and Conditions. Likewise, the operability tests of the units protection systems and start-up of the 2nd category power supply diesel generators were monitored within routine inspection activities. These tests were evaluated as successful.

Nuclear power plant Dukovany – overall view *(Photo – ČEZ, a.s. archives)*

Checking how the operational events were dealt with by the Dukovany Event Committee was the objective of some special inspections. As a result, the SÚJB has come to the conclusion that the Committee investigations of operational events are performed in an adequate manner.

Inspections during the periodic integral leaktightness testing of hermetic compartments (PERIZ) of the reactor units at the end of refuelling outages focused on verification of compliance with Limits and Conditions and with the approved methodology of leaktightness measurements, have shown that PERIZ tests at all units were performed in accordance with the Limits and Conditions and that leaktightness of the hermetic compartment boundary meets the Limits and Conditions requirements.

Since the Dukovany NPP hermetic compartments which include the bubbler-condenser system are much larger than that of "classic" containment, the Operator pays a special attention to their leaktightness and has implemented a number of measures for its improvement. An increased leaktightness was confirmed by PERIZ tests at all units resulting in further enhancement of the nuclear safety level.

The units preparedness for refuelling was also subjected to the SÚJB inspections. Inspectors reviewed the relevant documentation to establish how fresh fuel is prepared for loading, whether the system for searching non-tight fuel assemblies is fully operable, whether the reactor core, spent fuel storage pool and transport cask well are free from foreign matter and whether their purity meets the requirements for nuclear fuel handling. Preparedness of the loading machine and refuelling schedule were checked as well. In this area, the SÚJB inspectors found no such shortcomings which would prevent fuel loading.

The SÚJB systematically watched over the reactors shutdown for refuelling, their startup after refuelling and selected tests of the physical and power startup. The units shutdown and their restarting were in all cases carried out in compliance with the Limits and Conditions and the relevant operating procedures. Similarly as in the preceding area, no serious deficiencies were found.

Nuclear power plant Dukovany – by night *(Photo – ČEZ, a.s. archives)*

Inspections carried out during units refuelling outages were focused on the implementation of planned modifications and changes in mechanical part of the technological equipment. These inspections confirmed that the Operator's quality assurance documentation had been prepared in accordance with the SÚJB requirements. No serious deficiencies were found.

Special attention the SÚJB paid to inspections before the units startup after refuelling. The issues of the special interests were:

- in-service inspections, implementation of modifications and preparedness of the mechanical parts, electrical and I&C systems for startup after refuelling and major overhaul. Results of these inspections have shown that there were no deviations from the In-service Inspections Programme or other shortcomings or deficiencies;
- staff and especially preparedness of the selected unit control rooms personnel for unit startup after refuelling – again no deficiencies were established;
- compliance with the SÚJB previous Decisions on the individual units operation. Likewise, the SÚJB inspectors conformed that the Licensee observes all conditions established in these Decisions.

Thus, results of these inspections gave evidence that nuclear safety at all Dukovany NPP units is assured in compliance with the valid rules and regulations.

Having in mind a "moral" and technical ageing of the Dukovany NPP I&C system, the SÚJB in 1999 made a significant effort with the objective to determine and to evaluate objectively the real status of the I&C as to its reliability, failure rate and residual service life. In addition to so intensified inspection activities, the SÚJB contracted an independent checks of most important I&C subsystems based on evaluation of their operational reliability. By February 29, 2000 the SÚJB shall obtain an independent review of I&C systems of the emergency protections, unit protection system, reactor protection and control, neutron flux monitoring and sequential startup automatics. After its evaluation, this review will serve as one of the basic information for establishing the SÚJB requirements for the scope and schedule of Dukovany I&C reconstruction (see also item 2.1.5.3).

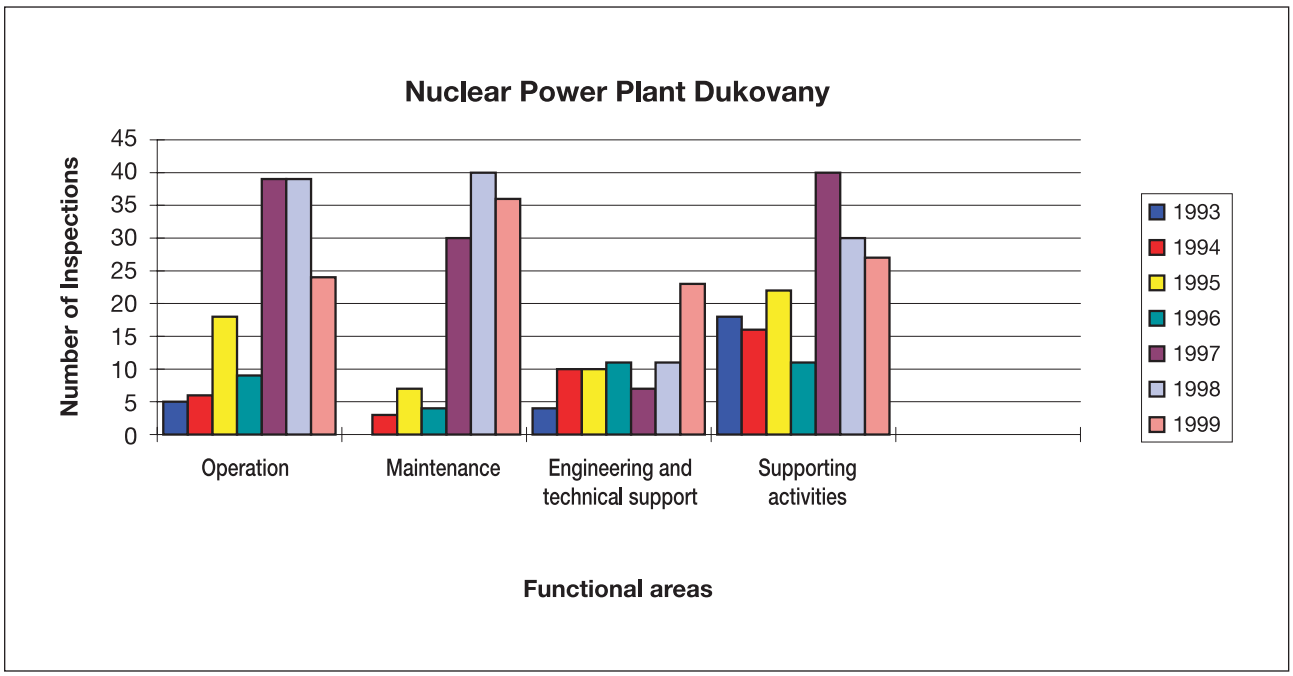
Assessment of supervisory activities

Since 1997, the SÚJB assesses its activities using a differentiated evaluation system according to which findings and conclusion of the inspections in four main areas (operation, maintenance, technical and engineering support, supporting activities) allow to classify a nuclear facility as of category 1, 2 or 3. Category 1 means the most favourable rating, category 3 – the least favourable one which, if established, calls for corrective measures on the licensee part. Qualitative assessment of the inspection activities results and their categorisation in the mentioned areas help the Office to plan its inspections and make them more efficient, at the same time such assessment shows the licensee which areas require its special attention while implementing the nuclear safety and safety culture principles.

Results of Dukovany NPP assessment for 1999 by the differentiated evaluation system:

1999	Operation	Maintenance	Technical support	Supporting activities
Dukovany NPP	1	2	2	1

The number of inspections performed in the period 1993 – 1999 in the individual areas of the differentiated evaluation system:



Operation

A total of 25 inspections were performed covering (by their focusing and range) all relevant activities of this area. Seven out of these inspections were scheduled in the approved Inspection Plan, 6 inspections were specialised unplanned ones and 12 were routine (monthly).
failures was rated higher than level "0" of the INES scale), and likewise no serious deficiencies were found in other operation activities, the SÚJB evaluation of the operation area for 1999 is 1.Results of the routine and specialised inspection in the area of operation allow to conclude that

nuclear safety is indeed the top priority of the licensee. Since there were no violations of the Limits and Conditions, failure rate was low and their effect on nuclear safety was negligible (none of the-failures was rated higher than level "0" of the INES scale), and likewise no serious deficiencies were found in other operation activities, the SÚJB evaluation of the operation area for 1999 is 1.

Maintenance

A total of 36 inspections were in 1999 focused on the maintenance, 20 of them were specialised ones, 12 – regular monthly and 4 – inspections before startup following an outage. Special attention was paid to the preventive maintenance during an overhaul, to results of tests after maintenance and repair before the startup following a refuelling outage, to periodic PERIZ tests, to organisational issues and philosophy of the approach to the Y2K problem, as well as to checking on the systems tests and the subsequent monitoring after implementation of changes.

These maintenance-oriented inspections provided evidence that the licensee carries out maintenance with due regard to nuclear safety. Inspections focused on the units preparedness for startup after a refuelling outage did not establish any violations of the valid regulations or deficiencies which would prevent the units startup to minimum controlled power after refuelling. Similarly, no violations of the Limits and Conditions were found in the leaktightness tests. Shortcomings were identified in definitions of the safety functions used in compiling "List of Selected Equipment" which in turn serves as a basis in the preparation of "In-service Inspection Programme". Some failures were identified as partly caused by maintenance and so evaluated by the Event Committee. Nevertheless, in no case it had been necessary to suspend or to interrupt the unit startup after refuelling due to improper or lacking maintenance. Therefore, level 2 was ascribed to this area.

Technical and engineering support

A total of 36 inspections were in 1999 focused on the technical and engineering support in compliance with the planned Operator's activities and the results of inspections performed during preceding period. Twelve inspections concentrated on the Event Committee proceedings, 5 specialised ones – on adequacy of the plant technical and engineering activities, 3 – on quality assurance, 2 inspections checked compliance with the valid documentation and one inspection prior the unit startup was focused on the technical solution and quality assurance in the technical solution implementation.

Nuclear power plant Dukovany – machine hall *(Photo – ČEZ, a.s. archives)*

Thus, the SÚJB inspections covered the majority of activities which belong to "Technical and Engineering Support" area.

The SÚJB acknowledges with satisfaction the implementation of symptom-oriented operating procedures for dealing with failure states and coping with operational emergencies.So far, the Operator's internal regulations had not taken into account changes following from the new way of the work procurement – using suppliers, and had not made it conform to the current legislation requirements.

A persisting problem in this area is a not-always full compliance of the operating procedures with the Limits and Conditions, respectively lacking reference to the operating procedures in the Limits and Conditions. The problem should be solved by new version of the Limits and Conditions currently prepared by the Operator which shall be conform to the Atomic Act provisions, this version shall be submitted for the SÚJB approval in 2000.

This area was rated as level 2.

Supporting activities

A total of 27 inspections performed were focused on physical protection, nuclear materials transports, nuclear materials accountancy, spent fuel storage and emergency preparedness. Thus, it can be stated that the SÚJB supervised all activities under its authority.

No deviations or deficiencies were established in the area. The procedures and guidelines complied with the relevant legislative requirements. The supporting activities at Dukovany NPP were assessed as level 1.

Evaluation of safety indicators

Results of Dukovany NPP safety evaluation by the safety indicators were in 1999 the best obtained since application of the safety indicators has begun (since 1991), and it can be stated that they were also the best in the whole history of Dukovany plant operation. Graphic representation of the results of 1999 Dukovany NPP safety assessment by the SÚJB which processed a set of the safety indicators is attached.

The evaluation results for the individual selected areas document that Dukovany NPP operation was safe.

With regard to the influence on nuclear safety, good results achieved by the Operator in the areas: "Significant events" and "Safety systems unavailability" are most significant ones. Practically all indicators used for monitoring of "Significant events" area reached their achievable minimum values, i.e. all units were operated without reactor scrams and without any safety significant events (level 1 and higher of INES scale). In the "Safety systems unavailability" area the unavailability time of a majority of the safety systems has decreased, mainly as a result of reducing the "scheduled" unavailability of the components by improving organisation of protections and blocks testing. Very good results of 1999 are affected only by a moderately increased unavailability of diesel generators, however, the increase is not significant and the reliability of the DG startup remained the same as in 1998. Somewhat lower was also efficiency of intervention by the control rod drive frequency converter system (higher number of the control rod assembly drops), nevertheless, similarly as in the preceding case, the comparison with the previous period shows that the change was not significant.

In 1999, traditionally good results were achieved for fuel reliability, radioactivity releases and staff and population protection against ionising radiation.

Evaluation and reviews of documentation
Nuclear fuel

In 1999, the SÚJB was reviewing a set of documents related to the Operator's application for new fuel license for Dukovany NPP 4th unit. This new fuel is identical with that already loaded in 1998

Nuclear power plant Dukovany – unit control room *(Photo – ČEZ, a.s. archives)*

in reactors of 1st and 2nd units and has all advanced features described in the SÚJB 1998 Report. Nevertheless, due to differences between individual units, the Operator had applied for a separate license, similarly as it will be the case for the remaining 3rd unit. The application was accompanied with the relevant Supplement to the Operational Safety Analysis Report which contained fuel mechanical design data, core neutron-physical and thermal characteristics, safety analyses covering transient cores with old and new fuel assemblies as well as equilibrium cores with new fuel only. The submitted documentation was based on the Russian supplier document "Technical Justification of Safety" and a number of specialised technical reports which, besides other, provided results of new fuel experimental verification under "active" and "non-active" conditions. Evaluation was carried out with the emphasis on establishing whether approach to the core design was sufficiently conservative, on thermal-hydraulic and strength calculations which confirm the core design criteria for stationary and non-stationary modes and under design accident conditions. The submitted analyses, required by the SÚJB, were assessed also as to application of the bounding parameters method (representative approach) which covers the reactor states much better and with a larger margin.

Analysis of the submitted results of thermal-hydraulic calculations for stationary states of normal operation modes, while the core is assembled from working assemblies and fuel parts of control rod assemblies with profiled enrichment over the assembly cross-section, shows that the technical requirements relevant for operational conditions of the supplied set of assemblies with profiled and non-profiled enrichment, are fulfilled; the design limits are not exceeded, likewise are fulfilled the reliable core-cooling criteria. These documents review confirmed fulfilment of a basic criterion of the limiting fuel rods degradation. Neutron-physical characteristics of the core in stationary and transient states allow to operate the reactor on nominal power with all reload batches considered. Evaluated were also the computer codes used by the Russian supplier as to their quality and ap-

propriateness of utilisation for neutron-physical computations, fuel rod behaviour computations, as well as for thermal-hydraulic analyses of stationary, transient and accident conditions of the reactor and technological circuits. Assessed was also the physical model, mathematical apparatus, verification by comparison with the experimental data, achieved accuracy and applicability for the particular kind of analyses.

Results of the evaluation of new fuel type for Dukovany 4th unit allowed to issue the corresponding license. So far, Dukovany units with new fuel were operated without any anomalies caused by this fuel. The Operator monitors status of these units cores more frequently, the results are regularly submitted to the SÚJB.

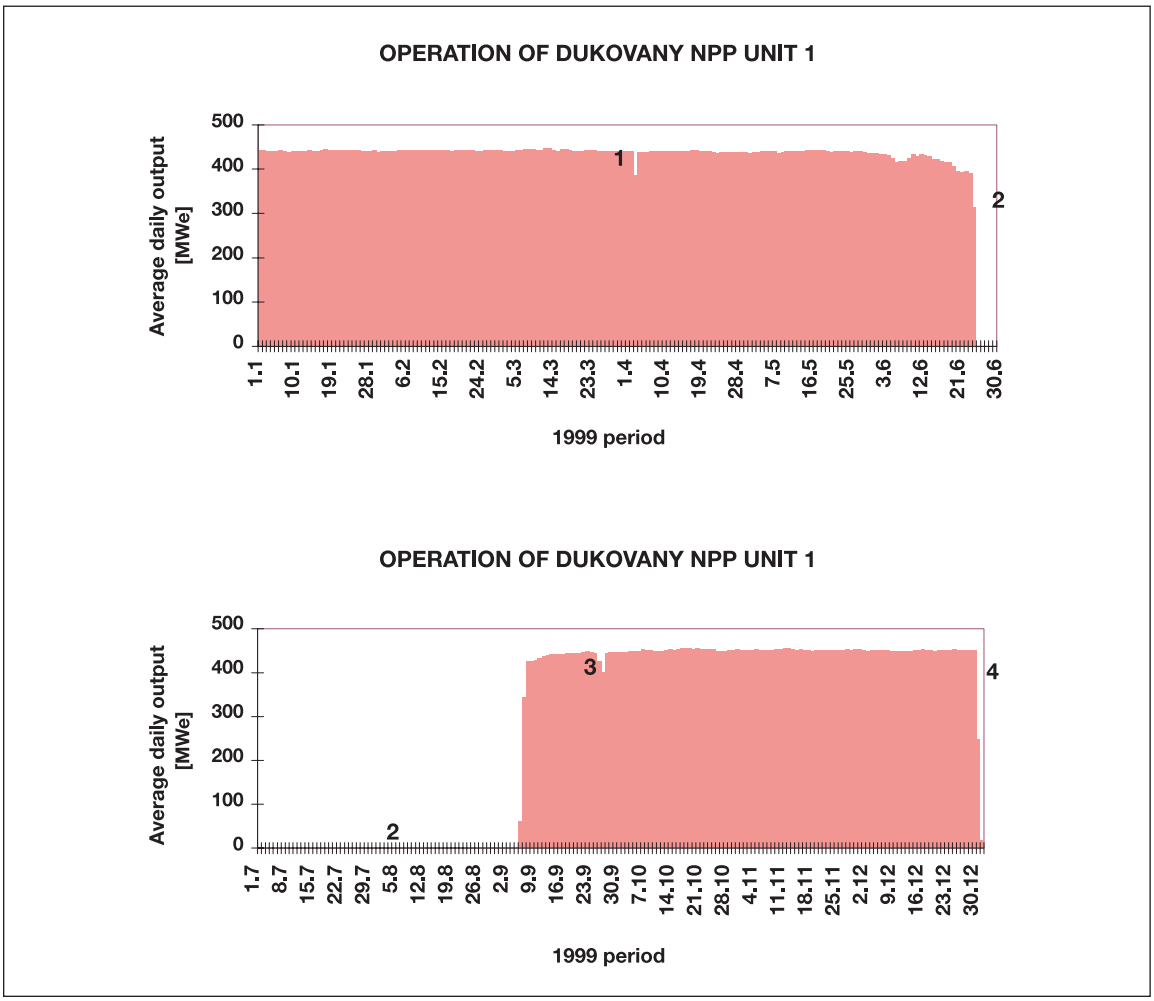
I&C Renewal

Nuclear power plant Dukovany – reactor hall *(Photo – ČEZ, a.s. archives)*

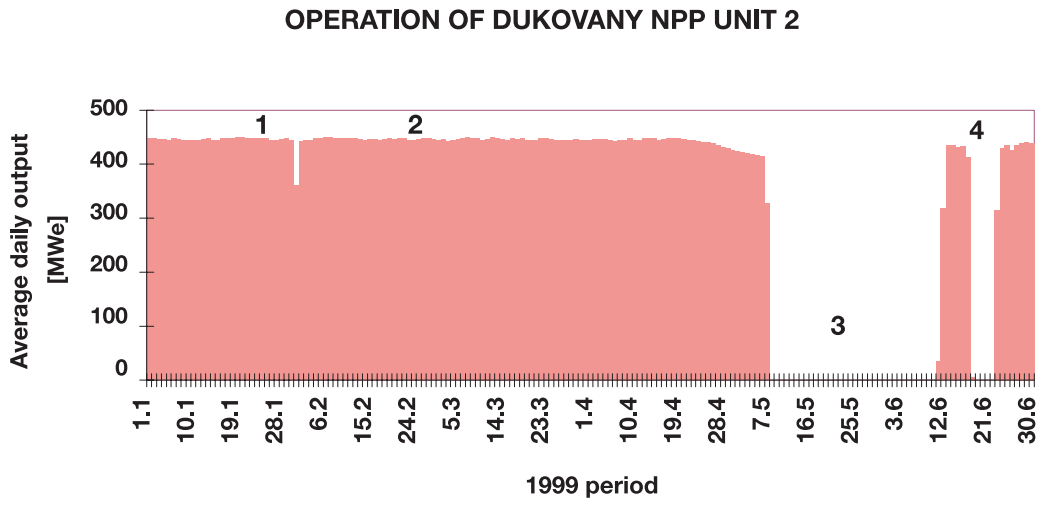
In accordance with the Dukovany NPP needs and the SÚJB requirements, ČEZ, a.s. continued preparations for the renewal of all significant parts of plant I&C systems. The "Dukovany I&C Renewal" project was launched with the objective to prepare and to implement renewal of I&C systems to ensure their reliable performance. In this connection, ČEZ, a.s. submitted to the SÚJB safety documentation for the concept phase of the contract design (Phase 1A - I&C Renewal). The work on safety documentation for phase 1B of the contract design continues and SÚJB comments are taken into account. These documentation will contain more detailed information, especially as to the I&C renewal concept and proofs of the safety requirements observance for renewed I&C systems and equipment, as well as to the acceptance criteria.

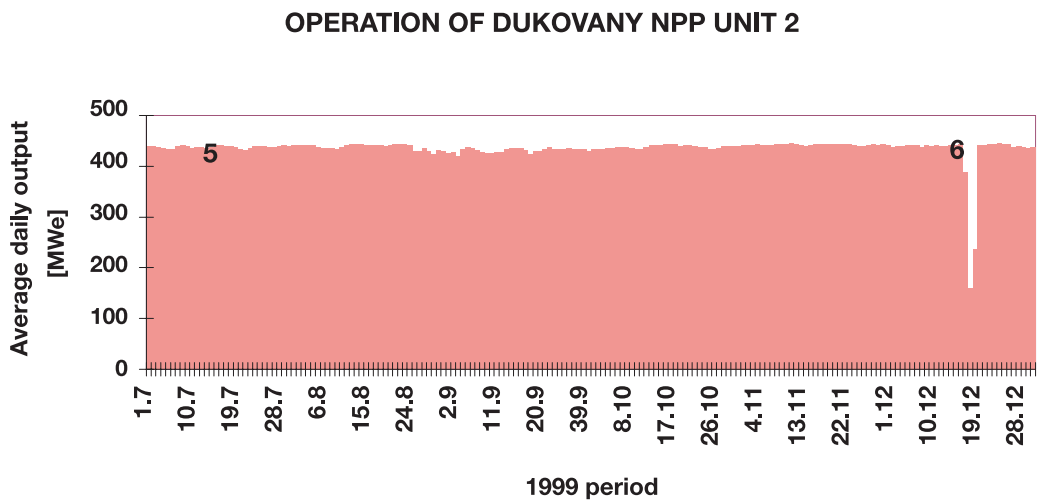
In 1999, continued renewal of VK3 system by the SCORPIO-VVER core monitoring system. At the 1st unit SCORPIO-VVER was actually installed as a part of the planned I&C reconstruction. Data

collection and their comparison were implemented within the tests and inspections programme during parallel operation of the new and old (VK3) monitoring systems. The final evaluation of the tests was made after a year of in parallel operation of SCORPIO-VVER and VK3 systems. The SÚJB activities in this area were focused on the checking and assessment of the documentation presenting results of SCORPIO-VVER testing (in the course of operation with SCORPIO-VVER connected in parallel to HINDUKUSH system) and documents on the computer codes verification. As a result – the SÚJB has granted a license for VK3 system renewal by SCORPIO-VVER system. At 2nd and 4th units SCORPIO-VVER system successfully passed the Pre-complex and Complex tests.

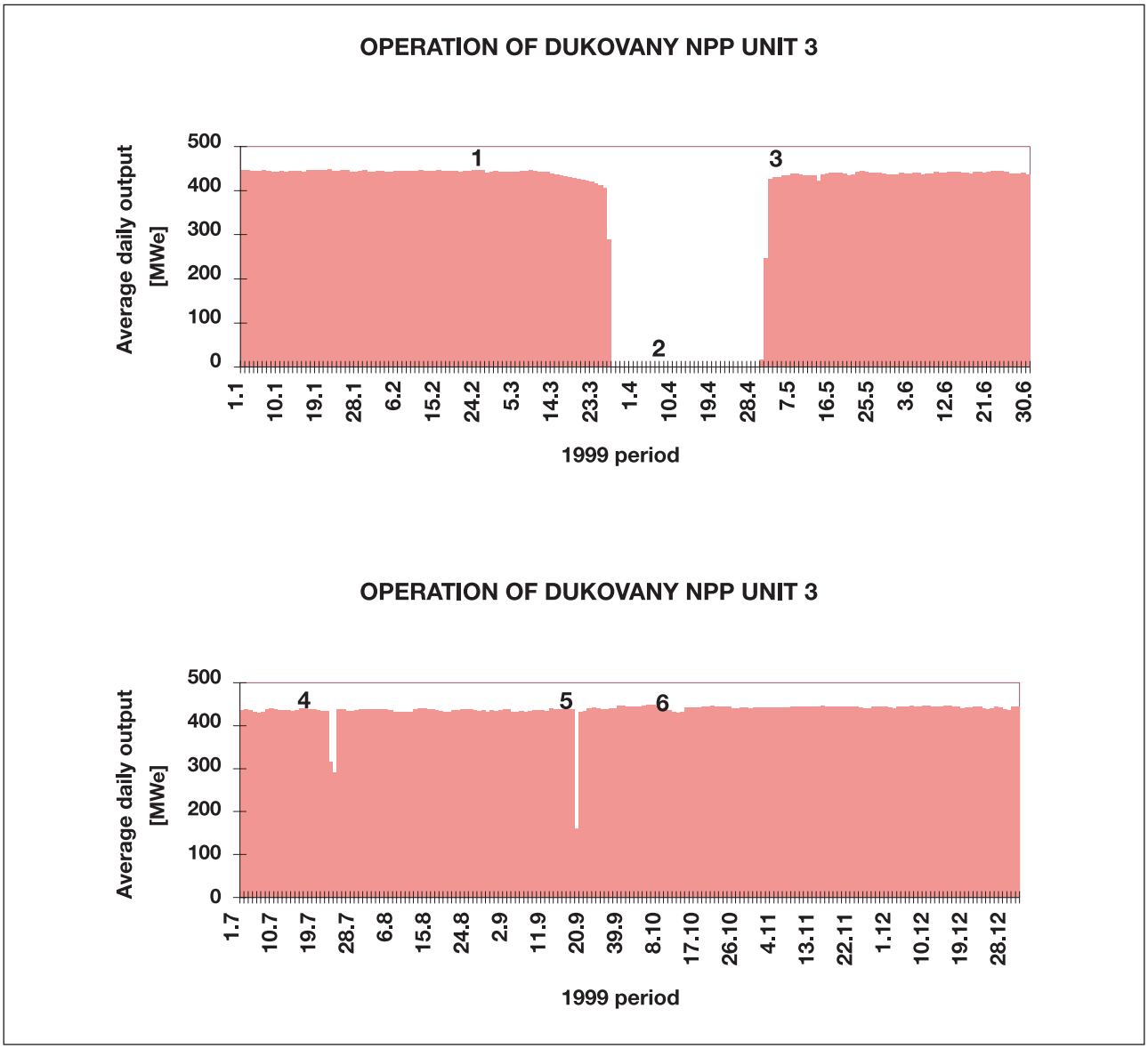


1 Defect of level controller in the main condenser
2 Unit shutdown for refuelling and regular maintenance
3 Planned power decrease
4 Planned power decrease to eliminate possible disturbances in the UCTP – Y2K problem

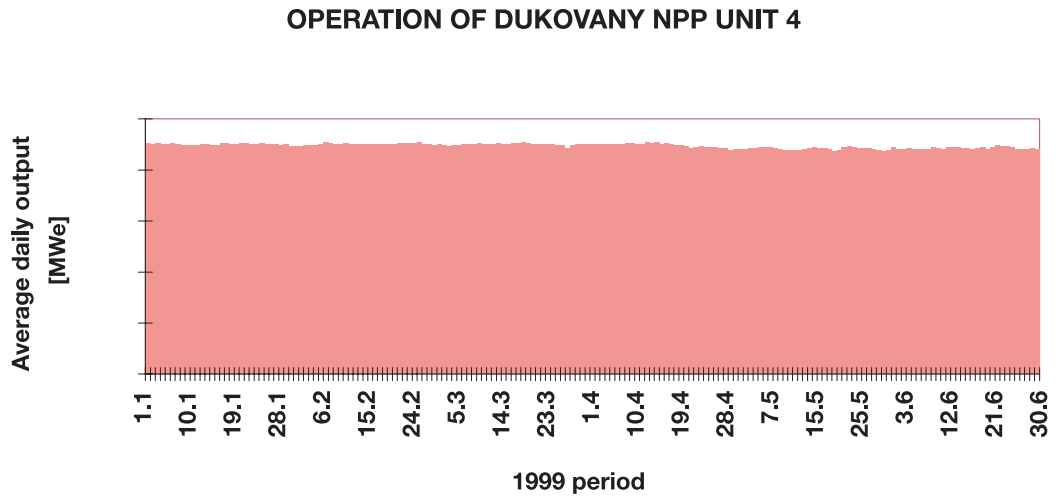


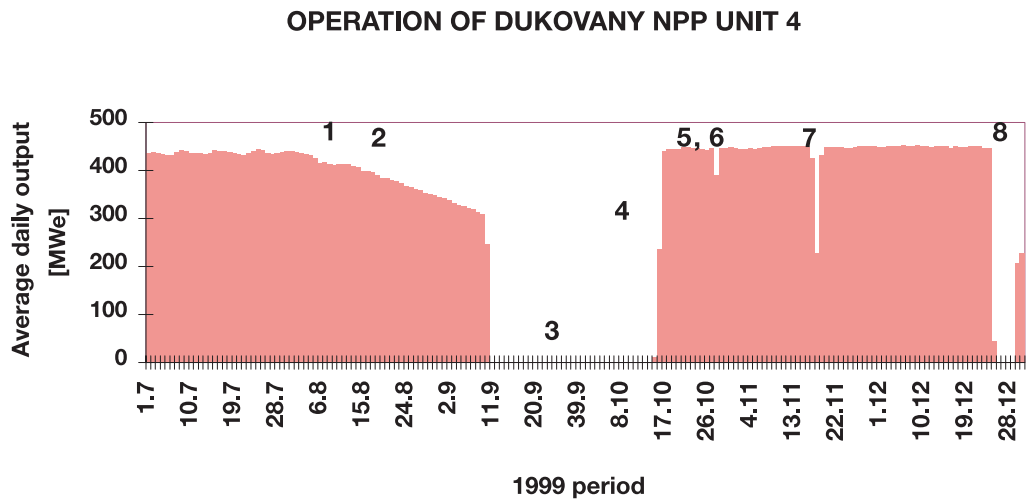


1 Loss of TG22 during controlling flap valve test
2 Scheduled power decrease following shutdown of low-pressure heater
3 Unit shutdown for refuelling and regular maintenance
4 Unit trip for removing internal leakage at steam generator No. 3
5 Power decrease for repair on secondary side
6 Power decrease for repair on secondary side



1 Defect on high-pressure heater TG31
2 Unit shutdown for refuelling and regular maintenance
3 Power reduction to 80 % for repair and adjustment of safety valve on PG4
4 Shutdown to mode 2 for leaking valve repair
5 Power reduction due to decrease of underpressure in the hermetic compartment
6 Power decrease due to control rod drop





1 Operation on temperature and power effects
2 Power reduction to 80 % from power limitation controller after loss of SG feedpump
3 Unit shutdown for refuelling and regular maintenance
4 HO-4 from assembly drop
5 Scheduled power reduction for power tests – tertiary control testing with TG42 tripped
6 Power decrease due to control rod drop to lower limit position – HO-4
7 Power decrease due to TG42 trip for repair on secondary side
8 Scheduled unit shutdown to dispatcher stand-by, repair on the primary circuit

Temelín Nuclear Power Plant

Construction and licensing process

Construction and assembling activities at the 1st unit were actually limited to some finalising civil construction work, removing temporary structures, finalisation of cable laying and connection and assembling tests on the control system.

At the 2nd unit, assembling of auxiliary systems of the primary and secondary circuits was gradually finalised and post-assembling cleaning operations have started. Installation of the instrumentation and control system was initiated as well as first tests of the switching stations.

Nuclear power plant Temelín – overall view *(Photo – ČEZ, a.s. archives)*

Unit 1

Nuclear power plant Temelín – view of the first unit *(Photo – ČEZ, a.s. archives)*

The successful containment integrity test performed in January 1999 confirmed a high quality of the civil construction and assembling work. Leaktightness rate achieved is lower than the established in the design and safety documentation.

As to the technology – finalised was reactor equipment installation including non-standard measurements system for

the integral hydraulic test. In successive steps were carried out tests of the individual systems and equipment of the primary and secondary circuits. All pumps of the safety systems and auxiliary systems of the primary circuit were run-in, performance of important pumps of the secondary circuit was verified. A large amount of work was done on installing insulation, which has been practically finished. Imperfections found during preceding tests of the loading machine were removed. Electrical systems were subjected to all important tests necessary before they can be utilised for power supply to the technological systems. A major part of the startup tests of the uninterruptible power supply systems was finished and at the end of the year the sequential startup automatics (emergency load sequencing) tests of all diesel-generators have been started; these tests will be finished in the coming year. The tests verified the systems preparedness in accordance with the project progress, the electrical systems operability was confirmed, including required quality of the Temelín NPP internal power consumption.

A major part of the assembling tests on the control system was finished and the startup tests were launched. Intercommunication tests between the individual I&C subsystems and intercommunication tests between the individual trains of the reactor protection system were performed. At the end of the year, the Baseline 6 software was installed on all I&C subsystems. Tests of the input and output interfaces of all Temelín NPP I&C subsystems were carried out until the end of the year, they will be evaluated after all these tests are completed.

Successful tests of all significant technological systems allowed to begin preparations for the integral hydraulic test of the primary circuit. The first sub-stage of this test (pressure tests and circulation flushing of the primary circuit) was performed in November 1999. Due to incomplete preparedness of the I&C system, not all tests planned and required within this sub-stage were finished. Successfully were finalised the strength pressure tests of the primary and secondary circuits, however, owing to unsatisfactory results the leaktightness tests will have to be repeated in 2000.

Unit 2

In 1999, trial installation of the reactor internals was carried out, assembling work on auxiliary systems of the primary and secondary circuits which precedes the post-assembling cleaning operations, was finished. In addition to insulation and the non-standard measuring systems, steam generators were completed. Revisions and adjusting of the polar crane, installation of steel structures for cabling proceeded; cable laying has been started. Switching stations transports were finalised. In the course of the year, the direct current parts of the plant internal consumption system were put into operation thus enabled to start the first startup tests of other electrical systems.

Supervisory activities

In 1999, Temelín NPP hosted a total of 48 inspections focused on the civil construction, assembling and startup activities at the plant. Similarly as in 1998, a prevailing majority of the inspections was connected with the 1st unit startup tests.

The SÚJB Decisions issued in 1999 concerned mostly the pre-complex and complex tests. ČEZ, a.s. has applied for the license on startup of the Non-Active Tests stage well in advance, thus allowing the SÚJB adequate time for the equipment actual state verification according to the corresponding documentation, while assuring that these documents will be gradually completed. Since this promise had not been fulfilled within the period allowed by the administration rules, the SÚJB has decided to interrupt the administrative proceedings.

The last version of the Non-Active Tests prepared in compliance with the SÚJB requirements indicates that this stage of non-active testing will be as to the number of the tests very challenging indeed (it will be necessary to perform or repeat the tests which should had been in accordance with the original applicant's programme already finished).

Inspections

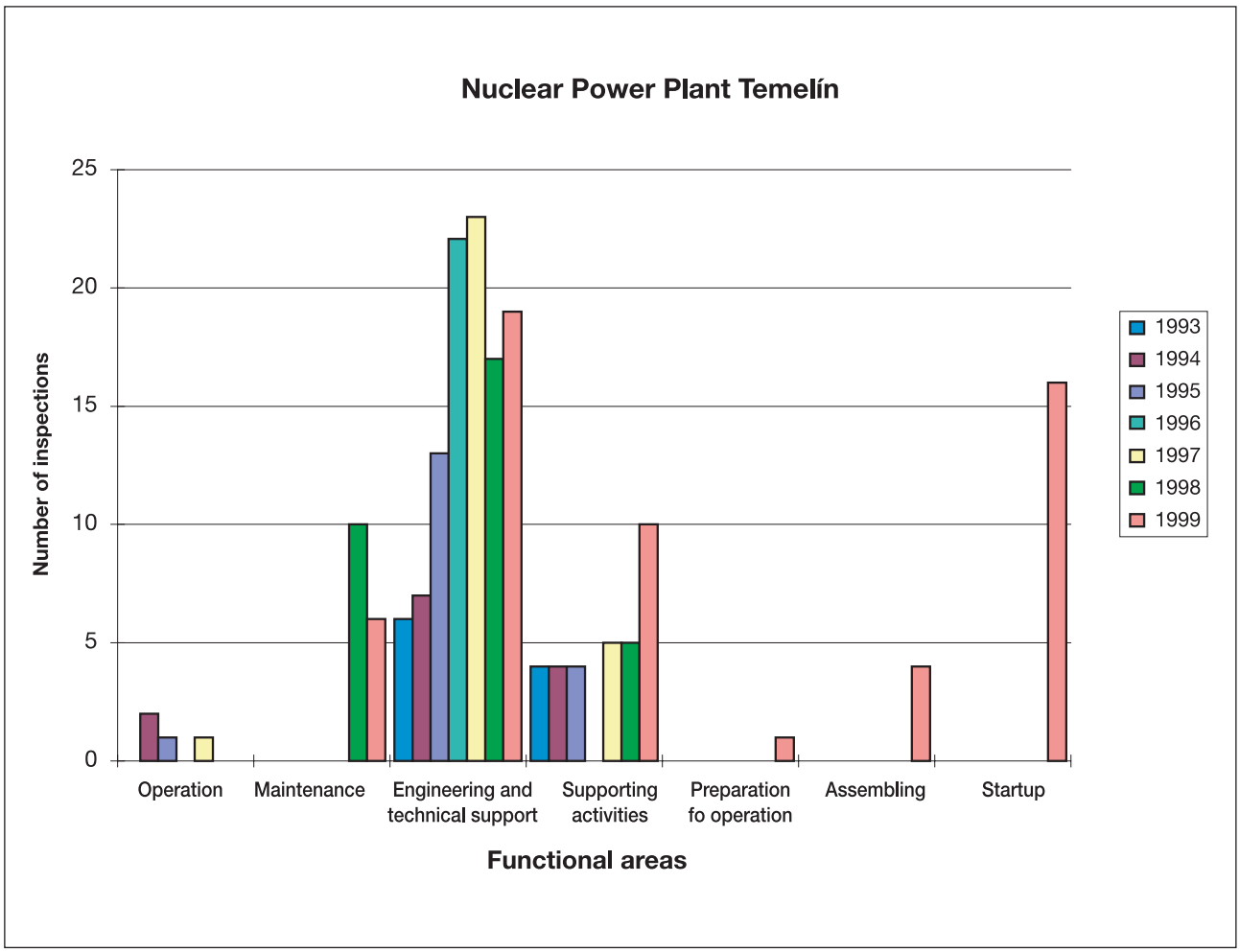
As it has been already mentioned, the SÚJB inspections were focused on the activities carried out in accordance with the approved pre-complex and complex testing programmes. With respect to conformance with these programmes and with the corresponding quality assurance documentation, inspectors checked up tests performed on the safety systems pumps, makeup pumps of the primary circuit, hydroaccumulators, main circulation pumps, linear cluster stepping drives, turbine-driven pump, Westinghouse/WELCO I&C system, as well as tests on the equipment of the auxiliary service building. No serious non-observance of the approved documentation prescribing performance of the individual tests, was found. Nevertheless, several deviations from the relevant quality assurance documentation on the performed tests documenting preparedness for the tests, were noticed. The adequate remedies were required directly in the SÚJB inspection records.

Nuclear power plant Temelín – view of the turbo-set *(Photo – ČEZ, a.s. archives)*

In the end of the year the attention was focused on the preparedness for the first sub-stage of the integral hydraulic test - circulation flushing of the primary circuit and pressure tests. The SÚJB stated that preparedness for this test, especially in the I&C system, was incomplete. Some deficiencies were found and recorded in the course of the test itself, namely – not all planned tests were performed or non-compliance with the test procedures established in the operating procedures or the startup programmes. All these shortcomings were recorded, and their elimination requested – before or within the non-active testing stage which, as a first, will be realised pursuant to the SÚJB license in accordance with Act No. 18/1997 Coll.

Assessment of supervisory activities

For the supervisory activities assessments the SÚJB is using a differentiated evaluation system. Having in mind that Temelín NPP is being finalised and for the purpose of more complex assessment of the supervisory effort, this system was revised and two more inspection areas were added – assembling and startup areas.
A total of 48 inspections were realised in 1999 (2 more have been started and will be finished in 2000). These inspection were focused on preparation for operation, maintenance, technical and engineering support, supporting activities, assembling and startup. Each inspection monitored nuclear safety assurance in one or several of these areas, in accordance with the prepared in advance programme.
The number of inspections performed in the period 1993 – 1999 in the individual areas of the differentiated evaluation system:



Results of Temelín NPP assessment for 1999 by the differentiated evaluation system:

1999	Preparation for operation	Maintenance	Technical support	Supporting activities	Assembling	Startup
NPP Temelín	1	2	3	1	2	2

Preparation for the operation

Within the present stage of the NPP Temelín construction, possibilities to assess the licensee performance within this area of activities are limited to the evaluation of the basic training of personnel. Inspections performed allowed to check on the Temelín NPP selected personnel training on display VVER-1000 simulator and to assess their preparedness (including the corresponding documentation).

Results of these inspection confirmed that training of the selected personnel (Temelín NPP Unit Control Room crew) on the VVER-1000 display simulator is carried out in compliance with all legal regulations and established conditions of the earlier SÚJB Decisions. Technically, the display simulator allowed simulation of all steps prescribed in the training programmes for these specific tasks. Professional competence of the selected personnel with respect to nuclear safety is assured and documented adequately, the SÚJB therefore assessed this area as level 1.

Nuclear power plant Temelín – assembling and inspection activities in a reactor well *(Photo – ČEZ, a.s. archives)*

Maintenance

In 1999, the maintenance area was monitored within inspections focused on the sub-area of the tests carried out with the objective to assess the equipment status, including instruments calibration, systems and components repair and their subsequent testing. Checked were for instance: steam generators, licensee preparedness for the 2000 rollover (Y2K problem), conservation and re-conservation programmes which establish activities necessary to maintain an adequate quality of the selected equipment. The SÚJB inspectors detected deficiencies in the systematic monitoring of selected equipment quality with respect to deadlines in the 2nd unit construction schedule and completeness of the conservation, re-conservation and the equipment status check-up procedures; this area was therefore assessed as level 2.

Technical and engineering support

The SÚJB effort in this area is focused on the activities related to technical and document support of the plant commissioning, to quality assurance system and supplies related activities. This area is assessed using not only findings included into the special inspections protocols, but also findings recorded in some parts of the routine inspections protocols.

In the technical and document support sub-area of the commissioning programme, within tests performed in accordance with P091 programme (sub-stage – circulation flushing and pressure tests), several deficiencies were found – not all items of the Quality Assurance Procedure were fulfilled, records of operators familiarisation with all relevant operating procedures were missing, similarly as the pre-complex and complex testing programmes as well as some other documents the tests were based on.

In the quality assurance sub-area, the inspectors came to the conclusion that the corrective measures fulfilment are filed in the Nuclear Safety department, however, there is no feedback between this department and professional divisions required by the Partial Quality Assurance Programme. This organisational shortcoming can lead to a situation when remedial measures are implemented only formally or not at all. These facts led us to describe the technical and engineering support area as of level 3.

Supporting activities

In this area inspected were physical protection of the NPP site, operated fresh fuel storage and tests within the "Control Centre" programme. Spot tests performed upon the inspectors request on the outer barrier of the physical protection system in daytime and night were successful, and the tested part of technical physical protection system satisfied all function requirements.
Inspections of the sub-areas relevant for the present plant construction stage did not detect any deviations, no corrective measures were required, so this area is assessed as level 1.

Assembling

Assembling is an area which draws a greatest attention of the SÚJB. Inspections of this area were carried out with the objective to check how are ensured: mechanical work, the technical conditions requirements and the quality assurance system, especially as to welds quality proofs. The issue of defects in the welded connections detected during the spent fuel pool inspection has been not by December 31, 1999 closed. The repair procedure was accepted, however the actual proofs of the performed repair quality have been not transmitted. Defects in the pulse tubing welds were subject of a number of negotiations and inspections. Since documentation on the welding process qualification and on the inspection programme of the significant weld connections have been submitted, this issue is now closed.

Nuclear power plant Temelín – mounting fuel assemblies *(Photo – ČEZ, a.s. archives)*

The welding process qualification included also proposal and verification of the method applied for checking pulse tubing welds. Results of the checks performed in accordance with the welds inspection programme will be transmitted to the SÚJB not later than by the beginning of the power startup. Acceptability of defects in stainless steel weld deposit was repeatedly discussed in December 1999. At the meeting were submitted new proofs of evidence, especially as to the defects acceptability and their impact on nuclear safety, as well as technical documentation on bimetal tubing and control calculations. The SÚJB has accepted the proposed solutions and its results.

With respect to these facts and to an active approach in solving the welds issue, the SÚJB assesses this area as level 2.

Commissioning

Commissioning is the second of two areas which requires most of the SÚJB attention. To this area belong: tests of technological equipment carried out in accordance with the approved Pre-complex Test (PKV) and Complex Test (KV) programmes, the corresponding Quality Assurance Procedures (PoJZ) and Partial Quality Assurance Programmes (DPZJ). The SÚJB systematically monitors PKV and KV tests acknowledging their importance for nuclear safety. During 1999 the following KV and PKV tests were checked or their performance inspected:

"Programme PKV P236 for DGS II"
"Programme PKV P317/C – Control Centre"
"Programme PK 1514/72 as a part of PoZJ G23 of the Unified Welding Procedure for Temelín NPP Construction"
"Programme PKV P199 for turbo-feed pump"
"Programme PKV and KV P110 of reactor protection system (SORR)"
"Programme KV P317/E for parts of technical system of physical protection in building 631/01"
"Programme PKV of emergency high-pressure injection pumps"
"Programme KV P317/D of technical system of temporary storage protection during Temelín NPP construction"
"Programme PKV and KV P12/R1 for main circulation pumps and their auxiliary systems"
"Programme PKV and KV P 157R1 of pneumatic fast-acting valves"
"Programme PKV, KV P129 of primary circuit makeup and boron regulation"
"Programme PKV and KV 9109 of reactor"
"Programme PKV and KV P091 – preparedness for sub-stage IHZ/CP,TZ"
"Programme PKV P236/R2 for Diesel-generator Station of 1st reactor unit"

Fulfilment of the commissioning programmes for other significant systems was checked within the routine inspections framework.

Generally, it can be said that Pre-complex and Complex Test programmes were prepared and subsequently performed in accordance with the time schedules. In some Pre-complex tests the SÚJB found deviations from the approved programmes as well as some shortcomings in their implementation. For instance – the test procedure prescribed for the Diesel-generator Station DGS II by programme P236 was not fully adhered to.

The summary record on finalisation of assembling, tests and preparedness for pre-complex testing has been for PKV and KV 157/R1 of pneumatic fast-acting valves issued more than three months after the actual tests had begun.

Preparedness of the turbo-feed pump system for tests according to P199 programme was not adequately checked before the actual testing.

A discrepancy was found between partial protocols for main circulation pumps and I&C, which means that the general requirement of P091 programme on I&C preparedness was not observed. Due to all mentioned shortcomings in the approved programmes implementation, the SÚJB assesses this area as level 2.

Evaluation and reviews of documentation

In 1999, the SÚJB activities connected with the Temelín licensing process were focused primarily on the evaluation of preliminary versions of the Pre-operational Safety Analysis Report and on reviewing additional information relating to the Westinghouse supplies.

Comments to the documents prepared by Westinghouse were subject of many consultations with specialists from Westinghouse, ČEZ, a.s. and ŠKODA Praha, these consultations due to current status of the design changes were focused especially on the I&C system and Limits and Conditions. A number of comments which had been made to the Supplement of Preliminary Safety Analysis Report were repeatedly discussed also with Czech authors of this Supplement.

In October 1999, ČEZ, a.s. submitted to the SÚJB Revision 0 of the Pre-operational Safety Analysis Report. The SÚJB has been evaluating this Report and its comments have been transmitted so that they could have been taken into account in the next version of Pre-operational Safety Analysis Report. Its Revision 1 for 1st Temelín NPP unit was submitted to the SÚJB in December 1999, while the license application for the Active Test stage (for which submitting of the POSAR is prerequisite) will be submitted later.

Fresh fuel storage facility at the Temelín plant site

By December 31, 1999, 166 fuel assemblies were stored in the fresh Fuel Storage Facility. Inspections focused on the observance of the trial operation conditions confirmed that fuel is stored conform to the relevant safety requirements.

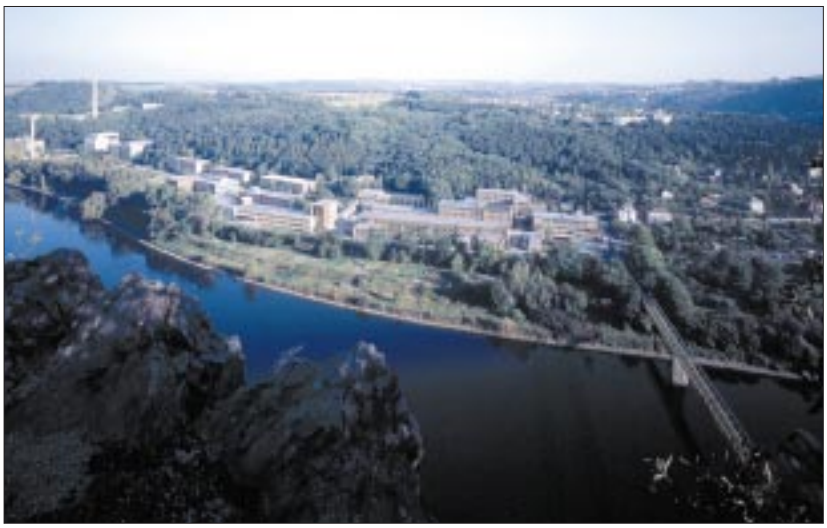
Nuclear research facilities

LVR-15 reactor at NRI plc Řež

The reactor operation plan for 1999 was fulfilled in the whole range. The power operation of the reactor reached 41510 MWh. Since the beginning of trial operation in 1989 (after major equipment overhaul) the reactor was operated over 209 564 MWh. Its operation was safe and reliable, there were no deviations from the Limits and Conditions. The reactor was in operation primarily for the foreign users, especially for the purposes of material research of nuclear facilities components. Production of radiation doped silicon and radioisotopes for domestic users together with experiments for basic nuclear physics research, represented a less significant part of the reactor utilisation programme.

The SÚJB inspections in 1999 did not establish any shortcomings or malfunctions, so no corrective measures were needed. It can be stated that the current status of this facility and its monitored parameters meet the safety documentation requirements. At present, LVR-15 reactor has become one of European research nuclear facilities of this type continuously and safely operated over the longest period.

Other nuclear research facilities



NRI Řež plc – overall view *(Photo – NRI Řež plc archives)*

Reactor LR-0 at NRI Řež plc and school reactor VR-1P at the Faculty of Nuclear Science and Physical Engineering of the Czech Technical University were operated safely and reliably. The SÚJB inspectors identified no shortcomings in the operation of these reactors. The VR-1P school reactor is still intensively utilised for teaching purposes and fulfils an important role also beyond the Czech Ministry of Education sector. The LR-0 reactor due to its very specific purpose is used only minimally.

Other nuclear facilities

Since 1997 when the Atomic Act came into force, a number of the facilities defined as nuclear facilities has increased. Into this category were included Uranium Concentrate Storage Facilities within the National Material Reserves, Uranium Concentrate Storage of DIAMO s.p. TÚU subsidiary and GEAM subsidiary.

These nuclear facilities are undergoing process of adjusting to the Atomic Act requirements which must be finished by 2002. In 1999, the SÚJB approved for these nuclear facilities the method to be applied for the physical protection assurance which is conform to the relevant provisions of Directive No. 144/1997 Coll.

Discussions on the preparation of the corresponding safety documentation as a basic document required for issuing the operation license in accordance with the Atomic Act have been commenced.

Spent fuel management

Interim spent fuel storage facility at Dukovany plant site

The SÚJB inspections performed in 1999 were focused on fulfilment of the Limits and Conditions for permanent operation. It was established that the checked parameters have not exceed their limiting values approved by the SÚJB within the Limits and Conditions. The inspections verified that the interim storage facility during 1999 monitored the required physical quantities, especially temperature on the surface of storage casks, pressure between the primary and secondary lids of each storage cask CASTOR – 440/84 and the dose equivalent rate, which allow to follow the radiological situation within the storage facility and its surroundings.

Intermediate Spent Fuel Storage Facility, Nuclear Power Plant Dukovany

(Photo – ČEZ, a.s. archives)

Upon the ČEZ, a.s. request, complemented with safety documentation and the Czech Ministry of the Environment "standpoint", the SÚJB in December 199 has issued permit for the Spent Fuel Storage siting within the Dukovany NPP site. This storage and existing Interim Spent Fuel Facility will become one organisational-operational unit. The administrative proceedings connected with the ČEZ, a.s. application for the siting license of a Central Spent Fuel Storage Facility at locality Skalka, as a back-up alternative for Dukovany spent fuel storage, were interrupted. In compliance with the relevant provision of the Atomic Act, the SÚJB has to wait for the Ministry of the Environment statement on the environmental impacts evaluation.

By December 31, 1999, the Interim Spent Fuel Storage Facility stored 34 CASTOR-440/84 casks with a total of 2264 fuel assemblies; one CASTOR-440/84 cask with 84 assemblies remained at the twin unit block 2.

Spent fuel storage pools of Dukovany NPP

As of December 31, 1999, a total of 2264 assemblies were stored in the spent fuel storage pools of Dukovany NPP units, under regular surveillance of the SÚJB and the IAEA inspectors.

High-level waste storage facility at NRI Řež

Two inspections of this storage facility took place in 1999, focused primarily on the quality of water in the spent fuel storage pool and on improvement of water treatment station efficiency. Based on the results of these inspections and upon the licensee application, the modified Limits and Conditions of High-Level Waste Storage Facility were approved, setting more strict criteria for water quality and implementing automating monitoring systems within the storage.

As of December 31, 1999, in the High-Level Waste Storage Facility were stored 16 fuel assemblies of EK-10 type and 197 fuel assemblies of IRT-M or IRT-2M types. 190 barrels with EK-10 fuel assemblies are stored in dry boxes.

Transport of nuclear materials

In 1999, the following transports licensed by the SÚJB took place:

- five spent fuel transports within Dukovany NPP site;
- 106 transports of individual spent fuel assemblies from LVR-15 building to the High-Level Waste Storage Facility at NRI Řež;
- 6 international transports of fresh fuel from Russian Federation to Dukovany NPP;
- one international transport of uranium concentrate from DIAMO, s.p. to Great Britain;
- three international transports of uranium concentrate from DIAMO, s.p. to Russian Federation;
- six domestic transports of natural uranium from ŠKODA-UJP, Praha, a.s. to glass works.

In 1999, the SÚJB performed five inspections of nuclear materials transports, two of them – international. Results of these inspections confirmed that transports were carried out in compliance with nuclear safety, radiation protection and physical protection requirements and conform to the conditions of the relevant SÚJB Decisions.

In 1999, the SÚJB type-approved five transport casks with expiring validity of approvals issued by the SÚJB before the Atomic Act came into force, as well as six new transport casks manufactured in the Czech Republic. The SÚJB has also type-approved six transport casks certified abroad.

In 1999, after nearly two-year assessments of safety documentation, the first Czech cask – ŠKODA 440/84 for transport and storage of VVER-440 spent fuel, received the type approval. Assessment of the safety documentation submitted to the SÚJB by German GNB company accompanying its application for type approval of the cask designed for transport and storage of RBMK spent fuel – CONSTOR 15000 RBMK, continues. Such casks will be manufactured by ŠKODA JS, a.s. in Plzeň for the purpose stated.

National system of nuclear materials accountancy and control

In 1999, there were 62 inspections focused on the nuclear items management, 42 of them were joint SÚJB-IAEA ones.

The IAEA reports on the inspections performed in the Czech Republic confirmed information of the National System of Nuclear Materials Accountancy and Control executed by the SÚJB as well as observance of the Czech Republic international obligations following from the Treaty on Non-Proliferation of Nuclear Weapons. The joint SÚJB and IAEA inspection at Temelín NPP confirmed the Temelín NPP preparedness to meet the IAEA requirements for the safeguards implementation by the date the nuclear fuel is loaded into the 1st unit core.

In 1999, the SÚJB has issued a total of 71 new nuclear materials management licenses. Thus, at the end of the year there were 206 licensees who had a license for nuclear materials management or nuclear materials procurement (issued before the Atomic Act came into force) which entitles them to manage nuclear materials in 230 organisation-operation units. This number covers 4/1 licenses for nuclear materials import/export, 7/4 licenses for selected items import/export, 52/13 licenses for dual use items import/export and 4 licenses for export/reimport of nuclear materials or dual use items.

Review of 1999 inspection activities

MBA code	Number of IAEA inspections	Number of SÚJB inspections	IAEA inspection effort[1] (man-days)
CZ-B	4	5	7 (6)
CZ-C	1	1	2 (3)
CZ-D	1	1	2 (5)
CZ-E	0	1	0 (1)
CZ-F	2	2	2 (3)
CZ-G	2	2	3 (3)
CZ-J	9	9	12 (26)
CZ-K	8	8	10 (42)
CZ-L	4	4	4 (7)
CZ-T	1	1	1 ([2])
CZ-V	1	1	2 (1)
CZ-W	0	1	0
CZ-X	0	0	0
CZ-Y	0	1	0
CZ-Z	9	21	9 (9)
C E L K E M	42	58	54 (106)

1) Inspection effort permitted by the relevant agreement for the MBA in 1997
2) Inspection effort not yet determined

1999 Material Balance Area (MBA) Review

MBA code	MBA name	Type of nuclear material inventory[1]	Amount (SQ[2])
CZ-B	Research reactor LVR-15, NRI Řež	HEU, LEU, N	1.2
CZ-C	Research reactor, NRI Řež	LEU, N, D	4.2
CZ-D	Research laboratories, NRI Řež	All types	0.9
CZ-E	ŠKODA JS, a.s. Plzeň	HEU, LEU, N, D, P	0.04
CZ-F	ŠKODA-ÚJP, Praha, a.s.	LEU, N, D	1.0
CZ-G	High-level waste storage, NRI Řež.	HEU, LEU	1.2
CZ-J	Dukovany NPP-1, ČEZ, a.s.	LEU, D, P	246.6

MBA code	MBA name	Type of nuclear material inventory[1)]	Amount (SQ[2)]
CZ-K	Dukovany NPP-2, ČEZ, a.s.	LEU, D, P	242.2
CZ-L	ISFSF Dukovany, ČEZ, a.s.	LEU, P	403.4
CZ-T	Temelín NPP, ČEZ, a.s.	LEU, D	24.6
CZ-V	VR-1P school reactor, FJFI Praha	HEU, LEU	0.2
CZ-W	DIAMO, s.p., SHR storage	N	([3)])
CZ-X	DIAMO, s.p. Stáž pod Ralskem	A	([3)])
CZ-Y	DIAMO, s.p., GEAM Dolní Rožínka	A	A ([3)])
CZ-Z	216 organisations	All types	0.9
Nuclear material exempt from record-keeping due no non-nuclear uses			1.0
Total 206 licensees			approx. 927.4

1) HEU - highly enriched uranium, LEU – low enriched uranium, P – plutonium, D – depleted ura nium, N – natural uranium, T – thorium
2) SQ – safeguards significant quantity, for plutonium 1 SQ = 8 kg (total weight of the element); for HEU 1 SQ = 25 kg of total weight of 235U isotope, for LEU, N and D 1 SQ = 75 kg of total we ight of 235U isotope; for Th 1 SQ = 20 t
3) Data are subject of trade secret

SÚJB Regional Centre building in Brno *(Photo SÚJB)*

STATE SUPERVISION OF RADIATION PROTECTION
Ionising radiation sources and workplaces with such sources

The scope and exacting character of work associated with the execution of State administration and supervision of radiation protection can be shown on the data on the number of ionising radiation sources and workplaces with such sources. According to Act No. 18/1997 Coll. the ionising radiation sources are divided into five classes, the higher the number – the higher is degree of possible detriment to human health and the environment: insignificant sources, minor sources, simple sources, significant sources and very significant sources. Higher class of a source always means more stringent and extensive radiation protection requirements; the licensing procedure is more complex and requires deeper professional knowledge. Inspection activities are primarily focused on the management of potentially most dangerous sources, and the inspections are more frequent, extensive and more in detail.

Mr. Zdeněk Prouza, Deputy-Chairman for radiation protection

As the workplaces with very significant ionising radiation sources are classified the following ones:

- workplace with nuclear reactors and related technological equipment (details are given in part 2 of this Report), namely 4 power reactors of nuclear power plant Dukovany, 2 research reactors in NRI Řež and 1 school reactor of the Faculty of Nuclear Science and Physical Engineering of the Czech Technical University in Praha;
- Interim Spent Fuel Storage Facility and Radioactive Waste Storage Facility within Dukovany site, Radioactive Waste Repository in "Richard" mine near Litoměřice, High-level Waste Storage in NRI Řež;
- Uranium industry workplaces – mining and uranium ore processing at Dolní Rožínka, cleanup of mining in locality Příbram and closed mine Hamr, cleanup of chemical mining in Stráž pod Ralskem and liquidation of sludge fields Mydlovary;
- workplaces with large industrial irradiators, namely – a workplace for food irradiation (especially – spices) of Artim Praha, s.r.o. and workplace for radiation sterilisation of medical material of Biostér Veverská Bitýška, a.s.;
- workplaces producing, using and distributing unsealed and sealed radionuclide sources with overall high activities, namely Cesio Praha, s.r.o. workplace, Isotrend Praha, s.r.o. workplace and some other,

Reviews of significant and simple ionising radiation sources as of December 31, 1999 are presented in Tables 3.1 – 3.3, according to particular ionising radiation sources.

Table 3.1 Workplaces with unsealed radionuclide sources

	Workplace with **significant** ionising radiation sources (Category III according to Directive 184/97 Coll.)	Workplace with **simple** ionising radiation sources (Category I and II according to Directive 184/97 Coll.)
Medical and veterinary applications	6	136
Industry	0	16
Other applications (research, etc.)	13	135
Total	**19**	**287**

Table 3.1 shows numbers of the workplaces with unsealed radionuclide sources, i.e. workplaces where there are radioactive substances in such a form which does not exclude possibility that they may be dispersed on-site or in the environment. As a rule, these sources are chemical compounds and not "piece" products; in the majority of cases these are radionuclide with very short half-life, and therefore their actual activity drops with time fast. From the radiation protection standpoint, workplaces with significant ionising radiation sources are those with unsealed sources which according to Directive No. 184/1997 Coll. are III Category workplaces. Category I and II workplaces are those with simple ionising radiation sources. (Table 3.1 does not present workplaces with unsealed very significant sources mentioned above.)

Into Table 3.2 are included sealed radionuclide sources, i.e. radioactive substances sufficiently leaded and tested to prove that under all anticipated conditions there will be no radionuclide dispersion within the site nor any release into the environment. Sealed radionuclide sources have character of "pieces" (units), and with exception of calibration sources, are not used directly, but are fitted into the corresponding equipment (for instance – crack detectors or logging sets). Presented numbers of the individual radionuclide sources are not identical with the numbers of equipment with sealed radionuclide sources, since in practice such equipment may contain at the same time several sealed ionising radiation sources, and even in varying numbers (typical for brachytherapy).

Table 3.2 Sealed radionuclide sources

	Sealed radionuclide sources for significant ionising radiation sources	Sealed radionuclide sources for simple ionising radiation sources
Medical and veterinary applications	68	513
Industry	424	2249/3069*)
Other applications (research, etc.)	133	1117/1416*)
Total	**625**	**3881/4441*)**

*) Sealed radionuclide sources, including minor sources

Table 3.3 shows numbers of radiation generators - devices which indeed generate ionising radiation but only during their operation (as an example may serve X-ray facilities). Among the radiation generators (according to Act No. 1/1997 Coll. provisions) are classified only such facilities which generate radiation with energy higher than 5 keV. If there is a possibility (as for instance in X-ray diagnostic facilities) to combine one generator with several X-ray tubes, the number of generators is presented.

Tab. č. 3.3 Radiation generators

	Significant ionising radiation sources	Simple ionising radiation sources
Medical and veterinary applications	1517	5511
Industry	213	356
Other applications (research, etc.)	17	157
Total	**1747**	**6024**

According to Act No. 18/1987 Coll., no license is required for utilisation of minor sources, it is sufficient to notify the SÚJB which at presence registers more that 143 thousand of such sources. Obligation to notify the SÚJB does not apply for insignificant ionising radiation sources, since those are sources which in principle do not endanger either human health or the environment – these sources are not subject of the state accountancy and control.

Emergencies

Sixty-three events involving handling of ionising radiation sources or activities leading to exposure were reported during 1999:

- in 36 cases, the measuring instruments at the entrance to metallurgical works have detected cars (railway wagons, lorries) carrying iron scrap. In 24 of the detected cases scrap was contaminated with natural radionuclides (Ra-226 as a rule), in 13 out of these cases the scrap consisted of tubes contaminated with natural radionuclides contained in mine water. Materials contaminated with artificial radionuclides (mostly Co-60) were detected in 10 cases – steel strips, machine parts manufactured from steel contaminated during melting, etc. In 2 cases, ionising radiation source Sr-90 (1 GBq) and fire detectors with radionuclides were found in the scrap. Following the SÚJB decision, contaminated materials were returned to the transport contractor, isolated and safely stored or disposed;
- in one case, fire detectors were detected at the seat of fire; according to measurements the seat of fire was not contaminated, nether its vicinity – fire detectors were disposed of by a licensed company;
- in 5 cases garbage collecting cars were intercepted at the entrance to communal waste incinerating facility – in all cases fabric (diaper, clothes) contaminated by radionuclides used for treatment and diagnostics at nuclear medicine workplaces (Tc-99m) was found, in two cases ampoules with luminescent paint (Ra-226) were found. All these objects were put in National Radiation Protection Institute store;
- in 5 cases were intercepted (in 4 cases at the border) cars which legally transported materials with increased content of natural radionuclides (ceramic materials, calcined shale); the cars after investigation were released for transport;
- in 2 cases a car with an increased dose rate was intercepted. Investigation has shown that one of the car passengers recently underwent a medical investigation which included application of radionuclides;
- in one case, a foreign citizen suspicious for transporting a ionising radiation source, was intercepted at Prague international airport – an artillery compass (luminous dial – Ra-226) was found;
- 4 cases were spurious alarms – non-confirmed suspicion on the persons exposure, discovery of a suspicious object, non-confirmed contamination of a damp;
- 9 cases were events interesting for the radiation protection issue, some of them had required a special investigation:

1. Three cases were connected with nuclear facilities:

– On January 20, at Cyclotron workplace of Nuclear Physics Institute at Řež during transport of radioactive material (Rb-81) from the hot cell to irradiator, the transport device was damaged and transport casing was broken resulting in contamination of the workplace which exceeded the intervention level from dose equivalent. The licensee immediately took the corrective measures required by the On-Site Emergency Plan to remove the contamination. There was no personnel exposure or leakage of radionuclides into the environment;

– On March 23, in the NRI Řež plc reactor hall an exceeding of the intervention level was signalled. Investigation has shown that as a result of a defect (cleaning disk stuck during manipulation with pneumatic mail), contaminated deposits on the pneumatic mail inner wall surfaces had dispersed. Normal radiation situation had been restored after this cleaning disc was removed. The highest exposure values for the personnel who took part in pneumatic mail handling had not exceeded 0.1 mSv. The SÚJB inspection had taken up with the licensee a change in the cleaning technology. There was no radionuclide leakage to the environment;

– The intervention level was exceeded on May 3, in nuclear power plant Dukovany (for 40 minutes) at the outlet of twin unit block air treatment. During this period there was no increase of radionuclides content in the plant effluents. The event was examined by the Event Committee and an appropriate organisational measure was implemented. This corrective measures consisted in increasing number of the gas flow checking points and supplementing the sound and light signalling which will warn operator on violation of the limiting condition;

2. In the period from February 1 – 9, the measuring point of the National Radiation Protection Institute detected violation of the aerosols investigation level (measured on filters – weekly sampling) – 18 mBq/m3 I-131; as to environmental impact these values are insignificant. The leakage source was not established, some of the nuclear medicine workplaces applying I-131 treatment is under suspicion;
3. Failure of medical irradiation facility (Chisobalt 2B 75 facility) of Masaryk hospital at Ústí nad Labem (radiation source after the pre-set time was not sealed) occurred on May 10 and 11. Two specialists who sealed the source received dose less than 0.25 mSv. Additional exposure of the patient with regard to the applied dose (40 Gy) was negligible;
4. On May 13, at Radiation Oncology Department of Chomutov hospital the source shutters (Chisobalt 2B 75 facility) were not fully closed after irradiation was ended. The situation was registered by an independent dosimetric checking. The primary shutters were then closed manually and the immobile patient was immediately removed from the irradiation room. The worker who closed the shutters received dose of 0.15 mSv;
5. On August 10 during AQUATEST, a.s., Praha logging measurements, the logging probe containing a neutron source Am+Be (111 GBq) was stuck in a pilot drill hole (in Doupovské mountains) at the depth of 203 – 205 m. Extraction of the probe by available technical means was unsuccessful and the SÚJB has agreed to solve this event by pressure cementing of the hole;
6. On October 27, at the border-crossing Rozvadov a Hungarian lorry carrying scrap was stopped at the German side of the border. The German party returned lorry to the Czech Republic territory because of an increased ionising radiation dose rate. On-spot measurement has confirmed presence of a radioactive material, which was a localised Co-60 source (4 GBq). Performed detailed measurements of the load confirmed that the maximum dose rate did not exceed 0.9 mGy/h, the dose rate in the driver cabin was less than 0.5 mGy/h. Upon the SÚJB decision the lorry was returned to Hungary;
7. A radiological event caused by a human error occurred on December 14 at the Radiotherapeutical Department of the Motol hospital in Prague. During irradiation of a patient by a linear accelerator the radiation field centre was set up erroneously. As a result or this error, the patient received an unplanned local dose of 35 Gy. The hospital immediately corrected her irradiation plan to comply with the original irradiation strategy, and she underwent a special tests and examinations programme. The corrective measures were taken, their efficiency will be monitored by the SÚJB.

Licensing of workplaces with ionising radiation sources

Handling of very significant, significant and simple ionising radiation sources and some other operations with these sources are allowed only on the basis of a SÍJB license issued in accordance with Act No. 18/1997 Coll. and/or till July 1, 2002 also on the basis of a license issued conform to Directive No. 59/1972 Coll. More than 6300 such licenses have been issued in the Czech Republic to legal persons, majority of which operate in the health care area. Since a license is needed for both the specified by the Act handling of sources and for operation of a workplace with significant and a very significant source, there are legal persons that hold several licenses. On the other hand, in some cases more than one license may be required for the same source if it is handled by several legal persons. At present, the SÚJB prepares a central computerised database – a special register of the licensees.

No license is needed for using minor sources; under the Act No. 18/1997 Coll. provision an user of such a source is only required to notify the SÚJB. For insignificant sources neither a license nor notification is required, since those are ionising radiation sources which in principle do not represent any hazard for human health or the environment.

In 1999, the SÚJB issued 3063 decisions, 2300 of them were issued by Regional Centres and 763 by the SÚJB Headquarters. These figures represent a 50 % increase compared with 1998. Majority of these licenses were ones for handling ionising radiation sources under Act No. 18/1997 Coll.,

Article 9, Paragraph 1, letter i) (mainly for using sources and acquiring radionuclide sources); operating licenses for workplaces with significant or very significant ionising radiation sources represented only a smaller a small fraction, there were also single cases of operating licenses for workplaces handling significant or very significant ionising radiation sources, as well as some other decisions.

A significant effort was connected with administrative procedures related with transfer of the radioactive waste repositories under state administration.

Radiation protection activities at nuclear power plant Temelín were focused on approval of documentation required under the Atomic Act – monitoring programmes for persons, workplaces, environs and effluents, specification of controlled zones, proposal of the decommissioning.

Licensing activity at nuclear power plant Dukovany, at NRI Řež and uranium industry and some other workplaces with very significant ionising radiation sources was focused on compliance of the documentation and operational practice with the Atomic Act requirements, especially in the areas of radioactive waste management and releasing radionuclides into the environment. Licensing of PET Centre – the joint workplace of the NRI Řež and Na Homolce hospital, producing diagnostic radiopharmaceuticals based on positron emitting sources, was another specific issue.

The figures presented above cover also decisions on the source type-approval under Article 23 of the Atomic Act, and at present very frequent decisions relating to basic documentation changes (especially monitoring programme and on-site Emergency Plan) to make this documentation fully conform to the Atomic Act provisions. However, into the mentioned number of decisions, are not included 971 specific decisions issued on the special professional competence for activities, especially important for radiation protection, 752 of them were issued by Regional Centres and 219 – by the SÚJB Headquarters.

It should be expected that with the forthcoming end of the transition period (validity of licenses issued under the old legislation ends by July 1, 2002) an increase in the application for handling ionising sources will continue, since a significant share of current users postpones application for a new license trying to put off the exacting administrative proceedings with more stringent requirements especially to the submitted documentation. The SÚJB inspectors are aware of this fact and focus their attention accordingly.

Inspections

Throughout 1999, inspections were carried out applying a combination of the territorial principle and professional specialisation of the inspectors, having in mind costs optimisation and improving inspectors capability. Practical experience shows that this is the only possible solution under the conditions when number of radiation protection inspectors is limited (51) and these inspectors, besides inspection activities, take also part in an extensive licensing-related work and in fulfilment of other SÚJB tasks required by the Atomic Act.

In accordance with such standpoint, inspections are divided into those performed by the SÚJB Regional Centres (RC) – carried out exclusively by the individual RC inspectors and the specialised ones – carried out by specialised inspection teams nominated by the Deputy Chairman for Radiation Protection and consisting of the radiation protection inspectors of the SÚJB Headquarters and those from various regions. The specialised inspection teams activities are focused on the specific types of ionising radiation sources and workplaces handling these sources (for instance – workplace with significant or very significant unsealed radionuclide sources, nuclear power workplaces, uranium industry, etc.). This system of inspections is complemented by ones carried out by ad hoc inspection teams, particularly for time- and effort-consuming inspections at workplaces with very significant sources.

Inspections are evaluated as one of four categories established according to the following criteria:

Systém hodnocení inspekcí je čtyřstupňový podle následujících kritérií:

I. radiation sources handling procedures are fully conform to the legislative requirements
II. formal deficiencies exist which do not affect the radiation protection level
III. deficiencies exist which require implementation of corrective measures, or the activity has to be limited or suspended
IV. serious deficiencies exist requiring withdrawal of the license, or there is an evidence of radiation sources being handled without an appropriate license.

Inspections performed by the SONS Regional Centres

Inspection activity of Regional Centres is carried out based on the approved semi-annual plans prepared by the individual Regional Centres. The overview of ionising radiation sources makes it obvious that the radiation protections inspectors can not visit in a year all licensees and all workplaces. The inspection plan therefore is usually prepared taking into account the following principles:

- inspect at least once in two years all workplaces with significant sources used in the industry;
- plan and perform inspections at medical X-ray workplaces with significant sources so that all of them (approximately 1550 – see table 3.3) are inspected by the end of 2000;
- on the basis of questionnaire proceedings organised for simple sources inspect preferentially "problematic" workplaces where deficiencies may by expected;
- for natural sources – focus attention on the water suppliers, producers of drinking and baby water, manufacturers and importers of building materials;
- systematically inspect significant ionising radiation sources rather than simple ones.

As to the scope, the Regional Centres inspections were focused on:

- checking on the process of harmonising practice with the new legislation – content and structure of documentation required by the new legislation – quality assurance programmes, monitoring programmes, Emergency Plans;
- checking on the long-term stability tests performed on sources used for therapeutical purposes and diagnostics (regulating patients exposure).

The total number (1555) of Regional Centres inspections in 1999, compared with 1998, was significantly higher (approximately by 25 %), as a result of a positive effect of standardised procedure and of the fact that licensees got more accustomed to new legislation; in 1998 inspections had to include a methodical and explaining parts which was time consuming.

In 1999, Regional Centres performed 1113 inspections focused on handling of artificial ionising radiation sources, 851 out of them were at workplaces of human and veterinary medicine, 182 inspections – at industrial workplaces and 80 – at other workplaces. 90 % of all these inspections were classified as level I and II, 9 % - as level III (absence of obligatory documentation, inadequately equipped workplace with respect to radiation protection assurance, non-observance of the monitoring programmes – the appropriate corrective measures were implemented) and less than 1 % as level N – utilisation of a source without license or with a license issued for already extinct legal person (reorganisation). These cases are investigated, corrective measures are required, in some cases an administrative proceedings were started (7 fines were imposed in 1999).

In 1999, Regional Centres performed 442 inspections of natural sources, 174 of them – at building materials manufacturers, 229 – at water producers, 4 – at bottled water producers and 35 – at workplaces with an increased natural radiation. None of these inspections was evaluated as level N. Into I and II level group were included 95 % of the inspected persons, 5 % was evaluated as level III (mostly due to non-observance of the required interval between measurements and in some cases – exceeding of the target values in supplied water or produced building material).

Special inspections

Radioactive waste management and release of radionuclides to the environment

The Specialised Inspection Team performed 14 scheduled independent inspections focused on the radioactive waste management at the NRI Řež plc, AEAO Praha, a.s., ÚJP Škoda Zbraslav, a.s., ZAM-SERVIS Ostrava, s.r.o., ČEZ, a.s. – NPP Dukovany and NPP Temelín, Physiological Institute of the Czech Academy of Sciences, Cesio, s.r.o., Isotrend, s.r.o., and one inspection – to check on the fulfilment of requirements specified in the protocol at ARAO Praha, a.s.

At some workplaces deficiencies were found in radioactive waste storage; there was one case when exceeding of discharge levels for incinerated waste was not documented, liquid waste were not stored as required by Article 25, paragraph 1, letter c) of the SÚJB Directive No. 184/1997 Coll.; in one case a non-compliance with the radiation protection Directive requirements (Article 25, paragraph 1, letter c) of the SÚJB Directive No. 184/1997 Coll.) was found. However, the majority of inspected licensees, had remedied deficiencies in the documents keeping (especially – non-complete documents accompanying radioactive wastes).

Two licensees were evaluated as level I, 11 licensees – as level II and one licensee – ČEZ, a.s. – NPP Dukovany) as level III, the plant failed to meet conditions of the SÚJB decision (implementation of sludge and ion-exchange resins treatment).

Uranium industry

In 1999, a total of 56 scheduled inspections and 1 unplanned inspection (DIAMO-CHT, documentation checking) and one local investigation (clean-up of Damětice locality and discharge to the environment – locality Ústalec) were performed. 23 of these inspections were focused on the workplaces operation, 21 – on fulfilment of the SÚJB license conditions and 12 inspections – on documents control.

Within administrative proceedings, 54 SÚJB decisions concerning uranium industry were issued, 42 of them were licenses or documents approvals, in 12 cases the administrative proceedings were suspended due to deficiencies in the applications. A total of 41 workers obtained special professional competence certificates which had a positive effect on the radiation protection level of the licensees. The SÚJB issued written statements within the administrative proceedings of other bodies, in the majority of these cases SÚJB specialists either took part in the proceedings or carried out own local investigation, or made comments during relevant discussions. Five inspections were carried out jointly with the National Mining Office (OKD-mine ČSA, ČMD Kladno, Radioactive Waste Repository Bratrství, mine Svornost Jachymov and Czech Republic Forests LS Horní Blatná).

27 licensees were evaluated as level I, 24 – as level II and 5 – as level III (primarily for not observing the controlled area regime, inadequate preparedness for forthcoming inspection and deficiencies in the monitoring programmes).

Nuclear medicine workplaces and workplaces with open radiation sources of II and III categories

In 1999, there were 47 inspections of workplaces with unsealed radionuclide sources, 42 of them were nuclear medicine workplaces and 5 – other workplaces.

Three workplaces failed to document results of the workplace monitoring programme, 4 workplaces did not keep records of waste monitoring, one workplace did not have records of the imaging equipment tests. Two workplaces did not have The range of the Quality Assurance system implementation at various workplaces varies. Similarly also varies the level of workplaces monitoring – some of the instruments are obsolete, new instrumentation or back-fitting of workplaces with measuring instruments or protection aids was recommended for 9 workplaces with the objective to improve working conditions in handling unsealed sources.

Out of total number of visited workplaces, 21 were evaluated as level I, 25 – as level II, 1 workplace – as level III (Nuclear Medicine Department of Olomouc hospital did not submit required documentation by the deadline and even after its prolongation).

Nuclear power plants and research reactors

A total of 7 inspections at nuclear power plants Dukovany and Temelín were focused on observance of radiation protection conditions. During inspections at Dukovany NPP, the SÚJB made 21 records in "Operative Contacts Log" concerning Central Register of Simple and Significant Ionising Radiation Sources, record-keeping, computer database of information important for radiation protection, updating of operating procedures and instructions, provision of the monitoring service, both for nuclear power plant and its contractors.

At Temelín NPP specialised radiation protection inspections were focused on compliance of the documentation and practice with the Atomic Act requirements, especially in the areas of radioactive waste management and discharges of radionuclides to the environment.

Out of 7 inspections, 3 were evaluated as level I, 4 – as level II.

Regulating professional exposure

Occupational exposure at the workplaces with ionising radiation sources was supervised by five currently existing dosimetric services: National Personal Dosimetry Service Praha, s.r.o., dosimetric services of nuclear power plants Dukovany and Temelín, dosimetric service of the NRI Řež plc and dosimetric service of the Institute for Expertise and Emergencies which monitors occupational exposures in the uranium industry (DIAMO, s.p.). In 1999, a license for calculations of aeronautics individual doses was granted to the Institute of Dosimetry. Records for approximately 20 thousand monitored workers were entered into the Central Register of Occupational Exposures kept at the SÚJB.

- At Dukovany NPP, 2261 workers were monitored (881 of them were NPP own employees and 1380 were contractors employees), the overall collective effective dose was 1387.6 mSv and the average individual effective dose – 0.61 mSv, the highest individual annual effective dose received one contractor's worker (12.37 mSv), the highest value of the effective dose commitment from internal contamination was again for one contractor's worker (0.24 mSv);
- in uranium industry (operating mine Dolní Rožínka) in 1999 in under-surface and above-surface workplaces were monitored 503 people, the overall collective effective dose was 4.47 Sv, the average individual effective dose – 8.89 mSv, the highest individual annual effective dose was 38.84 mSv (under-ground);
- 4500 persons were supervised in other industrial applications, their average individual dose varied within 1 – 2 mSv interval; higher doses are connected with crack detection (1.85 mSv) and logging (1.5 mSv);
- doses of 10 thousand workers were evaluated at medical workplaces with ionising radiation sources, 35 % of these persons had the annual efficient dose below the recording level, the average individual effective dose for the remaining 65 % was 1.6 mSv; the average annual effective dose of physicians – cardiologists was roughly 2.5 mSv, nuclear medicine doctors received monthly 2.1 mSV;
- a group of specialised profession, as servicemen and inspectors of the sources reached an average annual individual dose of about 1 mSv.

The collective effective dose in 1999 was assessed as 16 mSv and the average individual effective dose for one monitored person as 1.0 mSv.

In 1999, none of the workers exceeded the valid annual individual dose limit of 50 mSv. The SÚJB inspectors examined 15 cases when dosimetric services reported single exposures (within the inspection period) of personal dosimeters higher than 20 mSv. In 11 of such cases persons worked in health service, two persons – in the industry (crack detection) and two – in uranium industry. In all cases investigated in the health service area, the persons testified that they had used protective apron; therefore the doses were recalculated for attenuation, after which all recalculated individual effective doses were below 20 mSv.

From the doses evaluation for 1998 (the Central Register treats data during the second quarter of

the year following after that for which the data from dosimetric services were received) followed that 30 workers exceeded summary annual individual effective dose of 20 mSv; 23 of them were employed in the health service and 7 in crack detection service.

The conclusions of the investigations confirm that in the case of medical personnel the situation repeats itself for several years and the persons concerned are physicians who perform complex interventions, their increased exposure is obviously connected with the duration of such examinations – it can not be said that the conditions of a particular license for handling ionising radiation source were violated, however, a special attention should be paid to these cases and the radiation protection conditions should be optimised. An explanation of higher doses of the crack detection servicemen was that the dosimeter was left laying near the sources and thus the dose was not personal.

Regulating public exposure

In reducing population exposure the main effort was concentrated on reducing radon related exposure in buildings which represents the major part of the overall public effective dose in the Czech Republic. This component of the persons exposure has a very wide range, while exposure levels, according to the experience of several past years, can be controlled with reasonable costs involved. Another important component of the population exposure which the SÚJB made every effort to reduce, was medical exposure – exposure of patients who undergo medical treatment or examinations which involve application of an ionising radiation source.

Medical exposure

The issue of monitoring and evaluating the population exposure from the sources used in medicine was for its radiodiagnostics area addressed in close collaboration with the National Radiation Protection Institute, and for nuclear medicine – with Faculty Hospital Olomouc. In nuclear medicine area special attention was focused on children patients up to 18 years of the age. During 1999, 150281 patients of this group were examined which represents 7.5 % of the total number of examinations. The calculated collective effective dose was 44 Sv (approximately 5 % of the total collective effective dose). The average collective dose per one examination is then about 2.5 mSv, which is significantly lower that for adult population (around 5 mSv). In these age groups in our Republic are urological examinations traditionally most frequent, representing 81 % of all examinations, they represent 65 % contribution to the collective effective dose. Within the Governmental task focused on elaboration of the procedures for checking compliance with the derived values established in Direcive No. 184/1997 for medical expositions, a draft proposal of the Quality Assurance programme for nuclear medicine workplaces has been prepared. This proposal supported by the Nuclear Medicine Society will be passed on the nuclear medicine workplaces and will primarily serve as a guide for preparing the documents to be approved by the SÚJB.

In the radiodiagnostics area, in 1999 were finished measurements necessary to determine effective doses for some specialised examinations – especially angiographic and digestive system examinations. The calculated doses for these examinations lie in the range of 3 – 10 mSv per examination. Present status of keeping at the workplaces records required to calculate doses received during such examinations was monitored within the same task. Deficiencies in the record-keeping found together with Nuclear Medicine Society will be emphasised in the subsequent SÚJB recommendation.

Exposure from natural sources

The SÚJB in co-operation with the National Radiation Protection Institute and District Administration bodies continued screening of persons living in houses with inadequately high radon risk. The relevant statistics are always prepared for the whole previous calendar year. However, results of the measurements are transmitted to house owners regularly, and if an increased radon

risk is identified, the owners are also informed that they can apply for a contribution from the state budget to cover a part of the remedial anti-radon measures.

Table 3.4 Results of the programme on identification of dwellings with higher radon risk

Number of houses measured	Number of houses where the equivalent radon volume activity was within the following range (Bq/m^3)			
	> 200	200 – 299	300 – 600	> 600
5 257	**1171**	**533**	**455**	**183**

The database resulting from the targeted screening which enables, in addition to routine outputs, also a map processing of the results down to the level of individual communities and an anticipated radon risk prediction for these communities houses, is used routinely.

In this area, the SÚJB (directly or through the National Radiation Protection Institute) was fulfilling its obligations imposed especially by the Czech Republic government Decree of May 31, 1999 on Radon Programme. Within this programme were prepared:

- information for the Government "Analysis of the Financial Means Expended for Radon Programme since 1990"; the information was accepted by the Government in November 1999;
- "Rules for Distribution of Financial Means Allocated in the State Budget for Population Protection against Radon Exposure, and Criteria for Assigning State Support for Anti-Radon Remedial Measures" (transmitted to District Administration bodies and Municipal Authorities) on November 29, 1999;
- The SÚJB Chairwoman Directive No. 21 of December 7, 1999, on ensuring Radon Programme of the Czech Republic;
- "SÚJB Principles for Allocating and Utilising Non-Investment Grants from the State Budget for Identifying Buildings with Increased Radon Concentration for District Authorities in 1997" which contains a reference Agreement on allocating non-investment grants for implementation of "Methodology for Identifying Buildings with an Increased Radon Concentration" prepared by the National Radiation Protection Institute.

In 1999, the district administration bodies received from the SÚJB budget 1 333 200 CZK in the form of non-investment grants provided for distributing and recovering the radon trace detectors in (and out) flats in the identified buildings with a higher radon risk. A sum of 4 804 978 CZK was spent on manufacturing detectors and their dosimetric evaluation. A sum of 1 500 000 KCZ was invested in other SÚJB activities relating to this Programme (briefing, agenda, database) and development of the methods for radon risk evaluation.

Medical aspects of radiation protection

In 1999, the SÚJB examined 76 suspect cases of occupational disease which included:

- 62 lung cancers and 4 other diseases (lymphoma, basaliom, intestine cancer, blood formation malfunction) in uranium mine workers. In 23 lung cancer cases and basaliom, the probability of causal nexus between disease and work in uranium mines was evaluated as predominating, two cancer cases were borderline. In all other cases the casual nexus between disease and work in a ionising radiation risk environment was not proven;
- 10 cases of other professions – 6 lung cancers, 2 cases of chronic radiation dermatitis, 1 basaliom case and 1 breast cancer case. In lung cancer cases the probability of a causal nexus between risk and work in risk environment was found predominant for one patient (work in ore mines), three were borderline cases, in the remaining ones no casual nexus was established.

Assessment of foetal dose caused by mother radiodiagnostic examination was performed in 20 cases. In 18 of them the equivalent dose estimate was lower than 5.0 mSv, in two cases – it was higher than 10.0 mSv (10.1 and 11.2 mSv). Foetal dose estimate was requested in two cases when

mother was examined by nuclear medicine procedure, in both cases the dose estimate was lower than 5.0 mSv. Practically always, reports were transmitted to Genetic Advice Centre, in one case – to the physician who had asked for an estimate.

Within the framework of our legislative harmonisation with that of the European Union and while striving to optimise the medical exposure, the SÚJB had a number of discussions with Radiological Society committees, Nuclear Medicine Society, Czech Ministry of Health, General Health Insurance Company and other health service institutions. Harmonising Czech legislation in the medical exposure area was a major objective of our participation in the Working Group meeting in Luxembourg and of the visit to Radiation Protection Institute in Ireland.

Negotiations with the Ministry of Health Head Hygienist led to changes in the medical evaluation of Category A workers (in the sense of Act No. 18/1997 Coll.) which is now conform to the European Union legislation (Directive 96/29/Euratom); considerable attention was paid to implementation of this change into practice.

Continued programme of medial aid to persons exposes during accidents, in this connection – a seminar was organised at the Professional Diseases Clinic focused primarily on providing assistance to workers with internal radioactive contamination.

Within evaluation process of the traumatological plan of nuclear power plant Temelín, a special attention was paid to iodine prophylactics; this matter was taken up with the plant management, Ministry of Health, Society for Endocrinology and some other institutions.

Central registers and databases in radiation protection

In the period 1997 – 1999, the SÚJB Radiation Protection Section was developing tools for administration of the state monitoring system as required by the Atomic Act – central registers of occupational exposure, ionising radiation sources, licensees and notifying persons and of population exposure resulting from utilisation of ionising radiation sources in medicine and exposure from natural sources.

Central Register of Occupational Exposures

At present, 2.0 version of this register is used routinely at the SÚJB workplaces in Prague. The register is fully operational, comprises tools for processing of updated data coming from their suppliers to update its own database. The register permits to search out information on filed workers, collective information for individual workplaces or professional groups and the collective information as the statistical outputs according to selected parameters.

Register of Sources

The application is in a trial operation, it allows to search out and to represent the historical data on the filed sources, it also contains tools for managing the agenda relating to the individual sealed sources, facilities with sealed sources, facilities with unsealed sources and generators of ionising radiation. At present, utilisation of the registration cards proposed for the individual types of sources is being checked on. The cards were sent to selected licensees and their data are subsequently filed into the Register of Sources.

Register of licensees and notifying persons

In 1999, the Register of licensees and notifying persons have been implemented as an integrating tool for registers used at the SÚJB. The Central Register of Occupational Exposure and Register of Sources are both already connected with this register; Register of Nuclear Materials and Register of Decisions (now under preparation) will be gradually connected, as well.

Central database of medical expositions

This database contains data provided upon the SÚJB request by the General Health Insurance Company, and it is maintained independent on the mentioned registers. These data enable to establish (for the X-ray diagnostics and nuclear medicine purposes) frequencies of the individual types of examinations for selected age groups in dependence on their sex. In case of nuclear medicine, it is possible to identify also the amount of radiopharmaceutical used in each examination. Data are anonymous as concerns workplaces and persons.

Radioactive waste management, discharge of radionuclides into the environment and decommissioning of nuclear facilities

Nuclear power plant Dukovany

According to a SÚJB Decision, Dukovany NPP received license for nuclear waste management under Article 9, paragraph 1, letter j) of Act No. 18/1997 Coll. and for discharge of radionuclides into the environment as effluents under Article 9, paragraph 1, letter h) of the same Act. ČEZ, a.s.–Dukovany NPP had applied for a change in the deadline for implementation of the sludge and ion exchangers treatment technology which allows to transfer such waste into a suitable for disposal form. The SÚJB granted such permission, since supplements to the safety analyses of the Dukovany storage facility shall be necessary to include so treated waste, and consequently postponed the deadline for this technology implementation till May 31, 2001.

The ownership of the Regional Radioactive Storage Facility, in accordance with the requirements of Act No. 18/1997, was transferred to the state so it will be managed by the Nuclear Waste Repositories Administration which holds the relevant licenses under Article 9, paragraph 1, letters d), i) and j) of Act No. 18/1997 Coll.

Nuclear power plant Temelín

ČEZ, a.s–Temelín NPP submitted application for a nuclear waste management license. The SÚJB after assessing the submitted documentation, asked for additional documents, the administrative proceeding were therefore interrupted.

In 1999, the SÚJB approved the ČEZ, a.s.-Temelín NPP proposal on the NPP decommissioning, thus that the decommissioning reserve will begin to accumulate immediately after the plant is put into operation.

NRI Řež plc

In 1999, the SÚJB focused its attention on implementation of new legislative requirements into the practice of this nuclear facility. Licenses for discharge of radionuclide into the environment, radioactive waste management were issued; decommissioning procedure for experimental reactor LVR-15, zero-power reactor LR-0 and workplaces with significant ionising radiation sources and High-Level Waste Storage Facility were approved under the condition that according to relevant provisions of Act No. 18/1997 Coll. these proposals will be systematically and fully re-evaluated.

Nuclear facility – Radioactive waste repository "Richard"

ARAO Praha, a.s. which managed the radioactive waste repository "Richard" ceased to operate by the end of 1999; the licenses issued by the SÚJB for ARAO will be invalidated.

In compliance with the provision of Act No. 18/1997, Article 16, paragraph 7 and upon the SÚJB consent, the legal successor became the Nuclear Waste Repositories Administration which holds a radioactive waste disposal license, a license for operating workplaces with a very significant source and a license for handling a very significant source.

The SÚJB approved the "Richard" decommissioning procedure.

Other facilities

Within the licensing procedure for the workplace with very significant ionising radiation source – Bratrství, selected for disposal of radioactive waste containing natural radionuclides, its decommissioning proposal was reviewed and approved. The applicant shall remove some deficiencies and amend the proposal in the sense of the relevant legal provisions; the updated proposal shall include, besides other, analysis of emergencies which may occur in the course of decommissioning, the deadline is December 15, 2004.

Licenses for the radioactive waste management, waste collection, classification, treatment and processing were issued to ISOTREND Praha, s.r.o., Zam-servis Ostrava, s.r.o., ŠKODA-ÚJP Zbraslav, a.s. The maximum allowable amount of solid and liquid radioactive waste to be stored was approved for ŠKODA-ÚJP Zbraslav, a.s. For the second time the SÚJB interrupted the administrative proceedings on the radioactive waste management license for ALLDECO.CZ, a.s. with place of business at Hodonín, since the application did not include the Limits and Conditions for waste safe management.

The SÚJB has approved for the DIAMO, s.p., "Chemical Mining" at Srtáž pod Ralskem a proposal of decommissioning for the workplace with very significant radiation sources under the condition that the licensee will update the proposal to be conform to the Atomic Act provisions not later than by December 31, 2003.

EMERGENCY PREPAREDNESS

Emergency Preparedness Department and Emergency Response Centre

In 1999, the SÚJB in co-operation with the Ministry of Interior–Headquarters of the Fire Protection Rescue Corps of the Czech Republic prepared proposal of the Ministry of Interior Directive No. 25/2000 Coll. which provides a detailed guideline for preparation of District Emergency Plan and Off-Site Emergency Plan.

Again in co-operation with the Ministry of Interior–Headquarters of the Fire Protection Rescue Corps of the Czech Republic, the SÚJB reviewed a working proposal of the Temelín NPP Off-Site Emergency Plan, prepared under co-ordination of the České Budějovice district authority; comments were discussed on December 1, 1999, the Temelín NPP off-site Emergency Plan will be prepared in compliance with the mentioned Directive of the Ministry of Interior.

Within the sub-committee for radiation protection and its working Group for Radiation Accidents the SÚJB participated in the preparation of the Czech Government Resolution on transferring tasks of the Governmental Emergency Commission on Radiation Accidents under authority of the National Security Council, i.e. Committee for Emergency Planning and Interministerial Crisis Headquarters. The document was submitted to the sub-committee for public protection, and at the second meeting of this sub-committee it was approved to be transferred to the Committee for Civic Emergency Planning for further negotiations.

In compliance with the schedule of the IAEA RER/9/050 "Harmonising of Regional Emergency Preparedness in Case of Nuclear Accident" programme, the SÚJB organised an international seminar on the classification of VVER-440/213 and VVER-1000/320 accidents. The seminar which took place on 17 –19 of May, 1999 concluded that the classification system introduced in the MAAE Guide TECDOC 955 should be modified. Within the same programme, the SÚJB also co-ordinated (in the sub-committee for public protection and its working group for radiation accidents) analytical effort on the Czech Republic preparedness for radiation accidents. The analysis had been transmitted to the IAEA.

In 1999, the Emergency Response Centre activities were focused on ensuring its routine operation. New versions of the codes for processing the Early Warning System data were installed, as well as that for Critical Safety Functions evaluation; Critical Safety Functions code was verified using real data. The Early Warning System programme was tested by transmitting SMS using GMS Paegas network. The Emergency Response Centre central database archive was completed. Effort connected with technical and organisational issues of Warning System for Liaison Points, continued so that the IAEA requirement on uninterrupted reception of information was met. System "DAVID" (simultaneous reception of fax-server, voice and reports transmission for workers) serves that purpose.

Within process of accession to the European Union, a preparatory work was started in connection with planned access to the radiation accident notification system – ECURIE.

System of data transmission from Dukovany NPP to the Emergency Response Centre operated in a trial mode, some technical defects were rectified, the standby data transmission system operation was checked.

The SÚJB has started discussions with Temelín NPP on detailed on-line transmission of selected technological, radiation and meteorological data from the plant to the Emergency Response Centre, which should enable an independent evaluation of the plant status in the event of radiation emergencies and accidents.

Participation in emergency preparedness exercises

On June 15, 1999 the SÚJB took part in the international communication exercise of Liaison Points of the countries participating in the IAEA programme "Harmonising in the Emergency Preparedness Area". In the exercise itself were engaged also the Czech Republic Civil Protection agencies. The exercise confirmed that all participating Liaison Points are prepared to transmit and to receive information in significantly shorter time than that required by the IAEA.

Data, information and maps transmission between the SÚJB Liaison Point and the District Administration Offices in Třebič, Znojmo and Brno-venkov (Dukovany NPP Emergency Planning zone extends to their territories) was tested on June 16, 1999 using various communication means (telephone, fax, e-mail). The test has demonstrated that there are some deficiencies in the mutual communication, especially in e-mail connection, and that some of receiving parties in district offices (whose telephone numbers had been reported to the SÚJB for the test purposes) are not well informed.

On November 18, 1999 Dukovany NPP tested its emergency preparedness with the objective to verify whether the relevant activities are carried out in compliance with the On-Site Emergency Plan. During this exercise, data transmission from Dukovany plant to the SÚJB and between the SÚJB and Czech Hydrometeorological Institute and district offices within the Dukovany Emergency Planning Zone was checked. Within the same exercise was tested also notification of Liaison Points of the countries included into the particular working group (Slovak Republic, Poland, Hungary, Slovenia, Croatia, Rumania) – in accordance with the IAEA project "Harmonising in the Emergency Preparedness Area".

These exercises went well according to the prepared scenarios; notification tests demonstrated Liaison Points preparedness.

Supervisory activities at nuclear facilities and at very significant sources

Nuclear power plant Dukovany

In compliance with the 1999 plan, the SÚJB performed inspection focused on fulfilment of the main requirements for adequate emergency preparedness of the Dukovany plant. A special attention was paid to conformity of the real emergency preparedness status to the approved document "ČEZ-EDU On-Site Emergency Plan", in detail was checked process of TSC construction and preparation for its operation.

In Co-operation with the District Administration Bodies, Headquarters of Civil Protection of the Czech Republic and Dukovany NPP, the SÚJB participated in continued improving of mutually acceptable warning system for the administration bodies and complementing information available for warning inhabitants within the Dukovany NPP emergency planning zone (for cases of Public Warning system failure or its spurious actuation). In this connection and within the SÚJB participation, the manual on public protection within the off-site emergency planning zone (annually issued by Dukovany NPP) was reviewed.

Nuclear power plant Temelín

In 1999, the SÚJB was checking and evaluating progress in development of the Temelín NPP On-Site Emergency Plan. To accelerate preparation of this document and to improve its quality, the SÚJB was making operative comments to the working revisions of the Plan's individual parts.

In fourth quarter of 1999, Temelín NPP submitted its "On-Site Emergency Plan" for the SÚJB approval. The SÚJB has approved the document in December 1999, and within the proceedings had discussed with the District Authorities concerned (České Budějovice, Písek, Prachatice, Strakonice, Tábor) the links between this plan and the off-site emergency plan.

The SÚJB assessed the draft proposal of manual "Public Protection in Case of Temelín NPP Radiation Accident", the SÚJB comments were taken into account and accordingly modified manual was printed in December 1999. At the same time went out of print a 2000 calendar with basic information on public protection in case of a radiation accident.

Other facilities and sources

In the course of 1999, the SÚJB had assessed 7 on-site emergency plans of other nuclear facilities and workplaces with very significant ionising radiation sources submitted by the licensees, as well as 3 emergency rules. An individual decision approved the on-site emergency plan of the Radioactive Waste Storage Facility within Dukovany NPP site. Other on-site emergency plans and emergency rules were approved within the licensing proceedings under provisions of Act No. 18/1997 Coll., Article 9. Revision of NRI Řež plc in the sense of Article 18, paragraph (2) of the SÚJB Directive No. 219/1997 Coll. is still under discussion. Reviewed and subsequently approved

were: "Emergency Rules for Transport of Radioactive Materials with Low Specific Activity", "Emergency Rules for Transport of Radioactive Materials within the Dukovany NPP Site" developed by the DIAMO, subsidiary GEAM Dolní Rožínka and "Emergency Rules of Czech Rail for Uranium Concentrate and Spent Nuclear Fuel Transport".
A greatest effort was spent in evaluating on-site emergency plans of the radioactive waste repositories Richard, Bratrství and Dukovany. As a part of the documentation required for such evaluations the licensees submitted analyses of theoretically feasible accidents and analyses of their consequences. These analyses, which took into account composition and form of stored radioactive waste, technical design of the repository and possible kinetics of an accident development, demonstrated that the radiation accident which would require implementation of off-site emergency planning, can not occur. This was a reason, why for these facilities under conditions following from Act No. 18/1997 and SÚJB Directives No. 184/1997 Coll. and No. 219/1997 Coll. is not necessary to establish the emergency planning zones.
An active approach of the SÚJB resulted in licensees becoming more attentive to the emergency preparedness issue, their knowledge and understanding of requirements related to the emergency preparedness has improved and consequently - quality of their new or revised on-site emergency plans has improved. The SÚJB also reviewed a number of exercise scenarios prepared within 1999 plan for the individual organisational units of subsidiary GEAM, s.p. DIAMO, Dolní Rožínka.

NATIONAL RADIATION MONITORING NETWORK

The SÚJB co-ordinates activities of the National Radiation Monitoring Network of the Czech Republic, and together with the National Radiation Protection Institute acts as its Headquarters. Results of monitoring are summarised in the Annual Reports on Radiological Situation within the Czech Republic Territory which are submitted to the Governmental Emergency Commission on Radiation Accidents and to the public through District Administration bodies, health centres and libraries.

Dr. Radim Filgas, Director of the National Radiation Protection Institute

The National Radiation Monitoring Network (RMN) operates in two regimes: the normal regime – for monitoring the actual radiation situation and early detection of radiation accidents, and the emergency regime – for evaluation of such accidents consequences. The normal regime represents continuous operation of so called permanent units of the RMN, in the emergency regime become additionally engaged the emergency units. Several subsystems which include selected or all permanent RMN units operate in the normal monitoring regime. These subsystems can be divided into the following groups:

- Early warning network which comprises 58 measuring points automatically transmitting the measured data. These points are operated by the SÚJB Regional Centres, National Radiation Protection Institute, Czech Hydrometeorological Institute and Civil Protection of the Czech Republic;
- Network of 11 permanent measuring points of the Czech Army which under normal conditions monitor radiation situation twice a day, and regularly transmit the obtained results to the RMN central database. Under emergency conditions, this network works in an intensive regime – according to the SÚJB requirements. Activity of the permanent points is supported by the emergency points system which is put into operation upon the SÚJB direction in emergency situations;
- Territorial network of 184 measuring points (TLD network) equipped with thermoluminiscent dosimeters which is run by the National Radiation Protection Institute and the SÚJB Regional Centres;
- Local TLD networks with 90 measuring points in the surroundings of Dukovany and Temelín nuclear power plants operated by Environmental Radiation Monitoring Laboratories of these plants, the SÚJB Regional Centre in Brno and with 3 measuring points operated by the Institute for Expert Reviews and Emergency Management at Kamenná;

- Territorial network of 11 contamination measuring points operated by the SÚJB Regional Centres, Environmental Radiation Monitoring Laboratories of the NPPs, National Radiation Protection Institute and Institute for Expert Reviews and Emergency Management;
- Network of 9 laboratories (6 laboratories at the SÚJB Regional Centres, 2 Radiation Monitoring laboratories and 1 laboratory of National Radiation Protection Institute) equipped for gamma-spectroscopic and radiochemical quantitative analyses of radionuclides in environmental samples (aerosols, fallout, foods, drinking water, animal food, etc.)

No extraordinary radionuclide release occurred in 1999, none of the established investigation levels was exceeded at any of the measuring points. Variations in the measured dose rate values were due to natural background fluctuations.

Monitoring of artificial radionuclides in the environment

The monitoring programme is designed to follow the time and spatial distribution of radionuclide activities and ionising radiation doses within the Czech Republic territory in order to determine the long-time trends and to detect any deviations from these trends at an early stage. A special attention is paid to artificial radionuclides, the RMN monitors the following radionuclides which may be present in measurable quantities: in the air – 137Cs, 90Sr, 239+240Pu, 85Kr; in foods - 137Cs, 90Sr, and in human body - 137Cs.

Air contamination

As in the previous years, in 1999 there were no serious deviations of artificial radionuclides content in the air. Volume activities of 137Cs due to the transport from higher atmospheric layers and resuspension of the original fallout from the soil surface were mostly in the order of units to tens of mBq.

A part of 137Cs airborne activity has an origin in the global fallout which is a result of earlier nuclear weapon tests in the atmosphere. In addition to 137Cs, aerosols contain 7Be, which is cosmogenic, and 210Pb which is a decay product of 222Ra. In aerosols and fallout these radionuclides are determined by semiconductor gamma spectrometry. As an example, the time dependencies of 137Cs, 7Be and 210Pb volume concentrations in aerosol and their surface activities in fallout are shown; these measurements were carried out since 1986 by the Air Contamination Measuring Points of the National Radiation Protection Institute in Prague (Figures below). The long-time decreasing trend of 137Cs activity and fluctuations of 7Be and 210Pb concentrations in the course of a year are obvious.

Dose rate measurement (92.3 nGy/s, i.e. 0.33 mGy/h)

Fig. 1 Volume activities of airborne aerosol measured by Air Contamination Measuring Points of the National Radiation Protection Institute in Prague (monthly averages)

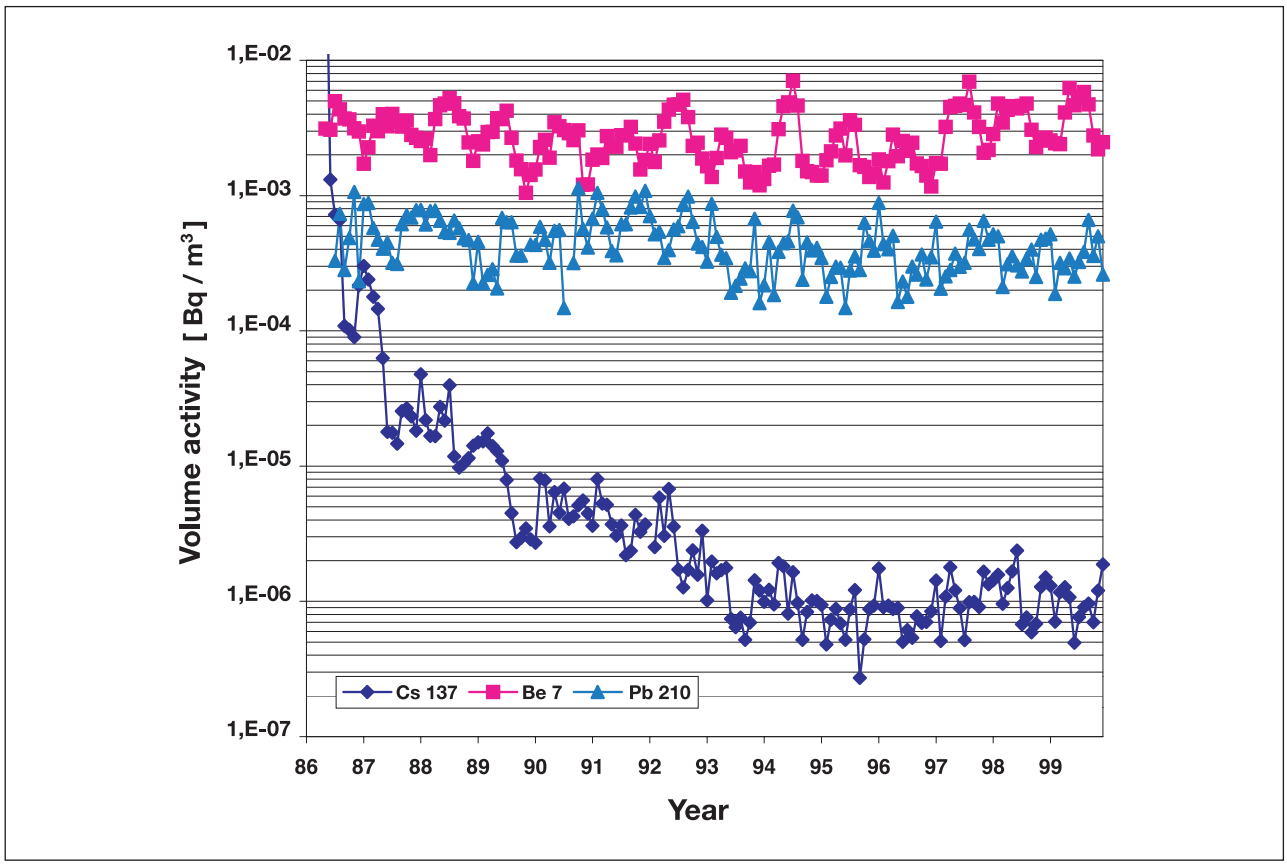
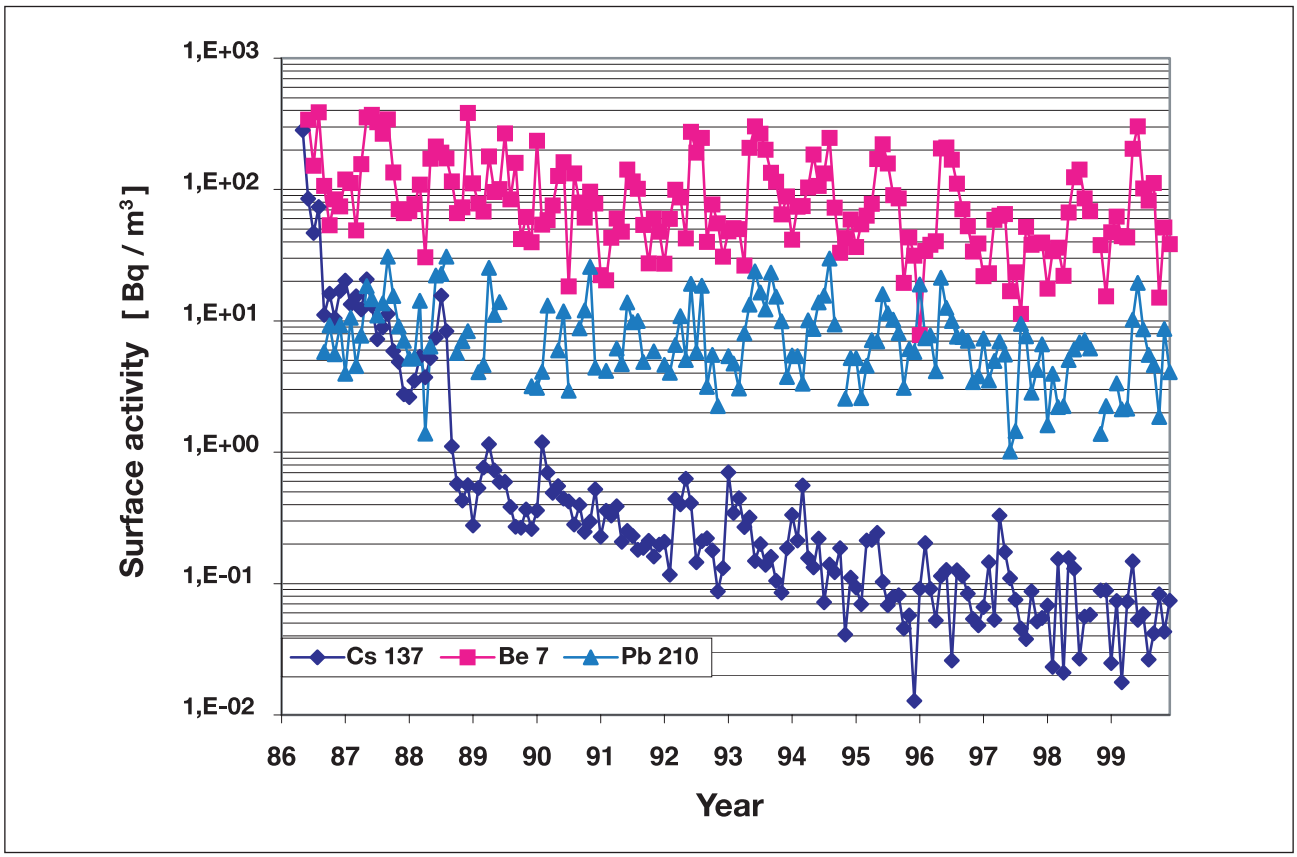
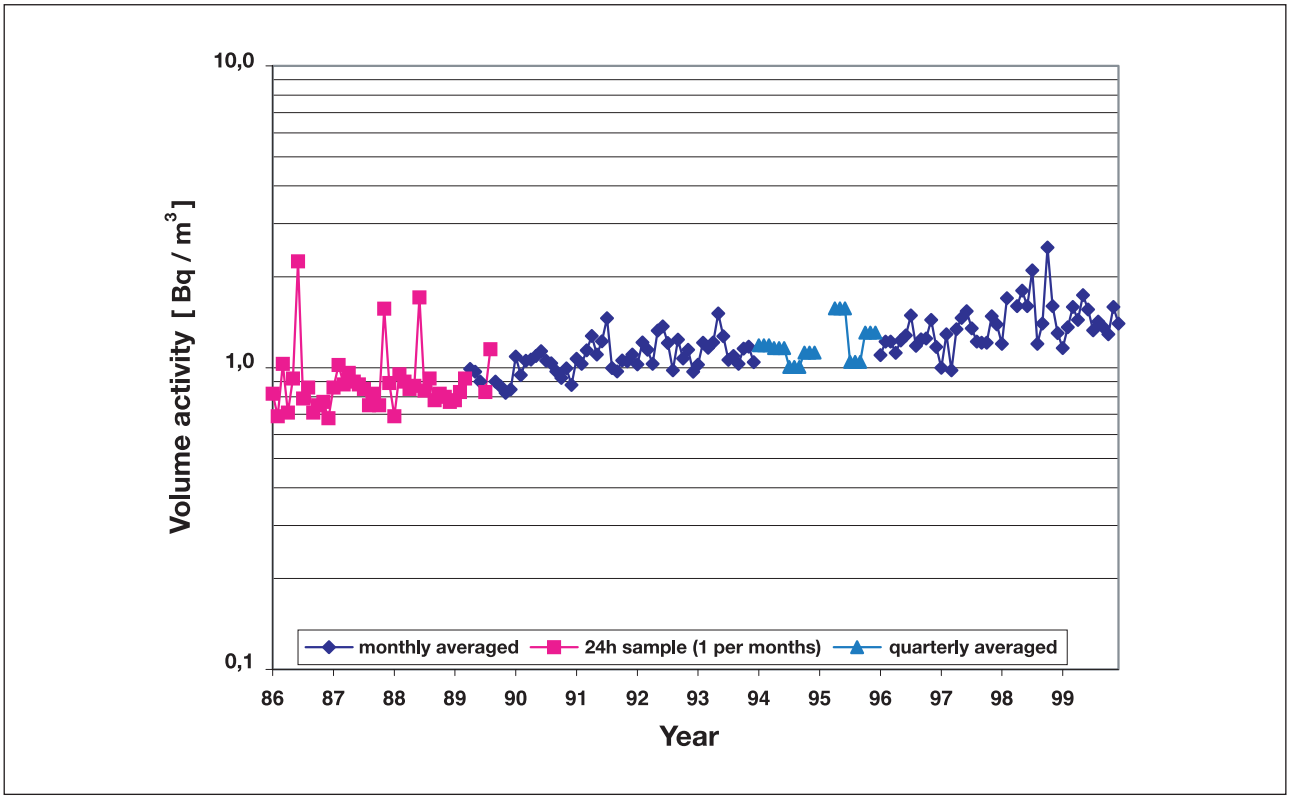


Fig. 2 Surface radionuclide activity in fallout on water surface measured by Air Contamination Measuring Points of the National Radiation Protection Institute in Prague (monthly sampling)



In 1996, 85Kr was added to the monitored by the RMN radionuclides, as a first step in the effort to monitor all artificial radionuclides detectable in the environment. 85Kr is a fission product and therefore it is also in minor quantities present in effluents of nuclear power plants. The main 85Kr sources are, however, nuclear fuel reprocessing plants, and in the past – nuclear weapon tests. Measurements of 85Kr volume activities actually followed previous activities of the Radiation Dosimetry Institute of the Czech Academy of Sciences. The measuring point is the same – within the mentioned Institute site (now Radiation Dosimetry department of Nuclear Physics Institute of the Czech Academy of Sciences). Next figure shows time dependence of 85Kr volume activities since 1996.

Fig. 3 Volume activity of 85Kr in air in Prague



Foods contamination

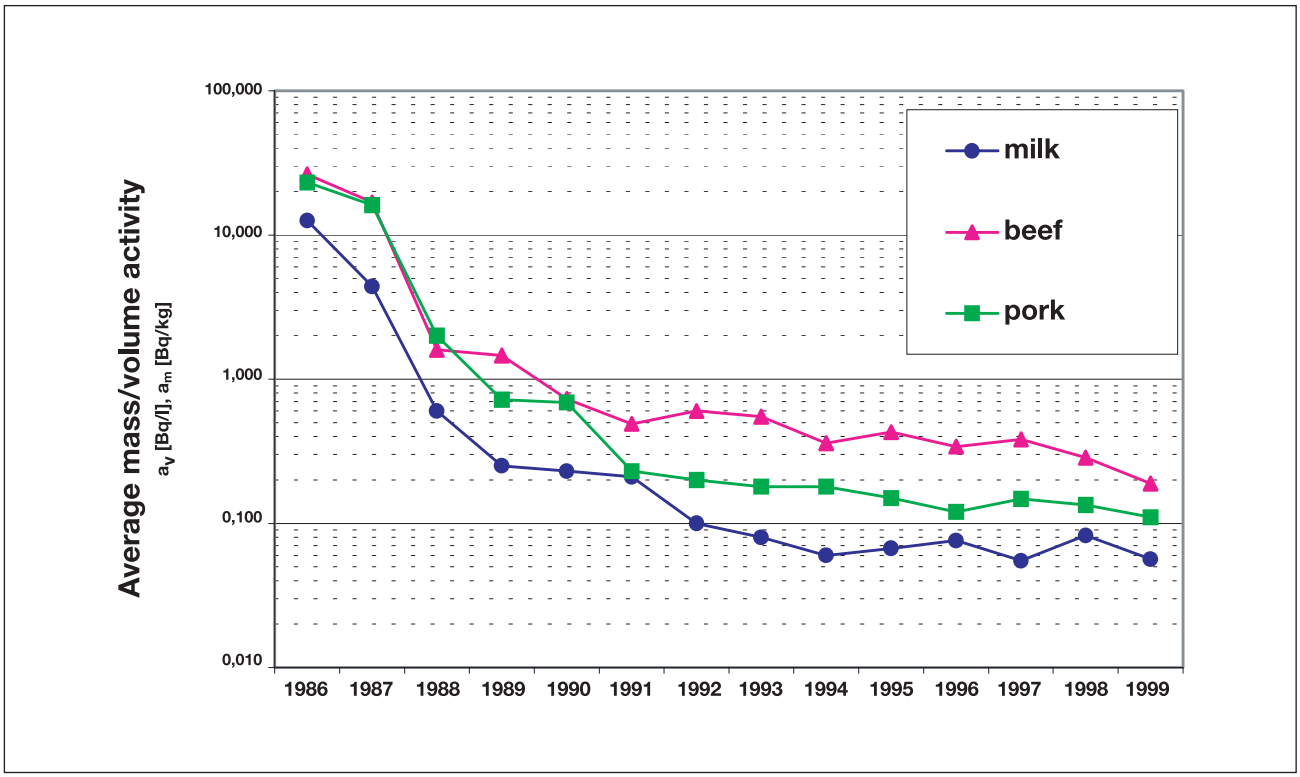
Food contamination by radionuclides has been monitored on a long-term basis following the relevant monitoring plan. This plan is established for the individual commodities, with particular respect to the significance of their consumption. Since no event resulting in a radionuclide content increase in the environment has occurred in 1999, there was no increase in food contamination either.

The volume activities of 137Cs in some basic foods, i.e. milk, beef and pork are in the order of tenths of Bq/l or Bq/g. The volume activities of 137Cs, 90Sr in drinking water are very low (tenths or units of mBq/l) or even below the detection limit. Over the years the tritium content in drinking water is in the order of units of Bq/l and likewise – remains constant.

As every year, the public attention is drawn to an increased 137Cs content in mushrooms, forest fruit and game meat. Despite the fact that these commodities represent only a very small share of the overall food basket, their contamination is monitored since 1986, and the results are regularly published in annual reports on the radiation situation within the Czech Republic territory, and in media. The 137Cs content in these commodities does not represent any significant radiation burden for the Czech Republic population (even if in some North Moravia and Šumava localities the values reach up to tens of Bq/kg).

The next figure shows the time of 137Cs activities in milk, beef and pork monitored by the RMN since 1986.

Fig. 4 Average annual mass/volume 137Cs activities in pork, beef and milk



Internal contamination of individuals

Monitoring of 137Cs internal contamination of a reference group of 30 persons (15 females, 15 males), mainly Prague citizens of 25 to 70 years of age continued using the whole-body counter of the Radiation Protection Institute. In view of a very low 137Cs content in the population, the whole-body measurements are performed once a year only, applying long measuring times to reach the lowest achievable detection limit. Similarly as in the preceding years, the internal 137Cs contamination was determined in a randomly selected group of the individuals from the whole Republic territory, by measuring 137Cs concentration in urine.

The time dependence of 137Cs retention for Czech population (results of the whole-body monitoring and volume activity measurements in urine) since 1986 is presented in the following figure. As to development of 137Cs internal contamination in 1999, the changes were again very small, similar to that for longer time periods after nuclear weapon tests in the atmosphere.

Monitoring of external exposure

The 1999 monitoring results of the territorial TLD network are presented in the following table. Measurements performed within the territorial TLD network over several years confirm that this network is capable to detect any significant deviations from the normal state at any particular site. The local TLD networks results for 1999 will be given in detail in the 1999 Annual Report on Radiological Situation in the Czech Republic.

Fig. 5 Time-dependence of 137Cs content in Czech population after the Chernobyl accident

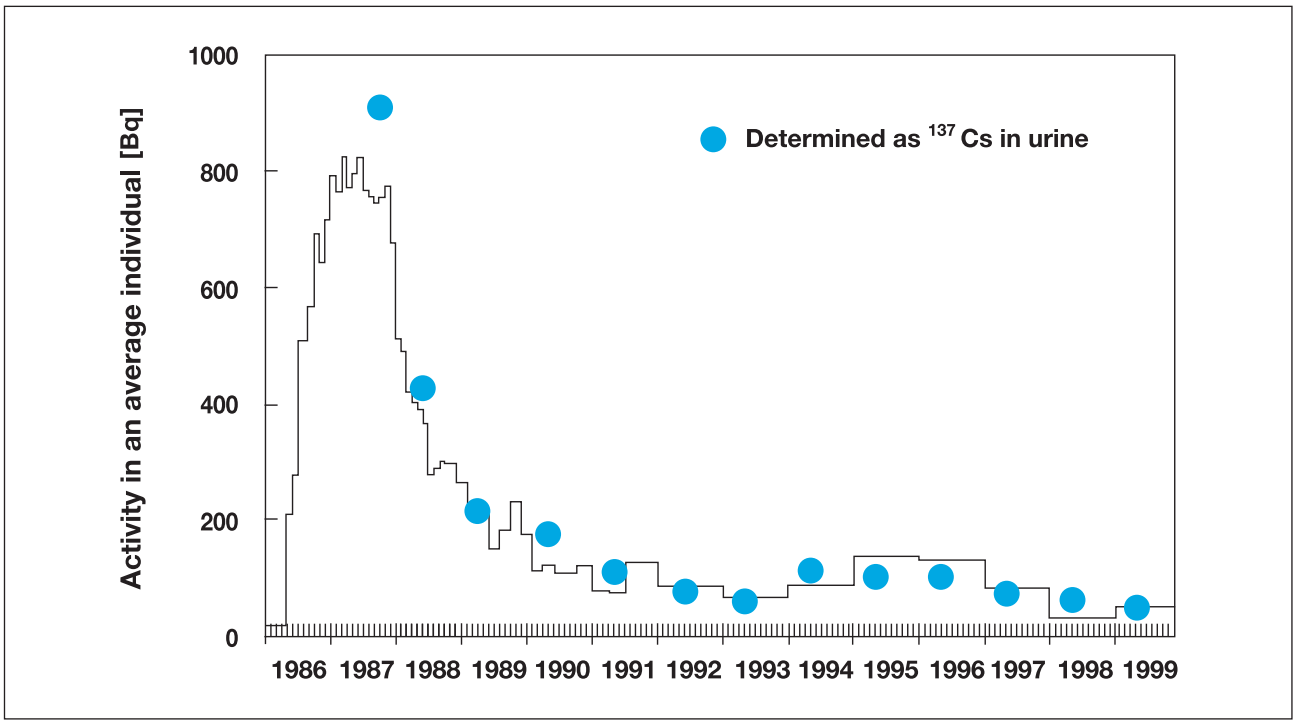


Table 1 Quarterly averages of the photon dose rate Hx (nSv/h) determined by the territorial TLD network within the Czech Republic territory

Oblast Number of MB	Prague 13	Central Bohemia 25	South Bohemia 30	West Bohemia 25
	$H_x \pm s$	$H_x \pm s$	$H_x \pm s$	$H_x \pm s$
I/99	126.5 ± 17.9	134.2 ± 46.7	147.3 ± 24.3	124.3 ± 17.9
II/99	129.1 ± 14.4	142.1 ± 45.2	158.7 ± 22.5	134.3 ± 25.5
III/99	129.1 ± 15.3	141.2 ± 48.2	161.9 ± 24.3	138.0 ± 22.6
IV/99	126.4 ± 15.0	136.7 ± 44.7	147.3 ± 21.6	135.9 ± 24.2
Oblast Number of MB	**North Bohemia 23**	**East Bohemia 21**	**South Moravia 26**	**North Moravia 21**
	$H_x \pm s$	$H_x \pm s$	$H_x \pm s$	$H_x \pm s$
I/99	128.8 ± 21.7	116.3 ± 14.3	169.5 ± 28.7	106.4 ± 14.4
II/99	123.6 ± 24.5	121.8 ± 24.1	133.8 ± 22.0	123.2 ± 16.2
III/99	123.6 ± 20.4	135.5 ± 25.6	131.7 ± 19.3	119.1 ± 10.3
IV/99	121.0 ± 25.0	135.0 ± 23.5	135.2 ± 20.8	114.6 ± 16.7

Notes: Hx – average value, s – standard deviation
MP – monitoring point

The dose equivalent rates are continuously measured by the Early Warning Network, the average values are recorded in 10-minute intervals. Every 24 hours the obtained data are transmitted to the central RMN database at the National Radiation Protection Institute, namely: from 10 measuring points located at the SÚJB Regional Centres and at the National Radiation Protection Institute – through modems via telephone lines, and 38 measuring points of the Czech Hydrometeorological Institute through its Institute communication network into its central computer and then – by the dedicated telephone line. If necessary, the data transmission intervals are shortened.

Monitoring of nuclear power plants effluents and surroundings

A total radioactive discharges of radionuclides from nuclear power plant Dukovany into the atmosphere and surface waters in 1999 remained very low. No accident leaks were detected, and according to the quarterly and monthly reports "Radiation Situation in the Surroundings of Dukovany NPP" issued by the Operator, the total releases into the air were below 1 % of the derived annual limits and the releases into the surface waters – below 3 % for corrosion and fission products and below 70 % for tritium.

The dose rate in the Dukovany NPP surroundings is continuously monitored by the teledosimetric system operated by the plant. In addition, at least one measuring point of the national Early Warning Network is located in the vicinity of each plant. The dose equivalents from external exposure in NPPs vicinity are monitored by the local TLD network operated by the Environmental Radiation Monitoring Laboratories of each plant. Independently of the networks mentioned, the SÚJB Regional Centres perform their own measurements (using TL detectors). In 1999, none of the networks detected violation of any investigation level.

Regular sampling and measurements of radionuclide activities in the environment components in the surroundings of a nuclear power plant are carried out by both the corresponding Environmental Radiation Monitoring Laboratory and the SÚJB Regional Centre. In 1999, similarly as in the previous years, no differences were found between the radionuclide contents in the environmental samples from the nuclear power plant Dukovany surroundings and the other parts of the Czech Republic territory.

Spectrometric measurements of contamination within the "prohibited" zone – 1 km from NPP Chernobyl, in which National Radiation Protection Institute personnel participated

OTHER ACTIVITIES

Personnel qualification and training

Mr. Petr Krs, Deputy-Chairman for Management and Technical Support

The SÚJB has evaluated the ČEZ, a.s. application documents and issued new permits for "Professional Training of Selected Personnel of Dukovany NPP and Temelín NPP", including permits for the selected personnel training on full-scope simulator VVER-1000 (replica type). Within this proceedings, the SÚJB has approved the relevant training programme and the ČEZ Managing Procedure "Psychological Examinations of Personnel Engaged in the Nuclear Activities".

Pursuant to the Czech Technical University Praha and Nuclear Research Institute Řež application and after evaluation of the submitted documents, the SÚJB has issued new permits for professional training of personnel of experimental reactors "School Reactor VR-1P", LVR-15 and LR-0, as well as the relevant training syllabuses.

In 1999, 4 inspection visits were focused on theoretical and practical training of selected personnel of both nuclear power plants – Dukovany and Temelín, and on these personnel training on "Display Simulator VVER-1000". One inspection checked on the professional training of the Dukovany NPP external sub-suppliers on "Multifunctional Simulator VVER-440". Two inspections checked on selected personnel included into a shift of VR-1P reactor (Faculty of Nuclear Science and Physical Engineering of the Czech Technical University) and into a shift of NRI Řež plc reactors LVR-15 and LR-0. Two other inspection visits to Dukovany NPP were concerned with the shift personnel preparedness for unit startup after refuelling outage. No deficiencies indicating non-compliance with Act No. 18/1997 were found in the submitted documentation.

In 1999, the SÚJB performed an overall revision and consequently updated the set of examination questions applied for the selected personnel of nuclear facilities.

The State Commission for Examining Special Professional Competence of Selected Personnel of Nuclear Facilities met during 1999 10 times; and within these meetings examined special professional competence of 87 persons from the nuclear facilities personnel, one of whom failed in the oral part of the examination. Thus, the success rate was 98.85 %. The successful applicants were granted the SÚJB Special Professional Competence Certificates valid at the Czech nuclear facilities.

The SÚJB Special Examination Boards continued to examine the special professional competence for activities especially important for radiation protection. A total of 1036 natural persons were examined, 971 of them were granted the Special Professional Competence Certificates, 65 persons failed.

Legislative activities

Three regulations implementing the Atomic Act came into force in 1999:

- Directive No. 195/1999 Coll. on the Requirements to Nuclear Facilities for Ensuring Nuclear Safety, Radiation Protection and Emergency Preparedness which, as it follows from its name, established requirements for nuclear facilities design or requirements which must be taken into account during designing nuclear facilities;
- Directive No. 196/1999 Coll. on Decommissioning of Nuclear Facilities or Workplaces with Significant or Very Significant Ionising Radiation Sources. This Directive provides a comprehensive and unified set of the conditions and requirements for nuclear safety and radiation protection assurance during decommissioning of nuclear facilities or workplaces with significant or very significant ionising radiation sources. Such complex legislative document covering this issue

did not till present exist. Similarly as the preceding Directive, it was prepared using international recommendations only, since there are no corresponding unified foreign legal regulations covering decommissioning, however in the USA and in some European Union countries such regulations are now under preparation;

– Directive No. 324/1999 Coll. which establishes the concentration limits and amount of radioactive material to which the nuclear damage provisions do not apply.

In 1999, in addition to these implementing regulations, the SÚJB has prepared and issued 3rd level documents, so called Safety Guides for licensees or public:

Quality Assurance System for nuclear medicine workplaces – devices;
Radiation protection requirements for organisations carrying out mining activities which can lead to exposure of workers, population or of the environment;
Ensuring smooth rollover to 2000 at license-holders for handling ionising radiation sources during medical applications;
The content of a Safety Analysis report for the siting permit of a radioactive waste storage facility;
Preparation of the Quality Assurance Programme for the prescribed tests of ionising radiation sources;
The SÚJB requirements related to paliative therapy carried out at nuclear medicine workplaces;
Principles of traumatological plans for nuclear facilities and workplaces with ionising radiation sources;
Implementation of quality system in the ionising radiation applications in radiotherapy;
Activities of suppliers within controlled areas of the ionising radiation license holders.

Legislative activities of the SÚJB are conform to the process of harmonising the Czech Legislation with that of the European Union, within the Czech Republic accession to the European Union. The SÚJB representatives regularly participate, as the members, in the meetings of Working Committee for Integration of the Czech Republic into the European Union and in working groups for harmonisation of law, for the environment and power industry. Proposed by the SÚJB amendment of the Atomic Act and the related implementing regulations, which has been already included into the legislative plan of the Czech Government for the year 2000, represents a most significant step in the law harmonisation process. The corresponding effort has started in the end of 1999.

Upon the Czech Government decision, Additional Protocol on the Agreement between the Czech Republic and the IAEA on safeguards implementation in accordance with the Treaty on the Non-Proliferation of Nuclear Weapons), was signed in September 1999 in Vienna. This document extends significantly the IAEA authority in the non-proliferation area and binds the Czech Republic to transfer to the IAEA additional data and information on the implemented and planned activities related to nuclear energy utilisation in the country. The Czech Republic has not yet ratified the Additional Protocol, since an intensive preparation for fulfilment of the obligations under this Protocol, including amendments of the relevant legal regulations, is in progress.

International co-operation

In 1999, the SÚJB concentrated its effort on fulfilment of obligations following from the international agreements, on maintaining and extending contacts with the partner organisations, and, of course, on co-ordinating the international technical co-operation within its competence, both on bilateral and multilateral level. The SÚJB participation in the process of the Czech Republic accession to the European Union was also a significant issue in its international co-operation activities.

Bilateral co-operation

One of the SÚJB long-term priorities within bilateral co-operation is co-operation with the neighbouring countries – Germany, Slovakia, Austria and Poland.

The Federal Republic of Germany

Signing Agreement on Information Exchange – March 1999

In 1999, preparation of the information exchange agreement between the Federal Ministry of Environment and Reactor Safety – (BMU (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit) and the SÚJB, which is based on the Czech Republic and the FRG Intergovernmental Agreement on the issues of common interest in nuclear safety and radiation protection, was finalised. The information exchange agreement was signed in March 1999 in Prague in the course of a bilateral meeting of the Czech Republic and the FRG representatives, organised annually under patronage of the SÚJB and BMU, in accordance with the Intergovernmental Agreement. In Czech-German co-operation are during several past years emphasised issues connected with the Temelín NPP construction, and this co-operation basically pursues three main objectives:

- preparation of informative documents for layman public and professionals, these documents are prepared as joint materials on near-border nuclear power plants Temelín and Bavarian Isar;
- preparation of responses to German public questions on the Temelín NPP nuclear safety;
- specialists consultations on selected technical issues of Temelín NPP nuclear safety.

Responsibility for the technical part of co-operation is in the FRG delegated to the Society for Reactor Safety (GRS). Within co-operation of this organisation and with assistance of Temelín and Isar specialists were by the end of 1999 finalised the following documents: "Report on Nuclear Safety Assurance and Radiation Protection of 2nd Unit of Isar NPP" and "Report on Nuclear Safety Assurance and Radiation Protection of 1st Unit of Temelín NPP". These materials include a common text which defines methodology applied for the preparation of both reports. In December 1999, the SÚJB transmitted to the BMU responses to the first set of the German public questions

related to Temelín NPP. Since inquires have concerned not only nuclear safety and radiation protection, a group of interministerial specialists (set up of the SÚJB Chairwoman for the purpose) took part in the preparation and final edition of the responses. At the end of the year, the SÚJB and GRS, supported by Temelín NPP, NRI Řež, Škoda Plzeň and Energoprojekt Praha, initiated joint consultations of specialists on selected nuclear safety issues of Temelín NPP. One of the seven topical areas the SÚJB and BMU agreed to organise workshops on, was already discussed - "Temelín NPP Containment". Consultations will continue in 2000.

Austria

In compliance with the agreement between the Government of the Czechoslovak and Austrian governments on regulation of the common interests issues concerning nuclear safety and radiation protection, the SÚJB was primarily providing information; the relevant activities included especially:

- information on the subject of aircraft flights over the Dukovany NPP site, prepared in January as an official response to the Austrian Ministry of Foreign Affairs request;
- visit of 30 officers of Austrian Ministry of Interior to Dukovany NPP in February to review the Czech legislative and regulatory framework in the area of peaceful uses of nuclear energy and ionising radiation; answers were provided to questions on the computer preparedness for Y2K problem; a "guided tour" of Dukovany NPP technological systems was organised;
- information on preparedness of computer systems installed at nuclear facilities for 2000 rollover prepared in April and September upon the official request submitted by the Austrian Embassy in the Czech Republic.

Information exchange was one of the topics of the regular annual meeting of Commission of Czech and Austrian specialists on the common interest issues in nuclear safety and radiation protection which, in compliance with the Intergovernmental Agreement, took place in December 1999 in Prague under patronage of the SÚJB and Austrian Ministry of Foreign Affairs. Concluding the meeting, both parties have stated that the meeting was a constructive and friendly one, significantly contributing to mutual confidence between the countries with different standpoints as to utilisation of nuclear energy.

Slovakia

In compliance with Agreement between the Czech Republic and Slovak Republic Governments on co-operation in the state surveillance of nuclear materials, the SÚJB traditionally continued its extensive co-operation with the Slovak Nuclear Regulatory Authority. Regular annual meeting of both regulatory bodies representatives took place in Prague in May 1999. Concluding the meeting, both parties confirmed that the mutual professional co-operation remains on very good level and that it can be extended even further. Co-operation Programme for 200 – 2004 signed in November 1999, should contribute to fulfilment of this objective. Regular consultations on the technical, legislative and international issues represent a significant component of co-operation between both regulatory bodies.

Poland

Within the SÚJB competence there are no formal agreements with the Republic of Poland. Under Article 16 of the Nuclear Safety Convention ratified by the Czech Republic in 1997, the member-countries which operate nuclear facilities are obliged, in the case of radiation hazard, to take adequate measures for transmitting early warning information to the relevant bodies of neighbouring countries. Therefore, the SÚJB representatives in the second half of 1999 started informal talks with representatives of the Polish Commission for Atomic Energy with the objective to establish procedure for implementing obligations established by this Convention. At the same time, the both parties consider possibility to regulate formally the information exchange in the area of state supervision over nuclear safety and radiation protection, i.e. peaceful uses of nuclear energy and ionising radiation.

Other bilateral co-operation activities of the SÚJB are oriented to the European Union countries

and countries with a significant programme of peaceful use of nuclear energy and ionising radiation, such as the United States of America, Japan and Russian Federation.

United States of America

In April 1999, Mr. Merrifield - a member of the collective directorate of the US Nuclear Regulatory Commission has visited the Czech Republic, the main items of his schedule were discussions with the SÚJB representatives and a short technical excursion to Temelín NPP. As Mr. Merrifield said, despite shortness of time, his impression of the visit was positive. In 1999, work has been launched on extension of current agreement between US NRC and SÚJB conform to the Intergovernmental Agreement on co-operation in the area of peaceful utilisation of nuclear energy. The agreement between regulatory bodies establishes the information exchange principle and a basis for the regulatory bodies co-operation in the area of nuclear safety and radiation protection of nuclear facilities. In addition to co-operation with the partner organisation (US NRC), the SÚJB also co-ordinates the programme of technical support provided by the US Government to Czech organisations through the US Department of Energy. In September 1999, the SÚJB and US DOE, working together, organised a seminar the SÚJB and US DOE, working together, organised a seminar on Y2K challenges for specialists from nuclear power plants and regulatory bodies of the Central and Eastern Europe. A great help in overcoming these challenges was a HP 9000 – L2000 server supplied for the SÚJB Emergency Response Centre within the technical aid programme organised by the US DOE.

Japan

1999 was the seventh year of an extensive project of the Japanese Government training programme for nuclear specialists from Central and East European countries. The SÚJB co-ordinates this programme in the Czech Republic within which 14 Czech specialists participated in 1999 in a number of training courses in Japan focused generally on nuclear safety and radiation protection, on nuclear power plants operation and maintenance management, on issues of technological and electrical systems control, on radioactive waste management and on the IAEA safeguards system set to control fulfilment of the obligations under the Treaty on Non-Proliferation of Nuclear Weapons. The participant acknowledged a high level of these courses.

Russian Federation

Co-operation between the regulatory bodies of the Czech Republic and Russian Federation, proceeding in compliance with the Agreement between the governments the Czech Republic and Russian Federation on co-operation in the area of nuclear energy, was in 1999 focused primarily on preparation of an agreement on the Russian specialists participation, as technical consultants, in the commissioning of 1st unit of Temelín NPP. Such agreement will allow the SÚJB inspectors to consult on-site technical issues with specialists whose experience in the regulatory practice was acquired in the Russian Federation while commissioning similar units with VVER-1000/320 reactors.

Great Britain

Great Britain, within its programme of supporting regulatory bodies of Central and Eastern Europe, extensively participated in creating the SÚJB Emergency Response Centre which shall serve for emergency management needs in the event of nuclear or radiation jeopardy. In 1999, British specialists were involved in consulting activities for finalisation of the Emergency Response Centre project and in organising training for the SÚJB staff and personnel of the organisations which provide technical support in the emergency preparedness area. Visit of two SÚJB specialists to nuclear power plant Sizewell (in July 1999), organised again within the mentioned programme of the British Government, allowed to compare the emergency preparedness measures implemented at nuclear power facilities in both countries.

Preparation of bilateral agreements on nuclear safety and radiation protection information exchange with Ukraine and Slovenia continued in 1999.

Multilateral co-operation

In 1999, as in the previous years, the SÚJB within its multilateral contacts was an active member of international organisations, especially in the IAEA, Preparatory Committee for control of adherence to Comprehensive Test Ban Treaty and the OECD Nuclear Energy Agency. Among the multilateral co-operation belongs also the SÚJB involvement in control of observance of the international agreements, especially – Convention on Nuclear Safety, as well as establishing new contacts with the European Commission and its consulting bodies, and participation in the Forum of Regulatory Bodies of Countries Operating VVER Reactors.

Opening of PET Centre at Na Homolce hospital, November 19, 1999

International Atomic Energy Agency

In 1999, as in the previous years, the SÚJB priority was professional co-operation with the IAEA. The SÚJB co-ordinated participation of Czech representatives in the meetings of such important IAEA advisory bodies as Nuclear Safety Standards Advisory Committee, Senior Advisory Group for Safeguards Implementation and some others, in the meetings of their technical committees and working groups.

View of accelerator

The SÚJB also co-ordinated the Czech Republic participation in a significant event of 1999 – the international conference "On Strengthening of Nuclear Safety in Eastern Europe", which took place in June 1999 in Vienna. A very important area of the SÚJB activity within its relationships with the IAEA is co-ordination of the Czech participation in the Technical Assistance Programme organised by the IAEA in compliance with its Statute for its member-countries. The programme is divided into

so called "National" (individual for each member-country) and "Regional" parts. Within this programme in beginning of 1999 were launched new Czech National Projects:

- Safety evaluation of civil constructions in nuclear power plants, and
- Improvement of qualification of the SÚJB radiation protection inspectors.

In parallel, a number of projects initiated in the previous period continued:

- Investigation of corrosion processes in zirconium alloys used in fuel assemblies
- Radioactive waste characterisation
- Implementation of Quality Assurance programmes in radiodiagnostics
- Model project of Centre for preparation of radiopharmaceuticals for Emission Positron Tomography (PET) and their application in radiodiagnostics. In the Czech Republic – the IAEA co-operation this project in 1999 continued to be a key one. In 1999, Na Homolce hospital finished reconstruction of the Centre building and the main components of a new workplace – cyclotron and "PET" camera were supplied from abroad. After adequate equipment testing, the PET Prague Centre was in November 1999 ceremoniously opened in presence of the IAEA Deputy Director General for Technical Co-operation - Mr. J. Quian and Head of the European Section of the IAEA Technical Co-operation Programme – Mr. Samiei.

In the second half of 1999, the SÚJB invited individual organisations to submit new national project proposals for the Czech Republic – IAEA Technical Assistance Programme for 2001 – 2002 period. Eight proposals were submitted for the IAEA consideration:

- Study of radiation damage of a nuclear power reactor pressure vessel
- Training centre for radiation protection personnel of Motol Faculty Hospital
- Implementation of a passive and active non-destructive examination of encased low-level and medium-level waste containing transuranium elements;
- Expert system for evaluating properties of reactor internals exposed to high neutron fluxes and gamma radiation;
- Automatic system for collecting and processing experimental data on school reactor VR
  - 1P for training of NPP specialists and students of the Faculty of Nuclear Science and Physical Engineering of the Czech Technical University;
- Development, implementation and validation of special chemical-analytical methods in the Central Analytical Laboratory of the NRI Řež plc;
- Establishing a workplace for investigation of the migration parameters for barrier materials of radioactive waste repositories;
- Production of "PET" radiopharmaceuticals doped with C-11, O-15 and F-18.

Within the "Regional" part of the Technical Assistance Programme organised by the IAEA for European countries, the SÚJB and other Czech organisations in 1999 participated in a number of activities. The Czech Republic organised five workshops and two training courses, as well as two Technical Committee meetings which covered a wide range of topics, as for instance: physical protection of nuclear facilities and nuclear materials, public information, emergency preparedness and quality assurance in nuclear medicine. In one of the workshops (in June 1999) took part the IAEA Deputy Director General for nuclear energy – Mr. P. Mourogov. Making use of this opportunity he visited Temelín NPP site, NRI Řež plc and ŠKODA JS, s.r.o. Plzeň. More than 50 Czech specialists participated in other activities organised within "Regional" part of the IAEA Technical Assistance Programme, especially those focused on safety of nuclear power plants with VVER reactors, radiation protection and emergency preparedness.

The Czech Republic is involved in the IAEA Technical Assistance Programme not only as a beneficiary but also as a contributor assisting in other countries projects.

In 1999, the Czech Republic has contributed to the IAEA Technical Assistance Fund 121 910 USD from the SÚJB budget. In addition to this contribution, the Czech Republic contributed 3.5 million CZK from the governmental technical assistance fund for technical support provided for Ukraine with the objective to built-up a facility for non-destructive testing of VVER-100/230 reactor pressure vessels.

Within technical co-operation with the IAEA, the SÚJB continued to organise professional training programmes and short-tern scientific visits for specialists from countries of the Western Europe, Asia and Africa. In 1999, 60 specialists in radiation protection, nuclear medicine, nuclear safety, radioactive waste management, regulatory activities, legislation, emergency planning, etc. were trained in the Czech Republic.

OECD/NEA

Co-operation between the IAEA and the OECD/NEA continued. The SÚJB representatives attended regular meetings of the Committee on Nuclear Regulatory Activities, and participated in activities organised by other NEA standing committees, as for instance – Committee for Radiation Protection and Public Health.

Convention on Nuclear Safety

Co-ordination of the Czech Republic actions while fulfilling commitments following from the Convention on Nuclear Safety was one of the most important activities performed by the SÚJB as an agent of the Czech government in the international co-operation field. This activity resulted in the presentation of Czech delegation at 1st Evaluating Meeting of the Parties to the Convention on Nuclear Safety which took place in April 1999 in Vienna. Information on the results of the Meeting was submitted to the government in June 1999. The Convention is currently the only international tool for nuclear safety evaluation in the international scale. Positive result of this evaluation which the member-countries agreed on while concluding the 1st Evaluating Meeting, should play an important role in negotiations on the Czech Republic accession to the European Union. It is also an important argument in arguing against all future forms of casting doubts on safety of the Czech nuclear power plants.

European Commission and its advisory bodies, PHARE programme

Within preparatory process of the Czech Republic accession to the European Union, the SÚJB not only participated in the effort co-ordinated by the Ministry of Foreign Affairs, but also joined in the structured dialogue with the relevant Directorates General of the European Commission (DG ENV and DG ENERGY). As a part of these activities, the SÚJB prepared basic information (on its sphere of activity) for the Czech Republic national programme of accession to the European Union as well as other documents related to this process. Besides that, throughout of 1999, the SÚJB participated in regular meetings organised by the Nuclear Safety and Civil Protection Directorate for the Environment (DG.ENV.C), especially – meetings of the CONCERT Group which is a platform for exchanging information and harmonising regulatory practices of the Central and Eastern European countries with that of the European Union countries, and meetings of the Nuclear Regulatory Working Group. At the November meeting of this Group, the candidate countries representatives were granted a full-fledged member statute which should allow maximum involvement of these countries in the common activities of European Union member-countries focused on nuclear safety of nuclear facilities that is not regulated by Community law. A SÚJB representative also took part in the preparatory meetings of the EC-DGENV on resuming in 2000 activities of Reactor Safety Working Group which will include representative of the candidate countries.

Co-operation with the European Union within multinational PHARE programme "Nuclear Safety" has been in 1999 limited to finalisation of the running projects. Finished in June 1999 PHARE project, designed to support Regulatory Bodies and co-ordinated by the EC Regulatory Assistance Management Group, brought very positive results for Czech nuclear safety and radiation protection legislation.

CTBTO Preparatory Committee

In 1999, the SÚJB continued to fulfil function of the National Agency under the Comprehensive Test Ban Treaty. In this connection, the executive secretary of the preparatory technical secretariat for monitoring adherence to the Treaty, Dr. Wolfgang Hoffman, paid a visit to the SÚJB. In Prague, Dr. Hoffman learned of the Czech Republic approach to meeting its commitments under this Treaty. In the course of 1999, the SÚJB representatives have been taking part in meetings of the Treaty Working Bodies, and together with the Earth Physics Institute, Brno performed all tasks related to the Czech Republic commitments.

Other multilateral activities

The SÚJB is a founder member of the Forum of Regulatory Bodies of Countries Operating VVER Reactors, established in 1993 to support nuclear safety and radiation protection enhancement by sharing experience and information as well as co-ordinating effort in this field. In 1999, SÚJB representatives participated in a regular annual Forum summit organised by the Russian Federation within its one-year term of chairmanship. Czech specialists continued their work in Forum working groups (for instance – in the group on the fuel cycle back-end).

As before, the SÚJB acted as a National Liaison Point for secretariat of the NUSAG which is authorised by G-24 Group to co-ordinate technical co-operation on nuclear safety.

Informing the public

In March 1999, the SÚJB submitted to the Government its 1998 Annual Report ("Report on Results of Activities of the State Office for Nuclear Safety in Execution of State Supervision of Nuclear Safety of Nuclear Facilities in 1998"). During its April session the Government discussed and acknowledged this Report with satisfaction.

Using this Report as a basis, the SÚJB prepared Czech and English versions of its reports for the public; the Czech version was distributed to the institutions concerned and the English version – to regulatory counterparts abroad and to the contact points of the bilateral agreements on nuclear safety. For general public the Report is made available at the SÚJB Internet page (www.sujb.cz); it was also subject of a special press-conference held in June.

In compliance with the Atomic Act, the SÚJB representatives informed the Heads of District administration bodies on the radioactive waste management within territory under their competence.

The SÚJB continued to meet its obligations of informing professionals and the general public by issuing bi-monthly journal Nuclear Energy Safety and the non-periodic series of Safety of Nuclear Facilities, thus publishing general information relating to nuclear safety as well as detailed requirements and guidelines on its assurance.

Press-conference on the SÚJB 1998 Annual Report

Throughout the year, the SÚJB regularly informed the Czech Press Agency and other media on all facts within its responsibility; significant events were always discussed at specially organised press-conferences.

In 1999, the SÚJB continued to create its Internet page. This page, besides the mentioned Annual Report, contains basic information on the SÚJB position within the state administration, its organisational structure, legal framework of its activities and most important contact addresses. The Internet page offers also a number of documents and reports from its competence area, as for instance "Czech Republic National Report" prepared as required by the Convention on Nuclear Safety. An absolute majority of information is available in both Czech and English mutations.

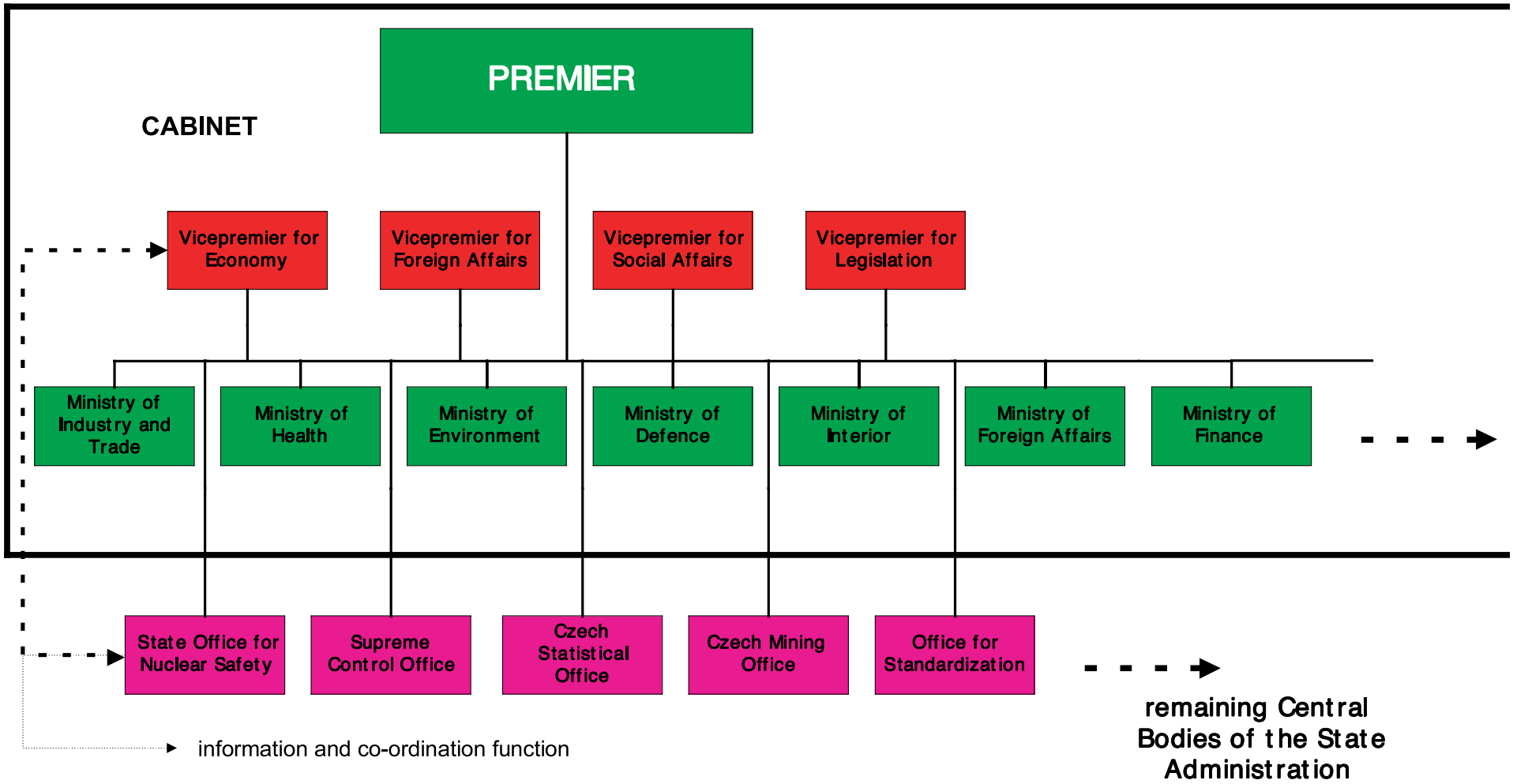
An international Public Seminar on Peaceful Uses of Nuclear Energy in Central and Eastern Europe organised by the SÚJB in co-operation with the IAEA in June 1999 in Prague was another of significant information sources provided for the general public. This prestigious meeting has heard presentation by the IAEA Deputy Director-General for Nuclear Energy Mr. V. Mourogov, Head of the OECD/NEA Nuclear Energy Division Mr. P. Wilmer and the IAEA Adviser Co-ordinator on environmental issues, Mr. Rosen, and Director of the IAEA Public Information Division, Mr. D. Kyd.

In the end of 1999, the SÍJB has been preparing for implementation of new act No. 106/1999 Coll. on free access to information. Interested persons have now at their disposal an information leaflet which provides, in a simple and understandable form, a guideline how to apply for information and how to proceed if the request is refused. The Office has also made internal arrangements necessary to deal with such requests within the established deadlines.

LIST OF ABBREVIATIONS

ČEZ, a.s.	Czech Energetic Enterprise, p.l.c.
DPZJ	Partial Quality Assurances Program
EC	European Commission
ECCS	Emergency Core Cooling System
EU	European Union
HEU	Highly Enriched Uranium
HO	Reactor Protection System (Havarijní ochrana)
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
IHZ/CP, TZ	„Hot“ Pre-operational Tests, Tightness and Pressure Tests
I&C	Instrumentation and Control System
INES	International Nuclear Event Scale
KV	Complex Tests
L&C	Limits and Conditions
LEU	Low Enriched Uranium
MBA	Material Balance Area
MCP	Main Circulation Pump
NEA/OECD	OECD Nuclear Energy Agency
NPP	Nuclear Power Plant
NPT	Treaty on the Non-Proliferation of Nuclear Weapons (Non-Proliferation Treaty)
NRI	Nuclear Research Institute at Řež (Ústav jaderného výzkumu Řež, a.s.)
PERIZ	Periodic Integral Leaktightness Testing of Hermetic Compartments
PKV	Pre-complex Tests
POSAR	Pre-operational Safety Analysis Report
POZJ	Quality Assurance Procedures
NRPI	National Radiation Protection Institute (Státní ústav radiační ochrany)
RMN	Radiation Monitoring Network
SALP	Systematic Assessment of Licensee Performance
SÚJB	State Office for Nuclear Safety of the Czech Republic (Státní úřad pro jadernou bezpečnost České republiky)
TLD	Thermoluminescent dosemeter(s)
US DOE	US Department of Energy
US NRC	US Nuclear Regulatory Commission
VK	In-core Control System
WEC	Westinghouse Electric Corporation

Position of the State Office for Nuclear Safety within the State Administration



ORGANIZATIONAL CHART OF THE STATE OFFICE FOR NUCLEAR SAFETY