INTRODUCTION

The State Office for Nuclear Safety (SÚJB) was established on 1 January 1993 through a specialized Act as an independent state administration body and the main component of the state supervision in the nuclear filed in the Czech Republic. The SÚJB mission is to assure that peaceful utilization of nuclear energy and ionizing radiation is in compliance with the requirements for health and environment protection and with the requirements of nuclear safety. The Office itself is a purely administrative and supervisory body with no ties to the processes of e.g. development of the national energy policy, energy market and issues of nuclear technologies development , including nuclear power engineering. Another SÚJB task is the continual effort to further develop and deepen safety culture, i.e. nuclear safety and radiation protection in general, and therefore the Office intensely monitors activities in the above-mentioned fields.

There are several aspects of SÚJB independence that are worth mentioning. The Office is funded from the state budget approved annually by the Czech Parliament. It has no legal relation to any ministry or other governmental agencies and its chairperson is appointed by a resolution issued by the Czech Republic's government. The related legislation – particularly the so-called Atomic Act of 1997 – has created the required legal framework for the Office to perform its tasks. The Office is authorized to establish detailed requirements within the individual fields of its competence through implementing regulations. Resolutions and other administrative acts by the Office may be revised only through a legal procedure. The described arguments supporting the claimed independence may be described in more detail, but it should be admitted here that its absolute independence could be actually hardly achieved. We live in a multipolar world with a high number of contact surfaces and interfaces. Nevertheless, in the history of state supervision of nuclear safety and radiation protection in the Czech Republic, the Office is currently enjoying the highest level of respect. The Office has all necessary preconditions to carry out its tasks and, also very importantly, all powers so that it may effectively resist direct or indirect pressure exerted by political, economic or other interest groups.

Based on the results of its supervisory and assessment activities SÚJB has concluded that in 2001 the decisive requirements for nuclear safety and radiation protection at NPP Dukovany, NPP Temelín and at other nuclear installations and workplaces with ionizing radiation sources in the Czech Republic were met. There were no serious defects identified at nuclear installations or workplaces with ionizing radiations sources, resulting in release of radioactive material into the environment or resulting in above-the-limit radiation threat to the workers and population in the installations surroundings.

A key element in utilization of nuclear energy is a competent operator. The only holder of a license to construct and operate nuclear power plants in the Czech Republic is ČEZ a.s.. The company is continually evaluated and supervised by the state supervisory body. The Office monitors important safety areas on four units of the operated NPP Dukovany and on two units of NPP Temelín, while one of them is at the moment (end of February 2002) finishing the power start-up tests and the other is being prepared for the first loading of nuclear fuel following the non-active tests.

Particularly the supervisory activities performed by SÚJB at NPP Temelín have been viewed as exceptionally significant, intense and in many aspects very informative. The prevailing opinion, that both the operator and SÚJB could in the licensing process of NPP Temelín use their previous experience from the other plants in the Czech Republic and Slovakia, is correct only to a limited extent. The power plant Temelín is a completely new type of a plant whose concept and design can be hardly compared to any other power plant

operated in the mentioned two countries. Therefore we feel pleased and honored by a statement issued by the International Atomic Energy Agency in Vienna saying that both the Office and operator of the plant have fully stood the test of meeting the exacting requirements inferred by the international recommendations. The same applies for the IRRT mission (which during the last year reviewed the ability of SÚJB to meet the criteria of internationally recognized supervisory practices in nuclear safety and radiation protection), and also for the OSART mission (which in the same period of time reviewed the operator's compliance with the previously expressed requirements for improved standard of nuclear safety, radiation protection and also the plant's ability to operate all its equipment to meet the internationally recognized and recommended standards).

Although the national and international supervisory assessment efforts have resulted in a number of findings the Office is actually satisfied with the licensee's approach to the problems. Both the plants have been gradually improving their indicators and dedicate necessary human and financial resources to increase the level of nuclear safety and radiation protection of their equipment and personnel.

The Office spent the year carrying out very challenging and often very difficult external communication, both within the country and internationally. We have never overestimated our potential and abilities in the field. Still, we are convinced that particularly at the international negotiations, that took part within the Melk process on NPP Temelín, our involvement represented a worthy contribution to their successful conclusion. We believe that we have provided sufficient information to general public in the Czech Republic and abroad, so that they do not succumb to worries or even fabrications spread by often uninformed or willingly misinterpreting sources. We believe that by talking to our opponents, who were willing to conduct a truly factual and constructive dialogue, we have been able to prove our readiness to accept their justified comments and to draw specific and practical conclusions therefrom.

By now, most of the ČEZ shares have been held by the state and the course of the privatization efforts last year has been widely known. SÚJB hereby again expresses its positive conviction that privatization and market opening will increase competition in the energy sector and cause its extensive restructuring. This may in the future result in major changes in the operation of nuclear power plants and new requirements for nuclear safety assurance. It may, however, also result in attempts to reduce the operator's production costs at the expense of capital investment into nuclear safety and radiation protection. A question remains whether the privatization terms should not be modified so that the new owner is able to fully observe the high standards of nuclear safety and radiation protection and continue to significantly participate in their maintenance and development. An adequate response to the circumstances has become a new task to be performed by the Office.

Ing.Dana Drábová
SÚJB Chairwoman

1. STATE OFFICE FOR NUCLEAR SAFETY

The State Office for Nuclear Safety (SÚJB) is a central state administration body with a separate budget. It is headed by a chairperson appointed by the CR government.

SÚJB performs state administration and supervision of the utilization of nuclear energy and ionizing radiation and supervision of radiation protection. Competencies of SÚJB are defined by Act No. 18/1997 Coll., on peaceful utilization of nuclear energy and ionizing radiation (the Atomic Act), and include particularly:

- execution of state supervision of nuclear safety, nuclear items, physical protection of nuclear installations, radiation protection and emergency preparedness in nuclear installation premises or at workplaces using ionizing radiation sources;
- licensing of activities under the Act No. 18/1997 Coll., e.g. siting and operation of nuclear installations and workplaces with very significant sources of ionizing radiation and radioactive wastes, transport of nuclear materials and radionuclide sources;
- approving of documents relating to the assurance of nuclear safety and radiation protection, as established by the Atomic Act, Limits and Conditions for operation of nuclear installations, methods of physical protection, emergency codes for transport of nuclear materials and selected radionuclide sources, internal emergency plans for nuclear installations and workplaces with ionizing radiation sources;
- establishing of conditions and requirements for radiation protection of population and exposed workers (e.g. establishing of exposure limits, definition of controlled zones), establishing of emergency planning zones and requirements for emergency preparedness of licensees under the Atomic Act;
- establishing of conditions and requirements for radiation protection of members of population and exposed workers;
- monitoring of population and occupational exposure levels;
- coordination of activities performed by the National Radiation Monitoring Network on the Czech Republic's territory and provision of international exchange of radiation protection data;
- keeping a national system of registration and control of nuclear materials, national registration system of licensees, imported and exported selected items, ionizing radiation sources, records on population exposure and occupational exposure;
- professional cooperation with the International Atomic Energy Agency;
- provision of data to municipalities and district offices about radioactive waste management on their respective territories and provision of adequate information to general public and CR Government about activities performed by the Office;
- provision of data from measurements and evaluation of the impact of nuclear, chemical and biological substances on human health and on the environment, including evaluation of the level of protection with individual and collective protective means against such substances;

- coordination and provision of activities to fulfill tasks resulting from the treaty about the ban on development, production, accumulation of supplies and use of chemical weapons and about their destruction under Act No. 19/1997 Coll.

To reflect its focus and performed activities the organizational structure of SÚJB is as follows.

Section of Nuclear Safety includes a department of nuclear installations assessment, a department of nuclear installation inspections and a department of nuclear materials.

Section of Radiation Protection includes a department of sources and nuclear power engineering, a department of exposure regulation, a department for the environment and radioactive wastes and a separate licensing department.

Section of Management and Technical Support includes a department of international cooperation, an economic department and the Office bureau. The division also includes the office monitoring the ban of chemical weapons.

Directly to the Office Chairwoman report a **department of emergency preparedness**, which also provides for the function of Emergency Response Center and coordinates the Radiation Monitoring Network, a **QA department** and a **department of defense and auditing.**

SÚJB includes **Regional Centers** (RC) situated in Prague, Pilsen, České Budějovice, Ústí nad Labem, Hradec Králové, Brno and Ostrava, plus two local workplaces at NPP Dukovany and NPP Temelín.

SÚJB controls one budgetary organization - **State Institute for Radiation Protection (SÚRO)** based in Prague and one allowance organization – **State Institute for Nuclear, Chemical and Biological Protection** (**SÚJCHBO)** based in Příbram – Kamenné.

The average converted number of SÚJB employees in 2001 was 183. Activities by SÚJB are fully funded by the state budget. The actual budgeted costs in 2001 for SÚJB activities, including those for SÚRO and SÚJCHBO, amounted to 288 378 thousand CZK. The budget set-up is shown in the table below:

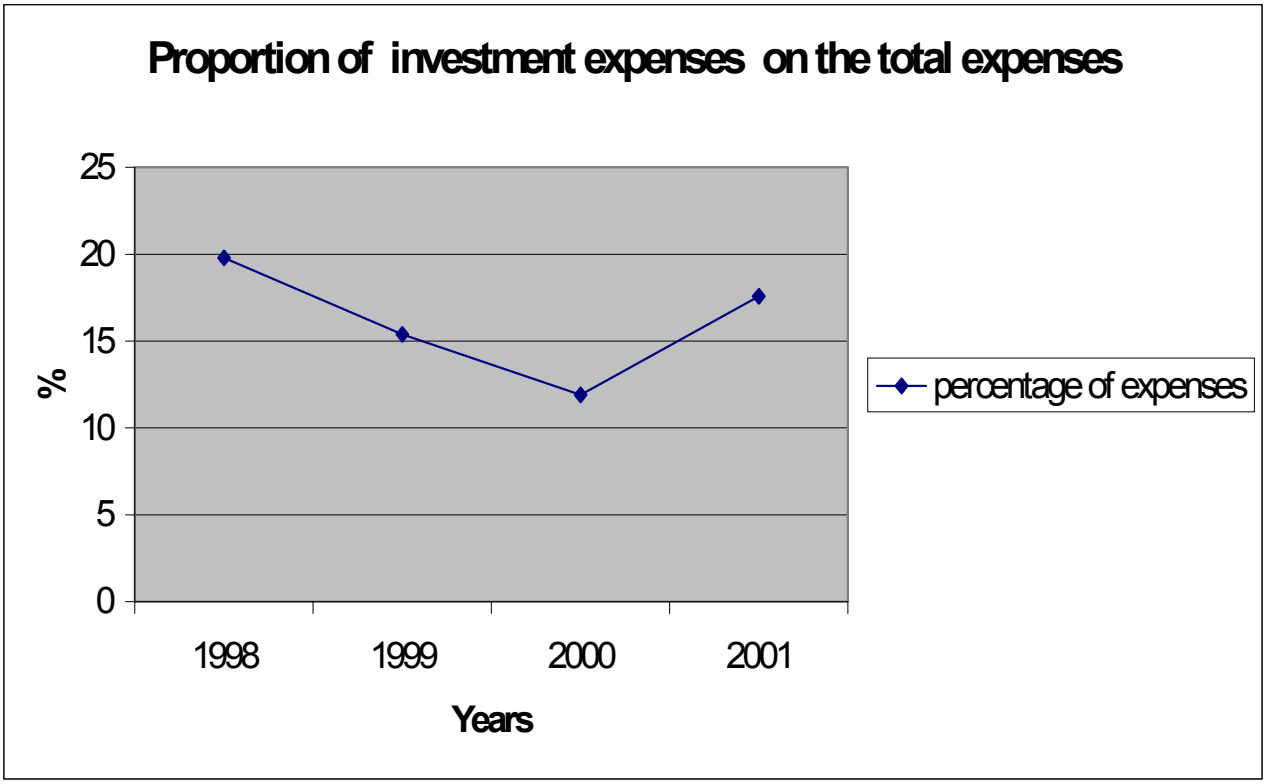
Total Costs

(in thousands CZK)

Year 1998	Year 1999	Year 2000	Year 2001
196 208	207 546	244 327	288 378

The volume of funds from the state budget for activities carried out by the State Office for Nuclear Safety or the entire sector is relatively small. The reason is the nature of costs in the sector which mostly cover technical provision of the activities and only to the necessary extent. The diagram below shows overall expenses in the sector over the past four years

The increase has been caused mostly by the expanding sphere of activities and, until the last year, by the preparation of the Czech Republic to join EU. Most expenses were associated with the provision of technology and its operation. Devices and instruments utilized in inspection activities shall at least meet the standard of technology to be measured, as long as financial limitations prevent exceeding of the standard. The set-up of expenses in the past four years is shown in the diagram below.



The following table provides more information about selected types of expenses. The data have been provided only for the past two years because comparison with the preceeding years would be too complicated

in thousands CZK

	Year 2000	Year 2001
Total expenses	**244 327**	**288 378**
Investment expenses	**29 169**	**50 805**
Selected non-investment expenses		
Radon program	15 018	8 200
European Union	12 458	23 000
Foreign development aid	3 300	3 600
Purchased material	15 058	18 936
Purchased services	75 253	71 449
Science and research	26 449	37 449
Non-investment expenses spent on the established organizations (including research institutes)	54 899	63 461

The selected expenses in the sector demonstrate trends in some budget sections e.g. some one-purpose allocations, such as Radon program, foreign development aid, science and research etc. The actually drawn funds illustrate the recent developments in the areas of concern.

In general, given the importance of its activities, the volume of funds available to SÚJB to carry out its activities is only the indispensable minimum. Any unexpected occurrence requiring extraordinary expenses has to be dealt with in advance, usually in a time-consuming procedure, with involvement of the Czech Ministry of Finance and based on separately substantiated requests, as the sector is unable to create any reserves from the allocated funds.

2. STATE SUPERVISION OF NUCLEAR SAFETY

2.1. Nuclear Power Plant Dukovany

2.1.1. Operation of NPP Dukovany

No event occurred in 2001 at NPP Dukovany resulting in an impermissible release of radioactive substances to the environment. The operation of all units was assessed by SÚJB as safe and reliable. Production units of NPP Dukovany were operated in agreement with requirements of the power control center, mostly in the basic load mode. The course of operation at the individual units is shown in the diagrams below. In 2001 there were scheduled outages on all the production units for refueling, general inspections and extended general inspections (the latter included dismounting and internal inspection of the pressure vessel) (Unit 3).

There were no actions by the reactor trip system of the first and second kinds (HO-1, HO-2) in 2001. There were five actions by the limitation system to reduce the reactor power output (HO-3) and nine actions by the limitation system to limit the reactor power (HO-4). Actions by the HO-3 limitation system were caused by:

- Failure of three reactor coolant pumps during the movement of oil system pumps in agreement with the schedule of drives alternation at Unit 3. The failure was caused by reduced oil pressure at the oil pump discharge as a result of a slightly open non-return back valve.
- Failure of the reactor coolant pump on reactor Unit 4 following loss of voltage at a switching board. The loss of voltage at the switching board occurred following unfounded action by emergency flash protection.
- Disconnecting of TG 12 from the grid after its excitation moved from the automatic into manual mode (this type of the limitation system action occurred two times).
- Failure of the reactor coolant pumps 1 and 4 following loss of power supply at the switching board 3BA; the loss of power supply was caused by flash protection unfounded action on this switching board.

Defects

In the concerned period 18 defects in total were identified at NPP Dukovany (including situations which involved actions by reactor protections). 17 were rated "0" based on the international INES IAEA eight-grade scale, i.e. situations in which the operating Limits and Conditions were not exceeded and situations which can be safely handled through suitable procedures. One operating event in which a physical start-up test on Unit 4 was interrupted, due to a temporary failure of neutron flux measurement with a neutron flux measuring device, was rated "1" on the IAEA INES grading scale due to its impact on nuclear safety. The investigations have shown that one of the initial conditions for the experiment was not observed, the system was unable to adequately carry out its function and the personnel failed to properly evaluate the event. As a result, the Limits and Conditions were violated and insufficient measures were adopted in the given moment.

Action by the Limitation System

Unit 1				
1	13.4.2001	**100%**	**HO-4**	Fall of control rod 18-49 on the lower limit switch, following power output reduction after the 400kV line failure and phasing-out of both TGs
2	9.10.2001	**100%**	**HO-3**	Disconnecting of TG 12 from the grid, following transition of the generators´ excitation from the automatic into manual mode. In the course of transition the limitation system acted two times.
Unit 2				
1	21.1.2001	**100%**	**HO-4**	Fall of control rod 06-49 by 15 cm, following action by the low frequency converter for motors of control rods assemblies in RCPS
2	26.8.2001	**100%**	**HO-4**	Fall of control rod 12-43 at replacement of the low frequency converter for motors of control rods assemblies in RCPS
3	4.10.2001	**100%**	**HO-4**	Action by the low frequency converter for motors of control rod assemblies in RCPS on the control rods 09-28; coming signal HO-4
Unit 3				
1	23.2.2001	**100%**	**HO-3**	Failure of three reactor coolant pumps during movement of the oil system pumps
2	26.10.2001	**100%**	**HO-3**	**Failure of reactor coolant pumps 1 and 4, following loss of voltage at the switching board 3BA**
3	31.10.2001	**100%**	**HO-4**	Fall of control rod 06-37 by 1,5 cm; action by the low frequency converter for motors of control rods assemblies in RCPS
Unit 4				
1	29.3.2001	**100%**	**HO-4**	Fall of control rod 06-55 by less than 25 cm, following action by the low frequency converter for motors of control rods assemblies in RCPS
2	4.5.2001	**100%**	**HO-3**	Failure of a rector coolant pump, following failure of a switching station after action by the emergency zábleskové ochrany
3	8.5.2001	**100%**	**HO-4**	Fall of control rod 06-49
4	10.5.2001	**100%**	**HO-4**	Action by the low frequency converter for motors of control rods assemblies in RCPS for the groups 4 – 6 of control rods

Limits and Conditions

In 2001 the licensee requested an approval from SÚJB for one temporary change in the Limits and Conditions for safe operation of the Nuclear Power Plant Dukovany. The request concerned permission of the third and further pressurizing of the interspace in a lid of the steam generator No. 12 at Unit 1. SÚJB assessed the proposed change from the viewpoint of its impact on nuclear safety and issued its approval.

In 2001 the licensee reported one violation of the Limits and Conditions for boric acid concentration in the tanks. The event was investigated at a meeting of the extraordinary

defect commission of NPP Dukovany which proposed corrective measures to exclude recurrence of the event. Regular SÚJB inspection activities exposed another case of violation of the Limits and Conditions during the already mentioned physical start-up tests. SÚJB inspectors did not identify any other violation of the Limits and Conditions.

2.1.2 Supervisory Activity

The supervisory activity carried by SÚJB at NPP Dukovany in 2001 has been documented in 133 protocols, 2 of which concerned organizations of the suppliers, and in 95 resolutions. The activity focused:

- on observation of the limit and safety parameters under the „Program of Periodic Inspections“. The inspections have shown that the selected operating procedures for operation of the units were observed in the concerned period and that the individual parameters corresponded to the design levels. Safety limits and set-up of the protective safety systems were in agreement with the Limits and Conditions. Throughout the year the Limits and Conditions were observed, with the exception of the cases described above.
- on operability tests of the protective safety systems on the individual units, along with automatic start of back-up dieselgenerators of the assured power supply category 2. The tests have been assessed as successful.
- on methods of investigation of operational events important for nuclear safety and radiation protection, by the defect commission of NPP Dukovany and on corrective measures to prevent repeated occurrence of the events. SÚJB has concluded that the investigations by the defect commission were performed properly and the established deadlines for implementation of the corrective measure were observed. SÚJB did not find any serious shortcomings in the filed.
- on the course of outage of the individual units for refueling and for general inspections and repairs and bringing reactors to the minimum controlled output after refueling and on the course of selected physical start-up tests. Shutting down of the individual units and their following start-up was performed in agreement with the Limits and Conditions and selected operating procedures. Serious shortcoming have been identified in this field only in performance of one physical start-up test at Unit 4.

SÚJB on regular basis performed inspections of tests of technological systems at the end of outages, particularly the tests of unit protections system with outputs to the actuators and the test of total loss of power supply of the unit’s home consumption. The inspections were performed in agreement with the detailed documents and the criteria for successful passing of the tests have been met.

At periodic integral sealed tightness tests of hermetic spaces on the individual units at the end of outages for refueling the inspections focused on observation of the Limits and Conditions and the approved methodology to identify untightness. The inspectors have found out that that the periodic integral sealed tightness tests on the units were performed in compliance with the Limits and Conditions and approved methodology and that tightness of the hermetic interfaces on the units met the requirements specified in the Limits and Conditions.

SÚJB paid a great deal of its attention to inspections before it issued the permission for the units start-up after refueling to bring the nuclear reactor to the minimum controlled output. The inspections focused particularly on the following:

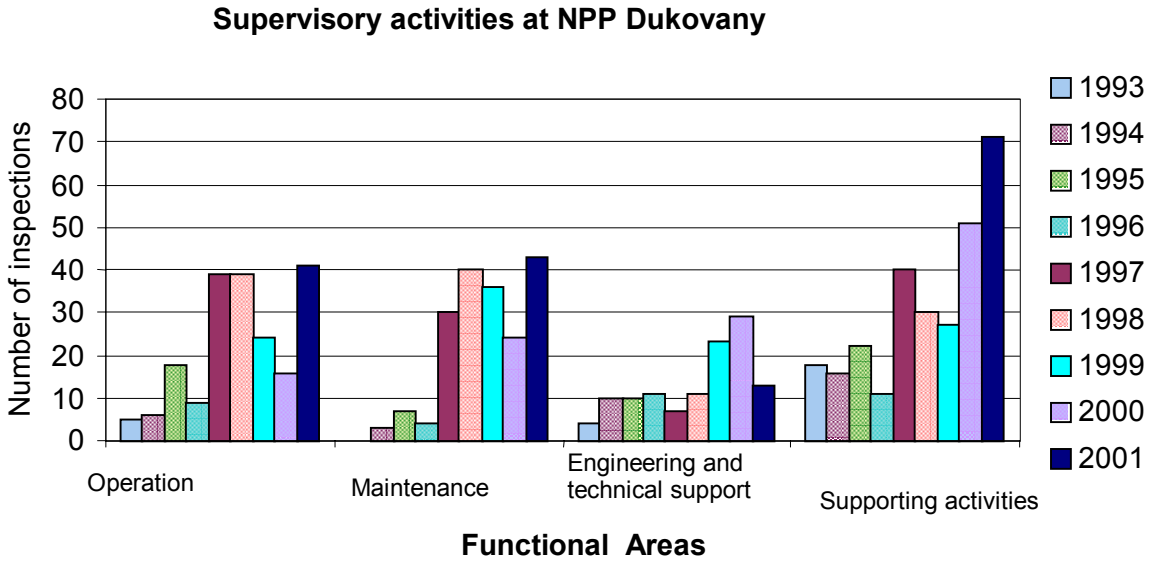
1) Implementation of adjustments and changes on the equipment and preparedness of the engineering part for the start-up after refueling and general overhaul. The inspections have exposed no deviations from the program of operational inspections or any other shortcoming or defects. The changes and adjustments on the equipment were implemented in agreement with the outage schedule.
2) Course of refueling, inspections of the neutron-physical characteristics for the coming campaign of the individual units and evaluation of the start-up program and content of the physical start-up. The inspections have shown that in all the above-mentioned areas the safety requirements and prescribed procedures were met and, in respect to neutron-physical parameters, the reactors of the individual units were ready for operation in the coming campaign.
3) Preparedness of the personnel, particularly selected personnel of the units control rooms to start up the individual units after refueling.
4) Audit of the performed inspections on power current electrical systems and instrumentation and control systems.
5) Compliance with the conditions in SÚJB resolutions concerning operation of the individual reactor units. SÚJB inspectors concluded that the licensee continually complied with the conditions specified in the resolutions issued earlier.

The above listed inspections did not expose any significant shortcomings which would prevent SÚJB from issuing a permit for the start up and critical condition of the reactor after refueling. Some minor shortcomings were found caused by insufficient maintenance. The shortcomings were addressed within the working order and under supervision of the respective SÚJB inspectors.

Three separate extensive inspections were performed to check compliance with the Quality Assurance Program of ČEZ-NPP Dukovany and related documents on quality assurance in the area of monitoring and assessment of nonconformities affecting nuclear safety and radiation protection during operation of the units and verification of the quality system to control design documents for I&C renewal. The inspections have shown that requirements for control of preventive and corrective measures are based on principles of the respective Quality Assurance Program and are specified in the NPP Dukovany internal procedures.

2.1.3 Assessment of Supervisory Activities

The performed inspections have been assessed as follows:



Operation

Unlike in the first half of the year, when the operation of all units at NPP Dukovany was assessed as good and further improving, a slight deterioration was observed in the second half of the year. Analyses of events important for nuclear safety have identified shortcomings in the application or non-observation of the operating procedures, as well as insufficient use of feedback from analyzed events and evaluation of the performed activities. In the concerned period the number of violations of the Limits and Conditions and defects caused by human factor increased, similarly as the number of actions by HO 3. Still, SÚJB has assessed the area as satisfactory and in the coming period it is going to extend its inspections in the field.

Maintenance

The inspections of the units´ preparedness for the start-up after refueling have shown no shortcomings. Training of the maintenance personnel was carried out in agreement with applicable statutory requirements. Specialized inspections in this field failed to identify any shortcomings in the submitted documents. SÚJB has assessed this activity area as stable and meeting high standards.

Technical and Engineering Support

In the concerned period some shortcomings have been identified in the elaboration of procedures, e.g. insufficient interconnection, inaccurate wording of requirements, absence of a differentiated approach to items of different importance, absence of method to address non-conformities in case of activities performed by contractors. Analogical partial shortcomings have been identified during verification of the quality system to control design documents for I&C renewal. SÚJB has assessed this field as a good standard, however, not all shortcomings identified in the last assessment have been removed and there was no significant improvement in this filed.

Supporting Activities

The inspections exposed no shortcoming important for safety and no corrective measures were required. The procedures and regulations were in agreement with the statutory requirements. The results of monitoring of personal and collective effective doses have confirmed that radiation protection was assured completely during the outages. Instructions for actions, their content and interconnection with the principles specified in the internal emergency plan of NPP Dukovany complied with the statutory requirements. SÚJB has assessed the standard of provisions in this field as very high.

Assessment of Safety Indicators

The assessment of a set of safety indicators of NPP Dukovany in 2001 has shown that from the viewpoint of nuclear safety the operator has been able to achieve similarly good results as in previous years.

2.2. Nuclear Power Plant Temelín

2.2.1 Approval Process

Unit 1

In the concerned period SÚJB received particularly summary protocols about test results performed in the course of start-up at power levels up to 30%, 55%, 75% and 90% of the nominal power output (N_{nom}), documenting completion of tests and their conclusions have been used as inputs for permits to continue following sub-stages of the power start-up. SÚJB assessed and approved programs of the individual power start-up stages and approved the program of trial operation on Unit 1 of NPP Temelín.

Unit 2

SÚJB assessed and approved some additional programs for pre-complex and complex testing of the Unit 2 equipment. Also a schedule was discussed of documents approval necessary to issue other permits for commissioning of Unit 2 and principles for harmonization of documents were established for the whole ČEZ, a. s. organization. The Unit 2 preparedness for commissioning was assessed and a permit was issued for non-active tests on Unit 2.

In early May SÚJB started assessment of the pre-operational safety report for Unit 2. The attention focused particularly on differences between the two units and incorporation of changes resulting from nonconformities identified in tests performed on Unit 1. Based on the assessment SÚJB concluded that the document contained no major shortcomings. In several cases, where experience from tests on Units 1 was not sufficiently taken into account, SÚJB requested corresponding changes. The procedure for issuance of a permit for Unit 2 active test has been suspended until the applicant removes the shortcomings in the enclosed documents.

2.2.2 Construction, Installation and Commissioning

Unit 1

The power start-up, started on 31 October 2000, continued on Unit 1 with tests at 30, 55, 75 and 90 per cent of the nominal power output (N_{nom}). The tests at the power output levels up to 30 % N_{nom} were completed while the turbogenerator operation was, under a specifically developed program, limited to the shortest time possible and in the course of this sub-stage the unit was shut down for 1 month due to the adjustments performed on the secondary circuit.. From March tests were performed at the power output levels up to 55% N_{nom}. The turbogenerator was operated during the tests several times at max. 450 MW. A long-term stable operation necessary for fundamental tests of the core was not achieved. Based on results of the performed tests and behavior of the turboset a decision was made in early May to suspend the power start-up activities and launch an extraordinary outage for an inspection, repair and adjustments on the turbine. The extraordinary outage took place from 6 May until 12 August 2001.

Apart from activities on the turbogenerator (particularly repair of its damaged parts, replacement of cones in high pressure control valves, adjustments on the oil system, adjustment of gland packing, etc.) also some maintenance works were planned during the outage, as required by the Limits and Conditions (inspections scheduled every 18 months), as well as additional periodic maintenance on the primary and secondary parts, electric systems and I&C.

It is obvious that the main problem of NPP Temelín Unit 1 has been the turbogenerator operation. So far no significant shortcomings have been identified in its function associated with nuclear safety, which would suggest deviations from the design assumptions or safety documents. The turbogenerator issue was closely monitored and SÚJB will pay attention to it also in the course of Unit 2 commissioning. After the outage the remaining tests at 55 % N_{nom} were completed and the start-up continued with tests at 75% N_{nom} and 90% N_{nom}.

Unit 2

Installation and completion works were finished on Unit 2 for the integrated hydrotest. After-installation cleaning works, partial pressure tests of the individual systems and their set-up into the design condition were performed on the primary circuit auxiliary system. In the entire reactor hall construction works were finalized in the individual rooms and passages. The reactor was filled with demineralized water and tests of clusters operation were performed; also installation was started of temporary measurements for the integrated hydrotest. At the end of the year's first half washing through and flooding of the primary circuit with demi-water was started and the reactor hall equipment was prepared to launch pressure tests in the primary and secondary circuits – the first stage of the integrated hydrotest, which represents one of the preconditions to start hot hydraulic tests and also the non-active tests.

It was necessary to repeat pressure tests to remove leakages in the primary and secondary circuits. In parallel, works were under way on I&C testing in the scope for hydraulic tests and tests continued on technologies required to achieve preparedness for the hot hydraulic tests. In late August started strength and tightness tests of the primary and secondary circuits. Due to the found leakage the tests had to be repeated; sealings of the main parting planes in reactor coolant pumps had to be fixed two times and the tests were finally completed on 29 September 2001.

The stage of non-active tests on Unit 2 in agreement with an approved program started on 13 October 2001 and in December started its sub-stage of Unit 2 inspection, following completion of the hot hydraulic tests. In the course of this stage of non-active tests additional tests were performed on the systems, repairs and repeated tests of components which demonstrated some deviation from the required function. Installation of feedwater pipes was completed on the secondary circuit and lever-controlled impulse safety valves for steam generators on the steam lines were replaced with spring valves.

All activities performed on both the units were systematically supervised by SÚJB inspectors.

2.2.3 Operation of NPP Temelín Unit 1

Since the beginning of the active tests stage the technological systems on Unit 1 have been in a normal operating condition in agreement with the requirements specified in the Limits and Conditions. Although the tests performed on the systems were not typical for the plant's nominal operating condition and in some cases were fairly demanding, SÚJB in 2001 monitored also the operation of Unit 1 at NPP Temelín, similarly as on the operated units of NPP Dukovany.

In the concerned period SÚJB issued two resolutions approving permanent changes in the Limits and Conditions of safe operation at NPP Temelín. In both the cases the reason to introduce changes into the Limits and Conditions was to improve the documents, based on a feedback from the Unit 1 active start-up.

The Limits and Conditions were violated in two cases:

1. On 17 February 2001 a test of mobility of the control valves 1TX32S02 and 1TX11,12,13,14S05 was not performed as part of tests of mobility control on TX valves. The violation was found during an SÚJB inspection and rated as a defect event "1" under the INES scale.
2. On 20 March 2001 a required activity was not performed – verification of operability of the remaining two safety systems divisions within 4 hours after securing of the 1TQ13D01 pump. The violation was rated as "0" on the INES scale.

2.2.4 Action by Reactor Trip and Limitation Systems

In 2001 there were in total four reactor trips and four shutdowns by the limitation system. One trip was planned as part of a test, the other three reactor trip actions and actions by the limitation system are described below. A reactor trip is a preventive means to protect the reactor and systems important for safety against non-design conditions or against situations which may result in a risk to nuclear safety. The action therefore does not mean that such a situation has already occurred. To the contrary, the time and action by the reactor trip system are set up to prevent situations involving nuclear risks with a sufficient lead.

Unplanned actions by the reactor trip system, ESF

Date, time	Automatics	Note
7.1.2001, 07:14	ROR (PRPS)	Low level in the pressurizer, Defect Report form filled out
4.5.2001 19:04	ROR (PRPS)	Signal "Low input into 3/4 reactor coolant pumps" due to activities on Unit 2, Defect Report form filled out
30.5.2001 10:18	ESF	S-signal, start of the respective TQ pumps
19.8.2001 03:09	LS(d)	Action by the limitation system from failure of the last working turbo-feed pump
17.9.2001 03:45	LS(d)	At the "island" mode testing under E047
20.9.2001 00:54	ROR(PRPS)	At regulation testing to home consumption under E024
11.12.2001 20:35	LS(d)	Unplanned action caused by failure of all condensate pumps while testing failure of one out of two condensate pumps under 1E024
15.12.2001 4:41	LS(d)	Unplanned actions caused by failure of the last working turbo-feed pump while testing failure of one out of two turbo-feed pumps under 1E024.

The reason of the reactor trip on 7 January was an increased level in the pressurizer, due to a fast pressure drop in the main steam header and subsequent cooling of the reactor coolant. The primary cause of the defect was a failure of all working condensate pumps and subsequent inappropriate manipulation by the operating personnel.

The event on May 4 consisted of a reactor trip during a transition from mode 2 to mode 3, following a failure of all reactor coolant pumps associated with a fall of a control rod in an underctritical reactor. The primary reason of the reactor trip activation was low input into 3/4 reactor coolant pumps as a result of activation of the pumps under-power relays. ´The situation was caused by a switch-on surge when power output transformers were switched on Unit 2 at the end of electric protections tests.

During tests measuring self-regulation properties of the reactor an unstable conduct was observed on 19 August, once the turbogenerator control system moved into the N_t mode, involving divergent oscillation of the control loop and nearly full opening of the TG control valve, the active TG output quickly increased. As a result, there was an increase in the steam parameters in TG extractions. Due to the increase in the steam pressure in the IVth extraction the revolutions of turbo-feed pumps (TBN) increased and both the working turbo-feed pumps, protected against high revolutions, failed. The failure caused a signal to be generated into the limitation system to shut down the reactor and TG by closing the fast-acting valve.

During the "island" testing mode on Unit 1 on 17 September 2001 there was a collective automatic back-up of eight sections on the 6 kV switching board in agreement with the design, however there was a momentary drop in the oil pressure in turbo-feed pumps which resulted in a shutdown of the pumps with technological protections, with subsequently initiated action by the limitation system from failure of the last working turbo-feed pump.

During a test of regulation to the home consumption on 20 September 2001 the turbogenerator switched into the "island" regulation mode and the limitation system acted from the signal „failure of 2 reactor coolant pumps " caused by the pumps power relays, despite the fact the pumps were working. Once TG moved into the "island" mode revolutions on TG decreased and a reactor trip followed from failure of more than 2 reactor coolant pumps and TG was shut down.

During a test of a failure of one out of two condensate pumps on 11 December 2001 the limitation system acted based on a failure of all the condensate pumps. Once one pump shut down there was a step decrease at the delivery of the working condensate pump and the limitation system evaluated the situation as its failure – subsequently the limitation system acted, the reactor moved to mode 3 and the turbogenerator was shut down.

On 15 December 2001 the limitation system acted from failure of the last turbo-feed pump during a test of failure of one of two turbo-feed pumps, while the working pump was shut down with a technological protection „steam leakage"; TG was shut down with a pushbutton..

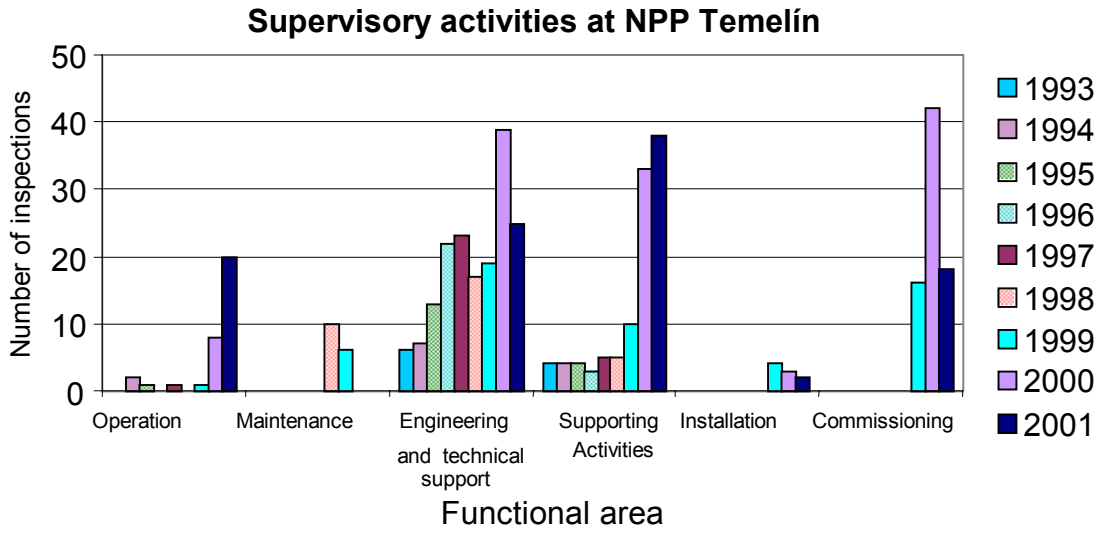
Defects

No event occurred in 2001 at NPP Temelín resulting in an impermissible release of radioactive substances to the environment. The operation of Unit 1 during the power start-up was assessed by SÚJB as safe. From the operating events 10 have been preliminary rated "0" under the INES international eighth-grade scale, as they did not have any significant impact on nuclear safety. Two events were rated as "1" by SÚJB. One was a missing test of control valves mobility as part of the valves control and mobility tests, the other was a leakage of the coolant from a shutdown open reactor.

The event occurred during tests on the primary circuit in the course of an outage. During a test of safety systems logic an activation occurred of a safety system and subsequently there was a coolant leakage from an unsealed reactor into the other containment space. In agreement with statutory regulations the operator informed SÚJB about preliminary investigations of the event cause and about the adopted corrective measures. On 4 June SÚJB started an inspection, in agreement with the methodology recommended by IAEA, in order to investigate in detail the root cause of the event, its evaluation from the viewpoint of the function of the operator's nuclear safety and radiation protection systems. The investigation also included determination of how serious the event was, using the INES international eight-grade scale and the event was rated as "1". SÚJB has concluded that the event was investigated in a manner corresponding to the established quality assurance system, that the

direct cause of the event was established correctly, i.e. undesired operation of pumps in the open primary circuit due to unwanted generation of a signal to start the pumps. The root cause was a human factor failure – the working method used by the personnel. The adopted corrective measures were aimed at preventing repeated occurrence of a similar event and SÚJB will also monitor their implementation during the continuing commissioning.

2.2.5 Supervisory Activities



Supervisory activities by SÚJB in 2001 have been documented in 78 closed protocols and in 96 resolutions issued by SÚJB.

The inspections were performed based on the SÚJB inspection plans for the first and second halves of 2001. The situation on Unit 1 following fuel activation was monitored through regular inspections while on Unit 2 the inspections covered all major activities, particularly tests associated with preparedness for active tests, hot hydraulic tests and the course of the inspection.

One of the fields monitored in detail was the functioning of steamgenerator safety valves. All the main valves were refitted and in agreement with SÚJB requirements their operability, functioning and tightness of the main safety valve on the steamgenerator was confirmed with protocols.

The inspectors also monitored removal of defects identified during the tests on NPP Temelín Unit 1 primary and secondary circuits, particularly focusing on vibrations of the steam line. Although the systems do not directly affect nuclear safety SÚJB was kept informed in detail about the found defects and monitored their redress.

Some shortcomings were identified during the inspections (e.g. in February the missing tests of control valves in contradiction to the operating procedures). During performance of tests in agreement with the approved commissioning programs e.g. the stage

program 1E001 was not observed. Moreover, there were individual non-observations of the approved programs e.g. deviations from testing procedures at the output levels up to 55% $N_{nom.}$ Further, deviations were found in the performance of some tests and certain formal shortcomings in records on violations of the Limits and Conditions, keeping of the book of operative changes in the operating documents and commissioning documents. Several shortcomings were identified in instructions to the operating personnel about the recorded changes. In all the cases SÚJB specified necessary corrective measures in the inspection protocols.

During tests on the output level up to 75% N_{nom} some shortcomings were found in the equipment function and documentation of the performed activities and related corrective measures were imposed. They included e.g. non-observation of procedures in agreement with the approved programs, changes in the deadlines for removal of defects and outstanding items, discrepancy between the declared preparedness of the systems for individual commissioning stages and its actual condition, moving of tests into other testing stages or sub-stages, missing evaluation of effects the changes in the testing stages may have on the tests objectives and criteria, incomplete and insufficiently detailed assessment of objectives and criteria in the protocols.

In the course of tests at different output levels during the power start-up of Units 1 some shortcomings were identified in documentation of the performed activities and in the equipment functions (inadmissible discrepancy in the loops hot legs during operation of two opposite reactor coolant pumps, unsuccessful transition into the "island" operating mode with subsequent regulation to the home consumption, undesired activation of undeprower relays of reactor coolant pumps at regulation of TG revolutions). The shortcomings were addressed with corrective measures, however they did not prevent transition to higher power output levels.

Observation of technical conditions during installation of engineering equipment was checked, i.e. of piping routes, pumps, tanks and other components in the primary and secondary circuit, and also during construction finalization of the rooms and during I&C installation and tests supplied by Westinghouse. SÚJB also monitored and evaluated the course of tests on I&C. Regular inspections were employed to monitor preparatory works for non-active tests at Unit 2.

The inspection of Unit 2 preparedness for non-active tests has found out that even after a request for a permit to perform the tests was submitted, accompanied by a summary protocol on preparedness to the non-active tests and individual protocols about the preparedness of the individual systems, some tests actually were not completed at that time and only later some defects and outstanding items were addressed and documents were amended. This means that at the time when the request was submitted the equipment was not properly prepared for the tests and therefore the request was dismissed. Once all the shortcomings were removed a new administrative procedure took place and the permit for non-active tests was issued.

The inspection of preparedness for active tests on Unit 2 identified shortcomings in the documents quality assurance system and SÚJB required their redress.

The inspection activities have been assessed as follows:

Operation

In the concerned period the operation of Unit 1 was extensively monitored, particularly through regular checks performed by local SÚJB inspectors. A general conclusion has been drawn that Unit 1 of NPP Temelín was operated in compliance with the nuclear

safety conditions and requirements. In most cases the Limits and Conditions were observed, the tests were performed in agreement with the approved programs and conditions and requirements specified in SÚJB resolutions were complied with. Based on input documents inspections of the operation have been assessed as very good, given the necessity to address complex operational and non-standard conditions resulting from the performed tests. The identified shortcomings point to a certain lack of discipline and insufficient operating culture.

Maintenance

Since there has been no reason so far to monitor maintenance no separate assessment has been made and maintenance has been included as part of the assessment of operation.

Technical and Engineering Support

For several months shortcomings were identified in this area, involving discrepancy between activities as approved in written and the actual form of the performed activities, and also shortcomings in documentation of the performed activities or observation of quality assurance programs. SÚJB has assessed the area as acceptable. Inspection activities will continue to pressure the operator to assure sufficient and demonstrable improvement in the quality of technical and engineering support of the commissioning process.

Supporting Activities

No shortcomings were identified in the course of inspections of physical protection, fresh fuel transport, observation of the Limits and Conditions in the fresh fuel storage and registration of nuclear materials. Some shortcoming, mostly of formal nature, were identified in the radiation protection field. Ongoing inspections assured compliance with the monitoring programs, including effluents balance, compliance with the limits required by statutory, implementing and internal ČEZ-NPP Temelín regulations. SÚJB has assessed the category as a good standard.

Installation

Before launching non-active tests on Unit 2 at NPP Temelín SÚJB performed two inspections in the installation area. In comparison with 2000 significant improvement was in observation of technical conditions of installation, above all due to the completion of the equipment installation and its preparedness to the tests. Since the installation works have been completed SÚJB has not provided any assessment of the activity.

Commissioning

In the concerned period the performed tests were carried out mostly in agreement with applicable approved procedures and programs. Results of the tests were again documented in agreement with the requirements of applicable programs. For most tests the established criteria were met and only exceptionally some defects were identified on tested components. The found shortcomings were addressed through corrective measures, however they did not prevent transition to higher power output levels. In several cases SÚJB ordered the tests to be repeated. In general, SÚJB has assessed the course of commissioning as a good standard.

Assessment of Safety Indicators

A set of safety indicator for NPP Temelín will be developed only after completion of the tests performed within the power start-up and after the trial operation starts.

2.3. Other Nuclear Installations

Reactor LVR-15 v ÚJV, a. s. Řež

The plan of the reactor operation in 2001 was met. A new BWR2 loop was put into operation and refurbishment was started on the RVS3 loop, with a partial dismounting. The reactor produced 44539Wh. Since the beginning of its trial operation in 1989 (following the overall refurbishment of its equipment) the reactor has produced 268892 MWh. The rector operation was safe and reliable. The reactor was used mainly to meet the needs of foreign entities (Japan, Germany and France) in material research for components in nuclear power installations. Production of radiation donored silicon and production of radioisotopes for domestic users, along with experiments for basic research in nuclear physics, represented a minor part of the reactor program. In the second half of the year some exposures were performed for medical purposes.

Five inspections were preformed in the concerned period, including one by IAEA. They included inspections of the new experimental loop BWR2, inspection of nuclear material management and inspection of the internal emergency plan. The inspection identified no shortcomings, defects or violation of the Limits and Conditions for safe operation.

School Reactor VR-1P at FJFI ČVUT

The school reactor VR-1P at FJFI ČVUT was operated in agreement with the approved Limits and Conditions in a safe and reliable manner. The VR-1 reactor has been extensively used for teaching purposes and played its instructional role also outside the sector managed by the Czech Ministry of Schools. A fundamental critical experiment in the B4 core was performed as part of the teaching process, including an experiment using a graphite matrix blank and low-enriched fuel assemblies EK-10. There were also tests of neutron detectors and neutron oscillators for ČEZ-NPP Temelín. Further there were training courses for ČEZ, a.s., training center Brno. Works continued on a study of comprehensive innovation of the control system of VR 1 reactor. In 2001 the reactor worked for 1200 hours. 2 inspections were performed in 2001 concerning critical experiments and adjustment of documents to comply with Act No. 18/1997 Coll., 3 inspections of nuclear materials and 1 inspection of physical protection of nuclear materials and equipment. The performed inspections identified no shortcomings or violations of the Limits and Conditions of safe operation.

Reactor LR-0 ÚJV Řež

In 2001 the reactor was operated for 159,5 hours. Measurements of criticality in selected active zones were performed for verification of fuel burning, measurements of impact of emergency and control rods in WWER 440 core and measurements in-reactor dosimetry in WWER 1000 reactors. There were no violations of the Limits and Conditions of operation in the LR-0 during the concerned period.

Fresh Fuel Storage Facility NPP Temelín

As on 31 December 2001 the fresh fuel storage facility contained 166 fuel assemblies for Unit 2 NPP Temelín, from which 3 were reserve assemblies, and 42 fuel assemblies for Unit 1 NPP Temelín, i.e. 208 fuel assemblies in total. Regular inspections performed in the fresh fuel storage faculties focused on observation of the Limits and Conditions for permanent operation. The inspections identified no defects.

2.4 Other SÚJB Supervisory Activities

Other SÚJB supervisory activities focused on spent fuel management, transport of nuclear materials, physical protection of nuclear materials in the course of transport, physical protection of nuclear installations and activities of the national system of registration and control of nuclear materials.

2.4.1. Spent Fuel Management

Interim Storage of Spent Nuclear Fuel in Dukovany

Throughout 2001 the following physical parameters were monitored in the interim storage of spent fuel in Dukovany - pressure between the primary and secondary lids of CASTOR-440/84 casks to check their tightness, equivalent dose rate to map the radiation situation in the interim storage and its surroundings. Beyond the standard requirements in the approved Limits and Conditions surface temperature of all the storage containers were monitored as well. The measured levels were in compliance with the levels approved by SÚJB in the Limits and Conditions for permanent operation of the interim storage. The inspections by SÚJB performed in the concerned period focused mainly on observation of the Limits and Conditions and identified no shortcomings.

As on 31 December 2001 the interim storage contained 42 CASTOR-440/84 casks containing 3528 fuel assemblies.

Following favorable assessment of the submitted safety documents SÚJB in March issued a resolution permitting operation of the interim storage of spent fuel in Dukovany as a nuclear installation in the ČEZ, a.s., NPP Dukovany complex, a workplace dealing with very significant sources of ionizing radiation and management of ionizing radiation sources in the interim storage of spent fuel in Dukovany, under the Act No. 18/1997 Coll. valid until 31. December 2010.

Spent Fuel Storage in Dukovany

In December 2001 an administrative procedure was started to issue a license for development of a spent fuel storage facility in the u ČEZ, a.s., NPP Dukovany complex, including assessment of the preliminary Safety Report about the facility. At the same time negotiations were held between ČEZ, a.s. and SÚJB concerning documents about insurance of the facility to support the application for the license.

Spent Fuel Storage Pools at NPP Dukovany

As on 31 December 2001 the spent fuel pools contained in section one 579, in section two 625, in section three 544 and in section four 541 fuel assemblies, i.e. in total 2289 fuel assemblies containing spent fuel.

High-level waste storage facility at ÚJV Řež, a.s.

Two inspections were performed in the facility in 2001, concentrating particularly on quality of water in the spent fuel pool, on optimization of the automatic system monitoring quality of water in the pool and efficiency of the water purification plant.

The inspection performed in May 2001 focused on compliance with the Limits and Conditions and implementation of the corrective measures resulting from the inspection in November 2000. In November 2001 the operator applied for a license to operate the high-level waste storage facility as a nuclear installation and the proceeding has not been yet closed.

As on 31 December 2001 the facility contained 206 fuel assemblies EK-10, from which 190 fuel assemblies in dry boxes, 16 fuel assemblies in the pool B and 228 fuel assemblies IRT-M and IRT-2M, also in the pool B.

Uranium Concentrate Storage Facilities

After the Act No. 18/1997 Coll. came into force the uranium concentrate storage facilities were classified as nuclear installations and therefore the state enterprise DIAMO s.p., branch facility GEAM Dolní Rožínka applied for a license to operate the storage of nuclear materials as a nuclear installation. SÚJB has suspended the administrative procedure until some shortcoming in the submitted documents and in the application are redressed.

2.4.1 Transport of Nuclear Materials

In 2001 there were four in-house transports of spent nuclear fuel in ČEZ, a. s. NPP Dukovany.

In the concerned period there were seven international transports of nuclear fuel from the Russian Federation to ČEZ, a. s., NPP Dukovany and four international transports of fresh fuel from the USA to ČEZ, a. s., NPP Temelín.

Moreover, there were international transports of uranium concentrate from DIAMO, s.p. facilities, two of them to France, three to the Russian Federation and two to Canada. Within the country there was also a one-off transport of eluate containing natural uranium between two facilities of DIAMO, s. p. There were 13 transports of natural uranium within the country from ŠKODA-ÚJP Prague, a.s. to glass works.

The supervisory activities by SÚJB involved six inspections of international transports of nuclear materials and one inspection of radionuclide sources under special conditions. Based on results of the performed inspections SÚJB has concluded that the transports of nuclear materials radionuclide sources was in compliance with the requirements for nuclear safety, radiation protection, physical protection and emergency preparedness.

Based on submitted documents SÚJB type-approved seven transport containers whose previous approvals were about to expire, from which three were manufactured abroad.. Moreover, SÚJB type-approved five transport containers for nuclear materials and one storage container for radionuclide sources newly designed in the Czech Republic and three containers designed abroad.

After more than three years of assessment SÚJB type-approved a container for transport of spent nuclear fuel and its storage - CONSTOR 1500 RBMK, designed by GNB (Germany). Due to shortcomings in the submitted documents the assessment process was

suspended for a newly designed container for fresh fuel for WWER 440, identified as 3525 AF designed by BNFL (Great Britain).

2.4.2 Physical protection of Nuclear Materials and Nuclear Installations

In agreement with its plan of inspection activities for 2001 SÚJB performed nineteen scheduled and one unscheduled inspections of physical protection of nuclear materials and nuclear installations and five scheduled and one unscheduled inspections of physical protection of nuclear material transport.

Nuclear Power Plant Dukovany

The inspection of physical protection in ČEZ a.s., NPP Dukovany has proved that the licensee complied with the requested manner of physical protection for nuclear materials and nuclear installations, in the scope approved by SÚJB, and that the licensee on a contractual basis provided for physical protection of the radioactive waste repository at Dukovany for SÚRAO Prague. The technical system of physical protection was operated in a reliable way, it was continually maintained and gradually modernized.

Throughout the year ČEZ-NPP Dukovany, in agreement with the valid permit issued by SÚJB, refurbished fire doors on the main production buildings I and II. Since validity of the SÚJB resolution approving the method of physical protection at the plant was to expire on 31 December 2001 the licensee submitted to SÚJB an application for a new one supported by respective documents as required by Act No. 18/1997 Coll.

Results of a subsequent inspection confirmed agreement between the documents and implemented physical protection system and therefore SÚJB issued a resolution approving the submitted documents and method of physical protection for ČEZ, a. s., NPP Dukovany. SÚJB started assessment of documents about revitalization of the technical system of physical protection, to be implemented in 2002-2004.

A Czech Police flying squad is available at any time to protect nuclear installations in the NPP Dukovany complex, in compliance with a resolution No. 937 issued by the Czech government on 18 September 2000.

Nuclear Power Plant Temelín

Physical protection of the plant was a standing subject of SÚJB inspections in 2001.

Results of the performed inspections of physical protection have proved that physical protection provided by ČEZ, a. s., NPP Temelín was in full compliance with the SÚJB resolution.

Based on an application submitted by the licensee and based on favorable evaluation of the enclosed documents SÚJB issued a resolution approving preparation of programs for complex testing and a catalogue of tests for the technical system of physical protection. During the second stage of implementation of the technical system of physical protection SÚJB performed five inspections focused on the course of functional tests in agreement with individual programs. Results of the SÚJB inspection have proved correct function of the technical system of physical protection as implemented in the individual buildings at ČEZ-NPP Temelín. Subsequently, the licensee submitted, along with the safety documents, an

application for approval of the method of physical protection of nuclear materials and nuclear installations in ČEZ, a. s., NPP Temelín. Based on a successful completion of complex tests and results of a comprehensive inspection SÚJB approved the submitted documents dealing with the method of physical protection. Physical protection was assured through administrative and technical provisions approved by SÚJB for a period of 3 months preceding the anticipated date of fuel loading into the Unit 2 reactor and temporary measures were canceled for entry of persons and vehicles which complemented the approved method of physical protection during the non-active test on Unit 2..

A Czech Police flying squad is available at any time to protect nuclear installations in the NPP Temelín complex, in compliance with a resolution No. 937 issued by the Czech government on 18 September 2000.

ÚJV Řež a. s.

Administrative and technical provisions to assure physical protection of nuclear materials and nuclear installations in the Nuclear Research Institute in Řež were continually complied with. Immediately after obtaining the building permit the licensee, in cooperation with and using a financial support from US DOE and Sandia National Laboratories, started implementation of the technical system of physical protection.

A new technical system of physical protection needs to be implemented by 30 June 2002 at the latest, when validity of the SÚJB resolution is about to expire.

Other Nuclear Installations

Faculty of Nuclear Science and Physical Engineering (FJFI), Czech Technical University in Prague 1

The inspection identified no shortcomings; the physical protection and its method have been assessed as complying with the statutory requirements.

SÚRAO, Radioactive Waste Repository in Dukovany

The inspection of physical protection identified no shortcomings or deviations from the approved method of physical protection, implemented as an integral part of the physical protection system in ČEZ-NPP Dukovany.

SÚRAO, Radioactive Waste Repository Richard near Litoměřice

The inspection identified no shortcomings or deviations from the approved method of physical protection of nuclear installations.

ŠKODA - ÚJP, Prague, a. s.

The inspection identified no shortcomings or deviations from the approved method of physical protection of nuclear materials.

Uranium Concentrate Storage Facilities

Physical protection in DIAMO, state enterprise, Stráž pod Ralskem and DIAMO, state enterprise – branch facility GEAM, Dolní Rožínka was implemented in full compliance with the approved method of physical protection.

Czech Metrology Institute – Inspectorate of Ionizing Radiation in Prague

Physical protection of nuclear materials in the Czech Metrology Institute – Inspectorate of Ionizing Radiation in Prague was provided in a manner and in the scope established in documents approved by a SÚJB resolution.

2.4.3 Physical Protection of Nuclear Materials during Transport

In 2001 two inspections were performed of physical protection in the course of a combined transport (by plane and road) of nuclear materials, when fresh nuclear fuel was transported from the Russian Federation to ČEZ, a. s., NPP Dukovany, two inspections of physical protection in the course of a combined transport (by plane and railway) of nuclear materials and two inspections of a combined transport (maritime and railway) of fresh nuclear fuel from the USA to ČEZ, a. s., NPP Temelín. Physical protection of the transports met or exceeded the requirements for transport of materials in category III and complied with the conditions contained in related SÚJB resolutions.

2.4.4 National System of Nuclear Materials Registration and Control

In 2001 114 inspections were performed focusing on nuclear materials management. From this number 57 inspections were performed in cooperation with IAEA and 45 inspections were performed independently by SÚJB inspectors. Additional 12 inspections performed by SÚJB inspectors concentrated on import/export of selected items and items of double use.

All the inspections met the established objectives and also positions issued by IAEA on the inspection proved correctness of the data in the National System of Nuclear Materials Registration and Control and compliance with the obligations of the Czech Republic under the Treaty about Non-proliferation of Nuclear Weapons. The course and results of the inspections were documented in detail in the inspection protocols that were disclosed also to the licensees.

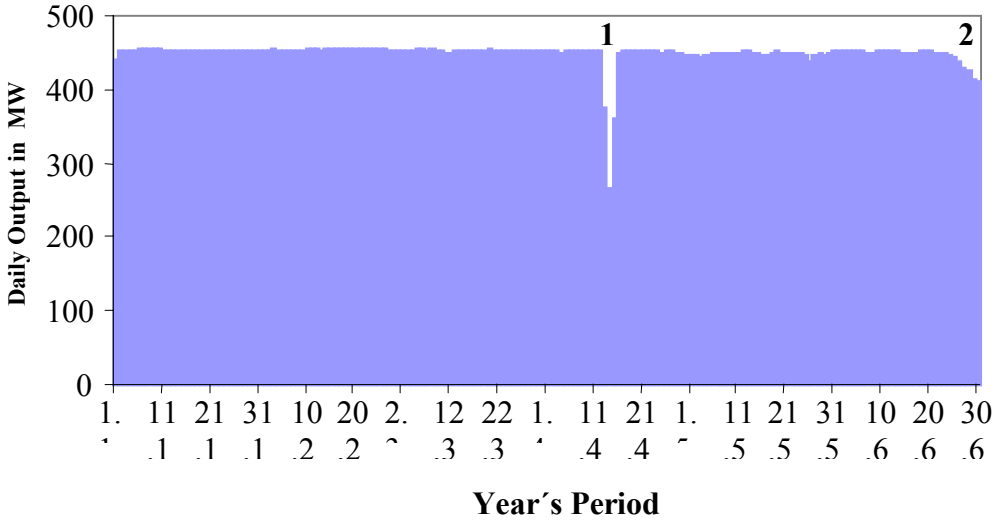
Two common technical inspection performed by SÚJB and IAEA in ČEZ, a. s., NPP Dukovany and one common inspection in ČEZ, a.s., NPP Temelín (Unit 2) have confirmed that operators of the two nuclear installations met all requirements specified by SÚJB and IAEA for installation of new digital surveillance systems – „Server Digital Imaging System (SDIS)“. Eleven inspections by SÚJB organized jointly with IAEA were performed in ČEZ, a.s. NPP Dukovany in connection with calibration of pressure sensors of transport and storage containers CASTOR 440/84 in the Interim Storage of Spent Nuclear Fuel in Dukovany.

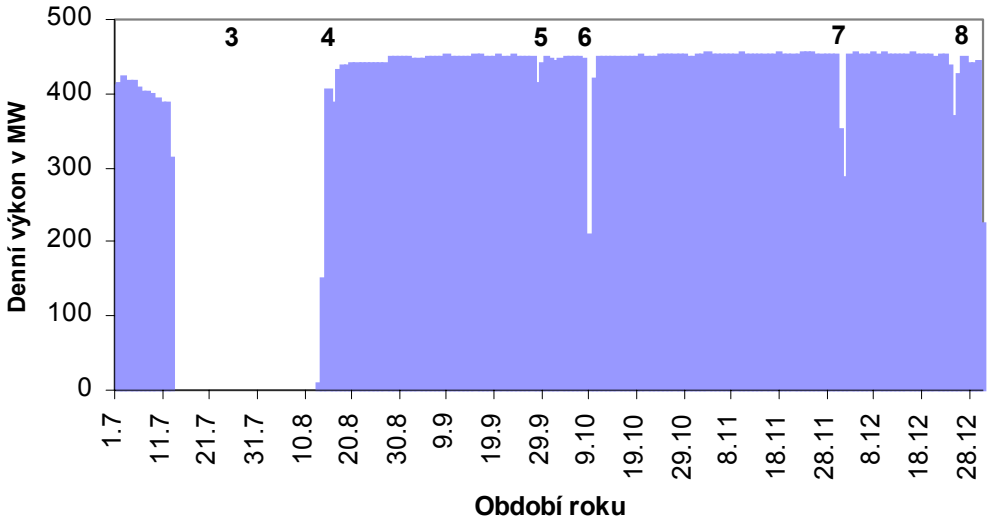
Last year SÚJB issued 16 new licenses in total for nuclear materials management. According to the list kept by the National System of Nuclear Materials Registration and Control there were 193 licensees as on 31 December 2001 in the Czech Republic authorized to perform nuclear materials management in 220 operations-organizational units. The number includes 13 holders of multiple licenses authorizing them to nuclear materials management in 40 operations-organizational units.

In 2001 SÚJB issued 91 licenses for import/export of nuclear materials, selected items and items of dual use in nuclear field. From this number 6/9 licenses were issued for import/export of nuclear materials, 9/7 for import/export of selected items, 43/10 for import/export of dual use items in nuclear field and 7 licenses were issued for export and reimportation of nuclear material. An overview of inspections in nuclear materials management in 2001 is shown in the table below:

MBA Code	Number of IAEA inspections	Number of SÚJB inspections	IAEA inspection efforts (person.days)
CZ-B	4	4	6 (50)
CZ-C	1	1	1 (50)
CZ-D	1	2	1 (6)
CZ-E	0	1	1 (50)
CZ-F	1	1	1 (6)
CZ-G	4	4	6 (50)
CZ-J	10	10	17 (50)
CZ-K	12	12	14 (50)
CZ-L	15	15	19 (50)
CZ-T	7	7	14 (20)
CZ-V	0	2	0 (50)
CZ-W	0	2	0
CZ-X	0	1	0
CZ-Y	0	1	0
CZ-Z	2	39	1 (6)
T O T A L	57	102	81 (438)

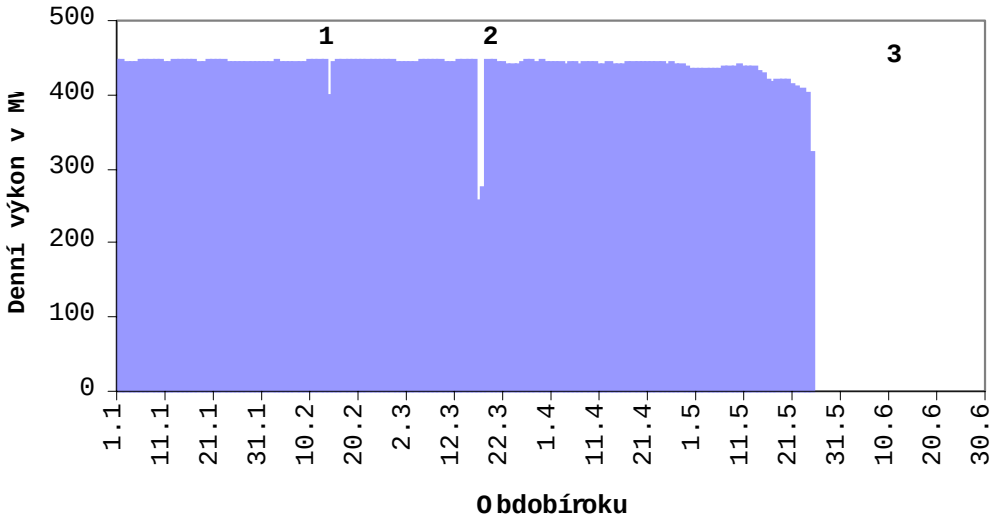
Operation of Unit 1 NPP Dukovany

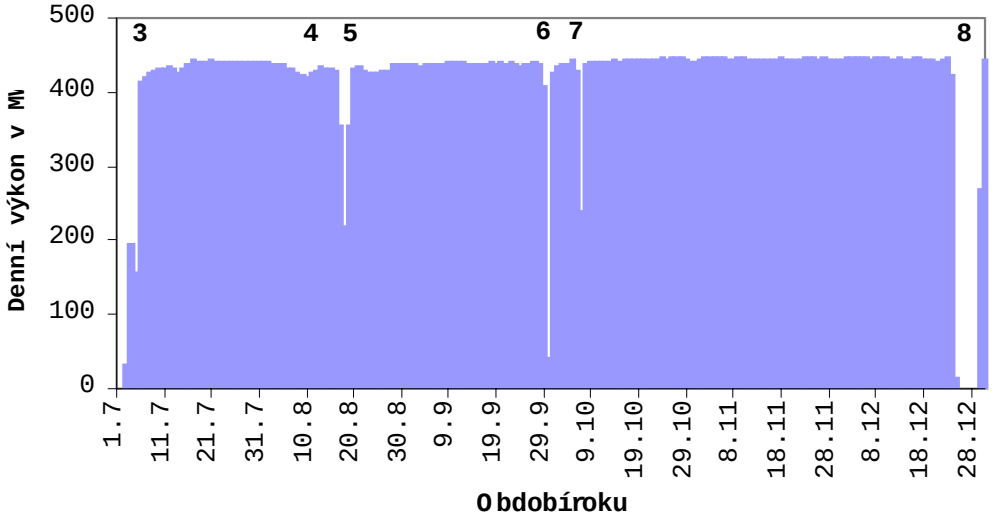




1 – Failure from action by emergency flash protection
2 – Unit outage for inspection purposes
3 – Unit inspection, refueling
4 – Failure of TG11 from manipulation by I&C
5 – Failure of TG 12 from a bogus signal of hydrogen pressure increase in the stator water
6 – Failure of TG 12 from signal loss of excitation after switching from "automatic" into "manual" mode, output reduction to fix leakage in feedwater tank NN1
7 - SP10 failure from action by rotor earthing protection
8 – Removal of leakage on TG

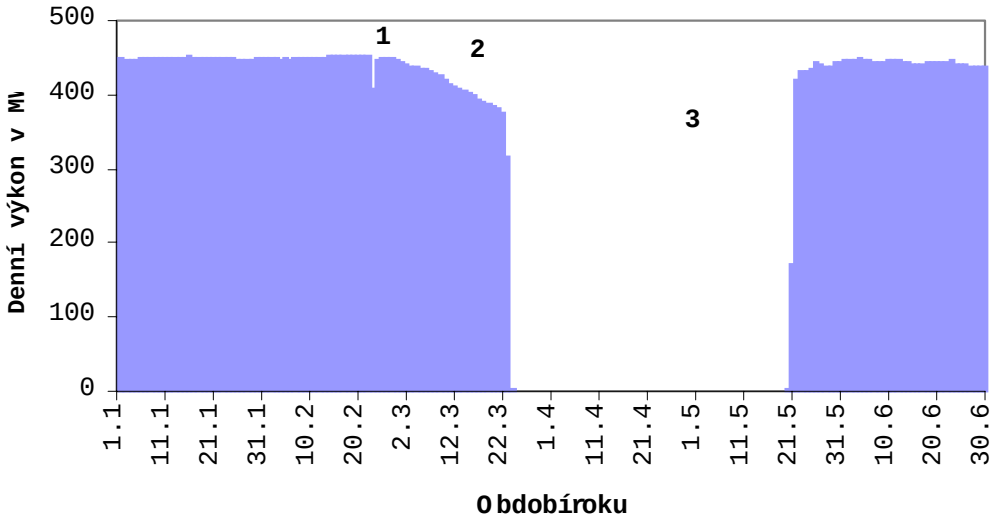
Operation of Unit 2 NPP Dukovany

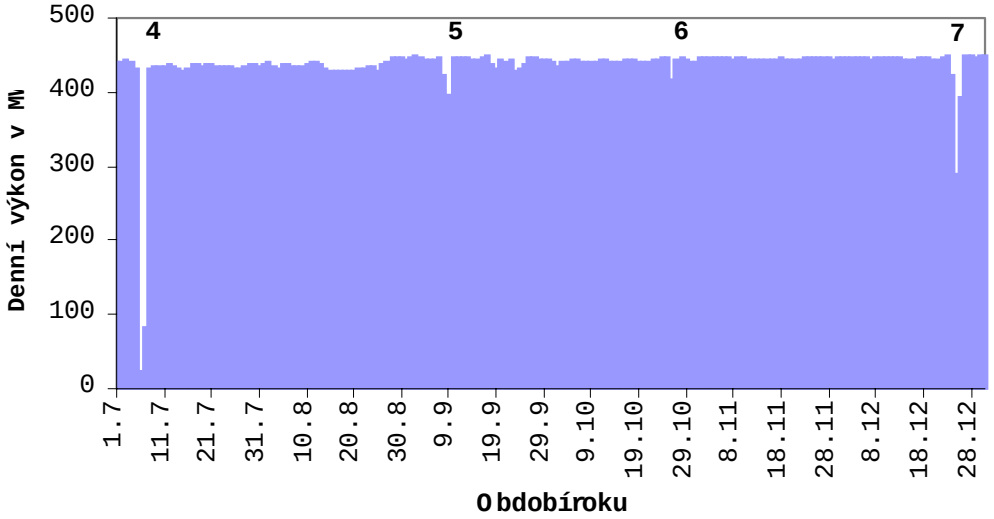




1 – Failure of TG 21 from stator water flow rate
2 – Removal of leakage
3 - Unit inspection, refueling
4 – Failure of TG 22 – defect on excitation
5 – Power output reduced and reaching 100 % - control rod fall
6 – Beginning of power output decrease – refurbishment in the switching station Slavětice
7 – Power output reduction to fix leakage in the primary circuit
8 – Power output reduced for current repair

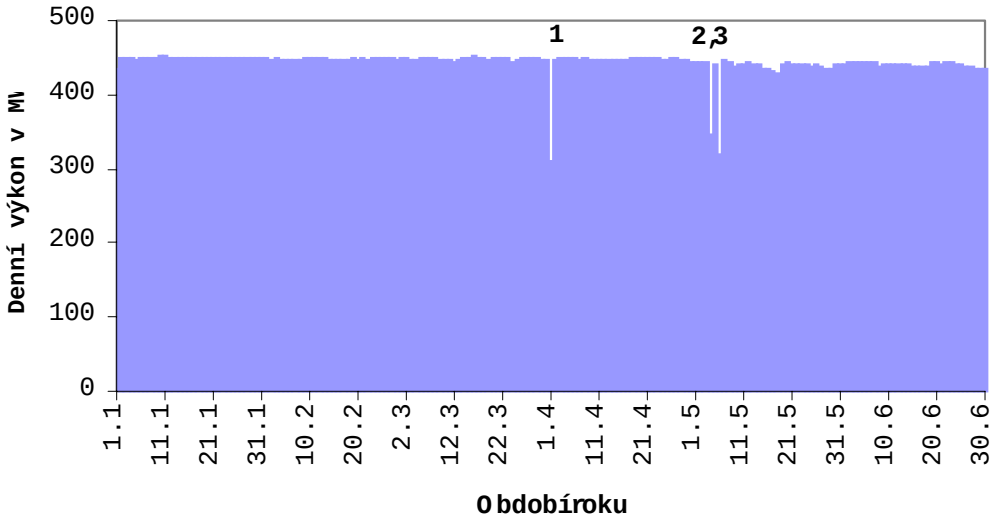
Operation of Unit 3 NPP Dukovany

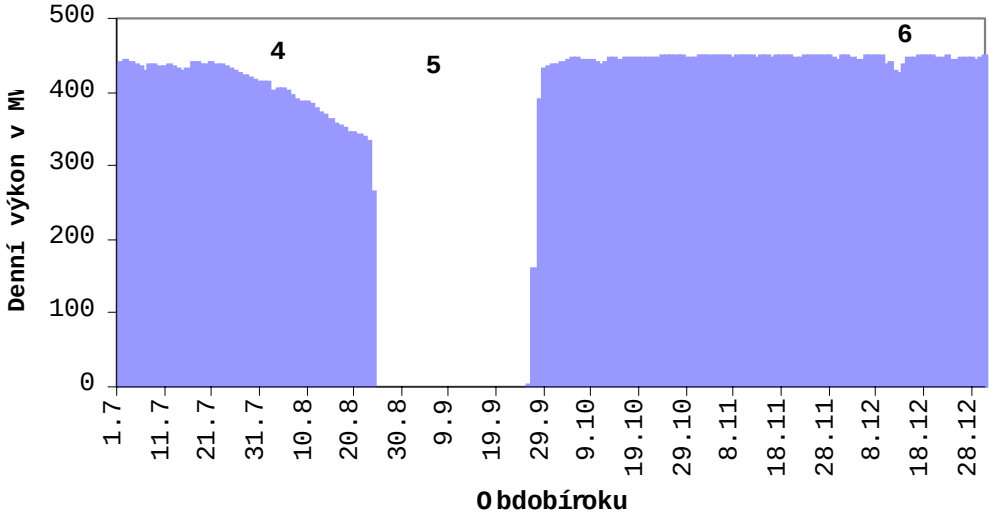




1 – Failure of reactor coolant pumps 1,3,5 at movement of TA10 pumps
2 – Power output reduced for general overhaul
3 - Unit inspection, refueling
4 – Power output reduction and phasing-out of TG 31 – refurbishment in the switching station Slavětice
5 – Power output reduction for optimization tests
6 – Failure of 3BA from bogus action by HZO
7 – Dispatcher back-up for power output surplus in the grid

Operation of Unit 4 NPP Dukovany





1 – Phase-out of TG42 for repair
2 – Action by HZO, loss of vacuum
3 - Phase-out of TG41 for power back-up (agreed back-up for repairs of the plant equipment)
4 - Power output reduced for general overhaul
5 - Unit inspection, refueling
6 – secondary regulation tests

2. STATE SUPERVISION OF RADIATION PROTECTION

The State Office for Nuclear Safety performs also a number of activities in health and environment protection against adverse effects of ionizing radiation. They include, in particular:

- state administration and supervision of radiation protection for the full range of workplaces using ionizing radiation sources - nuclear installations, workplaces employing unsealed radionuclide sources, dental x-ray devices, including type approving for sources, nuclear waste management and release of radionuclides to the environment;
- monitoring, evaluation and regulating of personal exposure, including exposure to radon and other natural sources of ionizing radiation and exposure due to emergency situations;
- coordination of activities in the national radiation monitoring network, including provision of international exchange of data on radiation situation;
- nationwide registration of ionizing radiation sources and nationwide registration of exposed workers;
- enforcement of radiation protection regulations, including imposition of corrective measures and fines.

3.1. Overview of Workplaces with Ionizing Radiation Sources

The scope and complexity of work associated with the state administration and supervision of radiation protection may be well documented with the number of workplaces using ionizing radiation sources. There are five categories of the sources under Act No. 18/1997 Coll., reflecting the increasing potential risks to human health or to the environment – insignificant, minor, simple, significant and very significant. The higher the category the stricter and more extensive requirements for radiation protection, the more complicated approval process and the higher required level of expertise. The inspection activities focus primarily on management of the potentially most hazardous sources and the respective inspections are more frequent, more extensive and more detailed.

The following workplaces use very significant sources of ionizing radiation:

- workplaces with nuclear reactors and related technological equipment (for more details see chapter 2 hereof), specifically 4 power generating reactors in NPP Dukovany, and two reactors in NPP Temelín, currently in the stages of physical and power start-ups, two research reactors in ÚJV Řež, a.s. and one school reactor in ČVUT FJFI in Prague;
- interim storage of spent nuclear fuel and spent fuel pools within the plant complex of NPP Dukovany, radioactive waste repository "Richard" near Litoměřice, high-level waste storage facility in ÚJV Řež, a.s.;
- uranium industry workplaces – mining and uranium ore processing facilities in Dolní Rožínka, clean-up of the mining facility in Příbram location and the closed mine Hamr, cleanup of the chemical extracting facility in Stráž pod Ralskem location and cleanup of the sludge fields in Mydlovary;
- workplaces with big industrial sources, specifically for food irradiation (particularly spices), owned by Artim Praha s.r.o. and workplaces for radiation sterilization of medical materials owned by Bioster, a.s., Veverská Bitýška.

Important workplaces with significant ionizing radiation sources include those manufacturing, distributing and using unsealed and sealed radionuclide irradiators with generally high activities, particularly workplaces of Cesio Praha s.r.o., Sorad Praha s.r.o., Isotrend Praha s.r.o., ÚJV Řež a.s, Nuclear Physics Institute of CR Academy of Sciences in Řež.

An overview of significant and simple ionizing radiation sources as at 31 December 2001 can be found in tables 3.1 through 3.3, based on the source type.

Table No. 3.1. Workplaces with Unsealed Radionuclide Sources

	Workplaces with **significant** ionizing radiation sources (workplaces in category III under Decree No. 184/97 Coll.)	Workplaces with **simple** ionizing radiation sources (workplaces in categories I and II under Decree No. 184/97 Coll.)
Medical and veterinary applications	4	150
Industrial applications	1	15
Other applications (research etc.)	5	125
Total	**10**	**290**

The table 3.1 indicates numbers of workplaces with unsealed sources, i.e. workplaces where radioactive materials occur in a form that does not exclude dispersing of radionuclides on the site or their release to the environment. These sources are usually in form of a chemical and not a „piece“ product; in most cases they are radionuclides with very short half-time and therefore their current activity quickly changes with time. From the viewpoint of radiation protection workplaces with significant sources of ionizing radiation are those with unsealed sources from category III under Decree No. 184/1997 Coll. Workplaces with unsealed sources from categories I and II are classified as workplaces with simple sources. The table 3.1 does not include the above-mentioned workplaces with unsealed very significant sources.

The table 3.2 indicates numbers of sealed radionuclide sources, radioactive materials sufficiently enclosed and tested so that under predictable circumstances of use dispersing of radionuclides on the site or their release to the environment is excluded. Sealed radionuclide sources are of „piece“ nature and, except the calibration sources, they are not used directly but installed into instruments (e.g. – defectoscopy and logging brachytherapy sets). The number of individual sealed radionuclide sources is not identical with the number of equipment using such sources – the equipment may use several sealed radionuclide sources at a time or one after another, sometimes even the number in the equipment may change (this is typical for brachytherapy).

Table No. 3.2. Sealed Radionuclide Sources

	Sealed radionuclide sources in equipment classified as significant ionizing radiation sources	Other sealed radionuclide sources
Medicine	63	477
Industrial and other applications	676	3534
Total	**739**	**4011**

The table 3.3 indicates numbers of radiation generators; in agreement with the definition in Act No. 18/1997 Coll. radiation generators include only those units generating radiation with energy over 5 keV. If one generator may be used with several x-ray tubes (e.g. in x-ray diagnostic instruments) the table indicates the number of generators.

Table No. 3.3. Radiation Generators

	Significant ionizing radiation sources	Simple ionizing radiation sources
Medical and veterinary applications	1584	5142
Industrial applications	202	345
Other applications (research etc.)	22	201
Total	**1808**	**5688**

No license is required to use minor sources under Act No. 18/1997 Coll. which shall be only reported to SÚJB. There are 160 thousand of such sources registered. For insignificant ionizing radiation sources there is no reporting obligation since such sources due to their nature pose no risk to human health or to the environment. – these sources are not subject to state registration.

3.2. Extraordinary Cases

In 2001 there were **86** emergencies reported and investigated in respect to management of ionizing radiation sources or nuclear practices (cases that occurred at Czech NPPs and did not result in human exposure to radiation or to release of radionuclides into the environment are reported in chapter 2 hereof). The cases can be described as follows :

- In 36 cases measuring instruments at entrances to steelworks or at border crossings detected radioactivity in vehicles (railway carriages, trucks) transporting iron scrap – from this number in 20 cases the contamination was caused by natural radionuclides (mainly Ra-226); in 16 cases the materials were contaminated with artificial radionuclides (mostly Co-60).

- There were 4 cases of contamination at border crossings (calibration source, RIA set; materials containing natural radionuclides.

- In 20 cases contaminated material was detected at entrances to waste incinerator facilities**.** After the garbage was sorted in 17 cases individual items were isolated (sanitary waste) contaminated with radionuclides used for therapy and diagnosing in nuclear medicine – specifically 11 times Tc-99m, 3 times In-111; in 3 cases Ra-226); in three cases devices (watch faces) were found containing natural radionuclides (Ra-226).

- In 9 cases contaminated items were detected in scrap yards, containing sources of ionizing radiation (fire alarms, lighting arresters).

- 5 cases concerned found or lost sources that were not significant from the viewpoint of radiation protection (calibration source) or of contaminated materials by private persons, at workplaces or in open space (fire alarms, chemicals containing natural U, Th, emanation device - Ra-226).

In all the mentioned cases SÚJB inspectors decided either to return the contaminated materials to the forwarder or the materials were isolated and safely stored or deposited.

- 4 cases were spurious alarms – unconfirmed suspicions: device without sources, box with ampoules, contaminated railway engine, increased level of radiation.
- In 8 cases the events required specific investigations, while events No. 4, 5 and 8 were important also from the viewpoint of observation and provision of radiation protection requirements:

1. On 9 April 2001, based on the information provided by CR Police and SÚJB, inspectors **chemicals were found** at the DIAGNOSTIKA company, Dolní Poustevna (ca. 7 kg of natural uranium, 3.5 kg depleted uranium and 0.1 kg thorium), for which **no license was available** for management of nuclear materials. The event has been investigated by the Czech Police.
2. On 1 June, 2001 due to a defect on the radiation device CHISOBALT A75 a **mistaken exposure of a patient** occurred in radiotherapy in the Liberec hospital – after the regular exposure was completed the source Co-60 failed to slide back into the cover. The patient was taken away from the source, the source was moved into the cover manually and the instrument was repaired. Investigations performed by SÚJB concluded that the radiotherapy workers acted in agreement with the approved internal emergency plan and action instructions for this type of a technical defect.
3. Following evaluation of personal dosimeters by the national service in personal dosimetry in June 2001 three women working at the radiotherapy ward in the Liberec hospital ORO reportedly obtained **doses of 23.0, 71.5 and 80.7 mSv**. Investigations have proved that the **doses were not personal**, because the dosimeters were used in operational tests (one-off exposure, partly shielded). SÚJB inspectors checked compliance with the license conditions at the workplace and imposed corrective measures.

4. **A workplace contamination** occurred at ÚJV Řež, a.s. from 11 to 20 July 2001 during decontamination and fragmentation works on liquidation of an old radionuclide-contaminated technology, which involved liquidation of radioactive waste, and also **surface and internal contamination** of the institute employees with Am-241. A detailed investigation was performed of the event by SÚJB inspectors, special monitoring of persons was performed by SÚRO Praha, and contaminated employees were examined (and to some of them radioprotective agents were administered) at the Clinic for Occupational Diseases, Faculty Hospital I in Prague. The exposure has been specified with long-term measurements (whole body count, excretion measurements) – total effective doses and effective dose load in the most exposed persons will be smaller than 350 mSv. ÚJV Řež, a.s. performed comprehensive decontamination of the workplace and a special commission was appointed by the Institute to analyze causes of the event. Based on the investigation ÚJV adopted a number of corrective measures. The event has been reported to IAEA in Vienna. SÚJB started an administrative procedure with ÚJV Řež, a.s. which resulted in a fine imposed on the latter.

5. In late September 2001 the company GAMMALUX NDT, s.r.o. Plzeň performed defectoscopy works in the joint-stock company CHEMOPETROL, a.s. in Litvínov. Following their completion on 27 September the workers **left a defectoscopy equipment containing Ir-192 source** at the temporary workplace. The equipment was soon discovered by CHEMOPETROL, a.s. employees and inspectors from RC SÚJB Ústí n.L. decided to place it the same night into a safe in the CHEMOPETROL a.s. complex and its transport were supervised by the Czech Police and fire squad. SÚJB started an administrative procedure with GAMMALUX NDT, s.r.o. which resulted in a fine imposed on the latter.

6. On 23 October 2001 a **theft** was reported in storage premises ŠKODA JS, a.s. Plzeň **of manipulator parts** used for diagnostic tests at nuclear power plants. The manipulator was **contaminated with radionuclides** from the performed works. SÚJB investigated how the equipment was assured from the viewpoint of radiation protection; the theft was investigated by the Czech Police and the perpetrator was not identified. No shortcomings were found in respect to assurance of radiation protection.

7. On 22 November 2001, during decontamination and liquidation works in ÚJV Řež relating to the above-mentioned case No. 3, there was an **exceeding of the action reference level of volume activity** in the atmosphere at the workplace where the wastes were treated. An investigation was started immediately, as well as decontamination of workplaces and monitoring of the employees who participated in the works. No internal contamination of the employees was confirmed. SÚJB requested a review of the corrective measures adopted in connection with the case No. 4.

8. On 12 December 2002, during defectoscopy works performed by DEFEKTA Praha close to the railway station in Zliv near České Budějovice, a **loss of control over a radionuclide source** (Ir-192, 487 GBq) occurred – an engine got to the track where the works were performed. The source remained at the end of the defectoscopy device hose which was cut off by the engine. The source was liquidated by the ISOTREND, s.r.o. Praha company. SÚJB started an administrative procedure to impose a fine and the case was also investigated by the Czech Police. They investigated compliance with conditions of the SÚJB license granted to DEFEKTA for defectoscopy works and the potential fault by the Czech Railway. Based on investigations performed by SÚJB inspectors no fine was imposed.

3.3 Licensing of Activities with Ionizing Radiation Sources

The administrative activities of SÚJB in radiation protection consist mainly in the issuing of licenses for management of ionizing radiation sources and licenses for workplaces using significant or very significant sources under Act No. 18/1997 Coll. The procedure applies to over 5600 legal entities in the Czech Republic, most of them medical facilities.

In 2001 SÚJB as a state administration body issued 2341 resolutions, from which 1782 were issued by the regional centers and 559 by its central workplace. In comparison with previous years (2381 resolutions in 2000, 3063 resolutions in 1999 and 1919 in 1998) the number reflects demand for licenses required under the new legislation. The indicated number fails to include additional 2589 specific resolutions issued in connection with professional authorizations for activities particularly important from the viewpoint of radiation protection. The number of authorizations issued in 2001 was nearly four times higher than that in 2000, because all authorization issued under the old legislation, i.e. before 1997, will expire by 1 July 2002.

3.4. Inspections

Similarly as in the past, the inspection activities in 2001 consisted of local inspections (by SÚJB regional centers) and specialized inspections (to inspect specific sources of ionizing radiation throughout the CR territory). This approach has proved to be the only viable way allowing to carry out inspections with a limited number of inspectors (they also participate in extensive administrative activities of SÚJB and in other tasks required under the law) and at the same time to maintain the necessary professional standard of the inspections.

The inspections have been divided into the ones performed by SÚJB **regional centers** (hereinafter RC) and their inspectors within the regions, and into **specialized inspections** performed by specialized inspection teams appointed by the SÚJB deputy for radiation protection from among the inspectors from SÚJB Prague headquarters, as well as from regional centers. Activities performed by special inspection teams focused on specific types of ionizing radiation sources and related workplaces where a higher level of uniformity in radiation protection is desirable throughout the country (e.g. workplaces with significant and very significant unsealed radionuclide sources, nuclear power plants, uranium industry etc.). The system is complemented with additional **inspections** carried out by ***ad hoc*** established teams, particularly for time-consuming and sophisticated inspections at workplaces using very significant sources.

In 2001 the internal procedure VDS 043 "Planning, preparation, implementation and evaluation of inspection activities in radiation protection" came into effect, which to the maximum extent standardized practices in implementation and evaluation of inspections throughout the Office. The system of inspections rating uses the following classification criteria:

Grade 1

Only minor nonconformities which do not prevent performance of the licensed activity and do not compromise safety.

Grade 2

Serious shortcomings, however the inspected person will be allowed to continue radiation practices under certain circumstances.

Grade 3

Major nonconformities preventing safe operation, as a rule some radiation practices have to be limited or suspended until the related corrective measure is implemented.

Grade N

No inspection was performed or evaluated e.g. due to insufficient input data from the inspected person.

Inspection activities are performed by RC SÚJB based on approved semi-annual plans set up in the individual regional centers, based on the following principles:

- workplaces with significant sources used in the industry shall be checked at least once in two years,
- inspections of significant sources of ionizing radiation shall have priority over inspections of simples sources, particularly in medical applications,
- priority shall be given to inspections of „problematic“ simple sources where some shortcomings are expected,
- in respect to natural sources, attention shall be paid to suppliers of water to public water distribution systems and producers of building materials.

RC SÚJB performed in total 1269 inspections in radiation protection, from which 798 with licensees for simple and significant sources of ionizing radiation. Specialized inspection teams performed 471 inspections dealing with nuclear power industry, nuclear medicine and unsealed sources, radiotherapy, natural sources and radioactive waste management.

In comparison with 2000 (total number of 1623 inspections, from which 951 by RCs and 672 by specialized inspection teams) in 2001 the total number of inspection dropped by ca. 25%, particularly due to a high number of the on-going tests of special professional qualification in which most of the radiation protection inspectors were involved.

In comparison with 2000 (while observing the classification change in agreement with VDS 043) a noticeable improvement has occurred in radiation protection in respect to artificial sources in the inspected entities: 84 inspected entities in 2001 were rated with grade 1 or 2, compared to 76% in 2000.

Table 3.4. Results of inspections rating in radiation protection in 2001

Area of Radiation Protection	Number of inspections subject to rating (%)			
	1 or 2	3	N	Total
Artificial sources	783 (84,3%)	146 (15,7%)	7 (0,7%)	936 (100%)
Natural sources	303 (91,0%)	26 (7,8%)	4 (1,2%)	333 (100%)
Total	1086 (85,6%)	172 (13,6%)	11 (0,8%)	1269 (100%)

For natural sources the situation remained favorable similarly as in 2000, when over 90% of the inspected entities were rated with grade 1 or 2. The prevailing cause of rating with grade 3, for the inspected entities licensed for management of sources of ionizing radiation, was absence of a license under Section (§) 9 of the Atomic Act or licenses issued to entities which changed their legal form or transformed themselves in the course of time

In case of producers of building materials and suppliers of water into public water works the most frequent reason for grade 3 was non-observation of the obligation under Section (§) 6 paragraph 3 of the Atomic Act, i.e. the obligation to provide for systematic measuring and evaluation of natural radionuclides content and to record the data and report them to SÚJB.

11 cases were rated with grade N: 9 of them involved termination of the activity and 2 cases concerned detection of contaminated materials; in terms of sources type 7 cases involved artificial and 4 cases natural sources of ionizing radiation.

Throughout the year the new database system "ZOI" („Reports on Inspection") was evaluated as positively useful to record inspections by RCs and headquarters. In the first half of 2002 all reports will be posted and made available on the intranet so that they are readily available to all the inspectors.

Based on the findings the inspection activities in 2002 will focus mainly on the following issues:

- **nuclear power plants** – assessment of the course of individual commissioning stages at NPP Temelín and immediate implementation of the resulting experience at Unit 2; at NPP Dukovany assessment of documents associated with the planned modernization;
- **nuclear medicine and unsealed radionuclide sources** – entities providing services to nuclear medicine wards (works in the licensee's controlled zone) and protection of employees in connection with the introduction of methods using PET radionuclides;
- **servicing activities** on the sources (installation, commissioning, repairs) of ionizing radiation , particularly in medical facilities;
- relating to the impact of **uranium** extraction, old loads and mining activities on the working environment, potential release of radionuclides into the environment and compliance with the approved monitoring programs;
- **radioactive waste management –** releasing of solid items for disposal at dumping sites and professional qualification of all employees of the licensees authorized for radioactive waste management.

3.5. Regulation of Occupational Exposure

The exposure of workers with ionizing radiation sources was monitored in 2001 by five concurrently operating dosimetry services – the national service in personal dosimetry (a limited liability company based in Prague), dosimetry services at NPP Dukovany and NPP Temelín, dosimetry service at ÚJV Řež, a.s. and dosimetry service SÚJCHBO Kamenná u Příbrami, which monitors workers in the uranium industry (Diamo, s.p.). Since 1999 the Institute of Dosimetry with the CR Academy of Sciences has had a valid license to calculate doses received by aviation personnel. Similarly as in the past years, around 20 thousand people working with ionizing radiation sources were monitored in 2001. The doses were registered in the Central Register of Occupational Exposure kept by SÚJB. The following conclusions have been drawn from the preliminary evaluation of doses:

- at NPP Dukovany 2177 workers were monitored in 2001 (from which 826 were employees of the plant and 1351 employees of the contractors), the total collective effective dose was 1,41 Sv (including all doses over 0,05 mSv) and the average personal effective dose was 0,65 mSv; the highest annual individual effective dose was found for a contractor employee (19,05 mSv),

- in the uranium industry 850 people were monitored at workplaces both underground and above the ground, the total effective collective dose was 4,450 Sv and the average individual effective dose was 5,2mSv; the highest individual effective in 2001 was 38,4 mSv (underground);

- in connection with other industrial applications approximately 2500 workers were monitored while the average individual effective dose was 1 -2 mSv; the professions exposed to higher doses in general were defectoscopy (1,5 mSv) and logging activities (2,2 mSv);
- for medical facilities using ionizing radiation sources doses received by nearly 11 thousand workers were evaluated, while for 50% of them the annual individual effective dose was below the recording level, the average annual individual effective dose in the rest of them was 1,2 mSv; the average annual individual effective dose in doctors – cardiologists, whose doses were traditionally the highest, was around 1,5mSv;
- ca. 800 workers in specialized professions, e.g. in servicing and inspecting of sources, received the average annual effective dose around 0,5 mSv;

The collective effective dose in 2001 was estimated at 15 Sv and the average individual effective dose per one monitored worker was estimated at 0,8 mSv.

The data from the register were in 2001 used to fill out UNSCEAR questionnaires for the period 1995-1999.

In 2001 a case was investigated of a defectoscopy worker whose effective annual dose was estimated at 250 mSv. An investigation by SÚJB inspectors confirmed the dose as probably personal, however it was not possible to accurately specify circumstances of the exposure. The worker was temporarily assigned to do a different kind of work with no exposure to sources of ionizing radiation. 5 more cases were investigated, when dosimetry services indicated **one-off** (in a given inspection period) exposure of personal dosimeters with doses exceeding 20 mSv. The afflicted persons were 4 healthcare workers and 1 worker in defectoscopy. The investigations confirmed the doses were not personal because the

dosimeters were not stored properly. Major attention was paid to assessment of the internal exposure of workers performing liquidation at ÚJV Řež, a.s. of radionuclides in contaminated material (see paragraph 3.2. hereof, case No. 4). The analyses performed until now have confirmed that the total effective dose loads (exposure in the course of 50 years following intake of radionuclides) will be smaller than 350 mSv; however the dosimetric measurements have not been completed yet..

It may be concluded from investigations of exposure to high doses that the critical professional group remains to include doctors performing intervention radiological procedures and workers in defectoscopy. Still, there was no significant increase in number of investigated cases. One negative phenomenon was the higher number of improper use of personal dosimeters – unsecured storage, incorrect storage at places of exposure, incorrect placement on the body, willful exposure, etc. There were still cases where it was impossible to identify the reason of a measured increased dose– in those cases the doses were entered into the register as probably personal (to keep a conservative approach). In 2002 meetings will be organized with representatives of the mentioned professional groups and effective procedure will be discussed to improve radiation protection of the workers.

In 2001, in agreement with the amended Atomic Act, a draft decree was developed on radiation protection of workers in the controlled zone of another licensee. The workers will be provided with the so-called radiation passes, issued and registered by SÚJB from January 2004.

3.6. Regulation of Public Exposure

The main efforts to reduce public exposure concentrated on the exposure to radon in buildings which accounts for the prevailing portion of the total effective dose received by population in the Czech Republic. This component of personal exposure is very varied, while higher exposure levels may be controlled at reasonable costs as proved by the experience from previous years. Another important component of public exposure is medical exposure and SÚJB also focused on its reduction. This type of exposure occurs in patients receiving medical treatment involving utilization of ionizing radiation sources.

3.6.1 Medical Exposure

The methodology of monitoring and evaluation of public exposure to sources used in medical facilities was devised in previous years, particularly in cooperation with SÚRO for radiodiagnostics and with the teaching hospital in Olomouc for nuclear medicine. In 2000 SÚJB received a data file from the country's major healthcare insurer „Všeobecná zdravotní pojišťovna" about the performed examinations involving ionizing radiation sources in 1998 and 1999. In 2001 the data were statistically processed and methodologies for the calculation of effective doses for individual types of examinations were made more accurate.

The results were used to fill out UNSCEAR questionnaires covering the period of 1995-1999. The results have been presented in a separate report available from SÚJB. In 2002 a new scientific project will be started by SÚJB to develop a detailed methodology for assessment of doses in radiodiagnostics, also taking into account instrumentation available at the individual workplaces.

As part of the harmonization process of the Czech legislation with that of EU in medical exposure provisions of the EC directive No.97/43/EURATOM have been translated into the prepared amendments to radiation protection regulations. In this connection and in connection with the SÚJB guarantee of compliance with Implementation Plan for EC Directive No.97/43/EURATOM, repeated meetings were held with representatives of the

Czech Healthcare Ministry, committees of ČLS JEP – Radiological Society, Nuclear Medicine Society, Society of Radiation Oncology, Biology and Physics, Society of Radiological Laboratory Technicians and Assistants, the major national healthcare insurer (Všeobecná zdravotní pojišťovna) and other healthcare institutions. The issue was discussed with representatives of the healthcare sector also at several specialized workshops. Big attention was paid to assessment of teaching curriculum and practical training of radiology physicists, whose numbers need to be increased in agreement with the quoted EU Directive for radiotherapy and nuclear medicine, as well as for radiodiagnostics. In this connection a motion was submitted to the Czech Ministry of Healthcare to form an inter-ministry Working Group of radiology physicists. The EU document "Indication Criteria for Imaging Methods" was translated as part of regulation efforts in medical exposure and provided to the Ministry of Healthcare, to cooperate on procedures for its practical use. In cooperation with SÚRO an irregular "Rentgen" bulletin was issued and distributed to medical workplaces. SÚJB employees have been members of specialized commissions at the Ministry of Healthcare (Commission for evaluation of placement of selected healthcare instruments, Commission for mammography screening) where they enforce radiation protection requirements to regulate medical exposure.

3.6.2 Exposure to Natural Sources

In cooperation with SÚRO and district authorities SÚJB continued the systematic efforts to locate citizens living in locations with excessively high radon-related risks. The statistics of locating efforts has been processed for the past calendar year. Results of measurements have been continually reported to owners of houses and buildings and in case of increased risks the owners have been informed about the possibility to apply for a contribution from the state budget for anti-radon measures.

A database of results from the locating efforts has been routinely used and, apart from regular outputs, it has also enabled to produce detailed maps for municipalities to predict radon risks in their residential facilities.

In this area SÚJB in cooperation with SÚRO performed also the following other obligations required particularly by the CR governmental resolution No. 538 of 31 May 2000 on the Czech Radon Program:

- An index of radon-related risks was established for each district as a criterion for the state subsidy for anti-radon remedial measures in housing facilities in 2001.
- A central register was maintained of financial requirements from district authorities for anti-radon remedial measures in school buildings, public water distribution systems and apartments.
- A proposal for allocation of subsidies to individual districts has been elaborated, giving preference to school buildings and water supply systems.
- A meeting was held with contact workers from all district authorities on current tasks under the Radon Program.
- A report was elaborated on the fulfillment of tasks from the CR Radon Program established by the governmental resolution No. 538/1999 and administered by SÚJB.
- Long-term and day-to-day tasks were assigned for the purposes of Radon Program implementation and their fulfillment was reviewed.

- Official positions for district offices were elaborated on anti-radon remedial measures in 16 school buildings and 23 public water distribution systems.

- A proposal was submitted to provide for the tasks assigned to district offices by the quoted governmental resolution in connection with the state administration reform (regional offices and municipalities with delegated power).

In connection with the prepared amendments to radiation protection regulations principles of radiation protection solutions were outlined during activities/works involving increased occurrence of natural radionuclides or increased effects of cosmic radiation that lead or may lead to a significant increase in exposure of physical persons. The regulations concern particularly:

- facilities processing natural materials containing natural radionuclides (the so-called NORM or TENORM - Technologically Enhanced Normally Occurring Radioactive Materials) potentially concentrated in some stage of their processing,

- facilities with increased radon levels in the atmosphere from geology or ventilation, e.g. caves, underground facilities,

- plane crews.

3.7 Medical Aspects of Radiation Protection

In 2001 SÚJB examined 93 suspected cases of occupational disease, from which:

- Among workers in uranium mines there were 83 cases of lung cancer and 2 cases of other diseases (skin basaloma). In 24 cases of lung cancer and both cases of skin basaloma the probability of a causal link between the disease and work in underground uranium mines was evaluated as prevailing. In the other cases no interrelation was proved between the disease and work in the risky environment with ionizing radiation.

- For workers in other professions there were eight cases of considered diseases – six cases of lung cancer (five workers from ore mines, one defectoscopy worker), retinitis (defectoscopy) and brain tumor (astrocyte glioblastoma; research workplace). In one case of lung cancer (ore mines) and for the brain tumor the probability of causal link between the disease and work in risky environments was evaluated as prevailing, in one case of lung cancer (ore mines) as borderline. In the other cases no causal link was confirmed.

Estimation of a dose received by a fetus due to radiodiagnostic examination of the mother was made in 20 cases. In two cases the examinations were in nuclear medicine, the other cases involved radiodiagnostics. Only for one patient the estimated dose exceeded 20,0 mSv (33,2mSv), in seven cases it was 5,0 - 10,0 mSv and in 12 cases it was below 5,0 mSv. The results were in the fastest possible way (mostly within 24 hours) transmitted to the applicant, mostly genetic consultants.

SÚJB continued its involvement in a system providing help and special medical assistance to individuals exposed in radiation accidents. In this connection SÚJB evaluated a medical part (traumatology plan) of the internal and external emergency plan for NPP Dukovany and medical part of the internal emergency plan for NPP Temelín.

Significant attention was paid to the iodine prophylaxis, including pro-active involvement at working meetings of IAEA in Vienna and WHO in Bratislava. Based on a material provided by IAEA in Vienna a Recommendation was issued by the SÚJB Deputy Chairman for radiation protection „How to recognize and immediately treat health impairment at a radiation accident “ and distributed in cooperation with the Ministry of Healthcare to medical facilities and centers, including medical faculties. In cooperation with the Clinic of Occupational Diseases of the General Faculty Hospital in Prague, SÚJB inspection unit and SÚRO department for monitoring of internal exposure, one case was addressed of internal contamination of ÚJV Řež employees with the Am-241 radionuclide.

The cooperation with the Czech Ministry of Healthcare also involved the department of chief health officer, mostly in connection with assessment of working risks (including evaluation of chromosome aberrations in periphery blood lymphocytes of exposed workers) and analysis and assessment of natural radionuclides levels in drinking water. Further, the cooperation involved registration of radiopharmaceuticals, research using sources of ionizing radiation and emergency preparedness.

SÚJB specialists in exposure regulation also provided information to general public about the issue of biological effects of ionizing radiation (e.g. negotiations with the environmental activist group South Bohemian Mothers), medical exposure (pro-active participation in workshops organized by the healthcare sector) and exposure from natural sources (e.g. workshop for residents of the Krásno municipality, afflicted by consequences of uranium ore extraction).

3.8 Central Registers and Databases in Radiation Protection

In 1997-2001 the radiation protection section of SÚJB developed tools for administration of national registers by SÚJB as required by Act No. 18/1997 Coll. (the Atomic Act). They are central registers of occupational exposures, ionizing radiation sources, licensees, notifying persons and population exposures to ionizing radiation sources used in medical facilities and to natural sources.

3.8.1 Central Register of Occupational Exposures

The register is now routinely used in its 2.1. version at SÚJB workplaces in Prague. The register is fully functional, contains tools to process data from the individual providers so that the database can be updated. The register enables to search in the data of individual registered workers, collective data about individual workplaces or professional groups and collective information in form of statistical outputs with selected parameters. In 2002 the register will be complemented with the agenda of radiation passes issued to contracted workers. The register is available on the SÚJB intranet.

3.8.2 Register of Sources

The application has been in routine operation since 2000 throughout SÚJB, including its regional centers. It enables to search and display historical data on the registered sources and contains tools for management of the agenda relating to individual sealed radionuclide sources, facilities containing such sources, facilities with unsealed radionuclide sources and generators of ionizing radiation. The register has been continually developed and in the future it will contain registration and assessment of long-term stability inspections.

3.8.3 Register of Licensees and Notifying Persons

Implementation of the register of licensees and notifying persons started in 2000 as a tool to integrate registers run by SÚJB. The register is linked with the central register of occupational exposures and to the register of sources, as well as to the register of nuclear materials and register of resolutions.

3.8.4 Central Database of Medical Exposures

The database has been developed using data from the major national insurer "Všeobecná zdravotní pojišťovna" (VZP) requested by SÚJB and it is maintained separately, without any links to the registers described above. The processed data from VZP enable to identify frequencies of examinations in different types of x-ray diagnostics and nuclear medicine, structured by age groups and sex of the patients. For nuclear medicine the quantity of applied radiopharmaceuticals is available for each examination. The last processed period is 1998-1999. The data are anonymous in respect to individuals and workplaces.

3.9 Radioactive Waste Management

A schedule has been approved for NPP Dukovany to introduce technology for treatment of sludge and ion exchangers. The Limits and Conditions for radioactive waste management were met. On request made by SÚJB safety analyses were repeated for the repository at NPP Dukovany and based on their results SÚJB approved new Limits and

Conditions for safe operation of the repository. The repository was operated in agreement with the approved Limits and Conditions.

Chapter 11 "Radioactive Waste Management" in the Preoperational Safety Report for Unit 2 of NPP Temelín was evaluated favorably. Based on the performed pre-complex and complex tests of equipment employed for radioactive waste management SÚJB has concluded that the equipment worked safely and in agreement with the design documents.

The administration of radioactive waste repositories(SÚRAO) applied for a change in the monitoring program and in the Limits and Conditions for the repository safety operation. SÚJB assessed the changes and approved them.

In respect to other workplaces SÚJB on 4 December 2001 suspended the administrative procedure about an application by ŠKODA-ÚJP, Praha, a. s., for a license for radioactive waste management, until shortcomings in the application are redressed. Based on the submitted documents SÚJB issued a license for radioactive waste management for WADE, a. s., Třebíč, in the scope and manner including gathering, sorting, accumulation, processing, storage and transport of radioactive wastes containing artificial radionuclides, generated in the ČEZ, a.s.- NPP Dukovany complex, while the licensee will carry out these activities as a contractor for ČEZ, a.s.- NPP Dukovany using technology and equipment owned by ČEZ, a.s.- NPP Dukovany and based on a contract with the customer - ČEZ, a.s.- NPP Dukovany and administration of radioactive waste repositories (SÚRAO) Praha. All the radioactive waste will remain the property of ČEZ, a.s.- NPP Dukovany or SÚRAO.

3.9. Release of Radionuclides to the Environment

3.10.1. Decommissioning of Nuclear Installations

Assessment was started of the Preliminary Safety Report - the part dealing with a concept of safe closing of operation and decommissioning - to extend the spent fuel interim storage in Dukovany.

3.10.2 Decommissioning of Workplaces in the Uranium Industry

In agreement with a SÚJB license for decommissioning, by closing and dismounting of the underground facility in the mine Hamr I, a workplace with a very significant source of radiation of the state enterprise DIAMO, s. p., the branch company Těžba a úpravna uranu, Stráž pod Ralskem, the first stage of decommissioning was completed on 30 April 2001, consisting of liquidation of horizontal and vertical mining facilities. The second stage followed, involving liquidation of the pits No. 1, 2, 3 and 13. In connection with decommissioning of the sedimentation pit – stage II of chemical extraction facility Důl chemické těžby o. z. TÚU DIAMO s. p. on 1 August 2001 started pushing of the water from sedimentation pit into the mine field Hamr I. As on 17 December 2001 1 301 858 m^3 of the water had been pushed under the ground.

3.10.3 Decommissioning of Other Facilities

Based on a request and favorable assessment of documents submitted in agreement with the law, SÚJB issued a resolution on 5 December for the iron works Třinecké železárny, a.s., to release radionuclides into the environment, melting batch contaminated with ^{60}Co by reinforcing steel (reinforcing wires) under the terms resulting from requirements for radiation protection.

On 27 December 2001 SÚJB issued a resolution imposing corrective measures on ÚJV Řež, a.s. based on the previous inspection findings, specifically liquidation of tanks in the building 211/3 (minor residues), liquidation (disposal) of radioactive wastes from building 211/6 (reloading of radioactive wastes), liquidation of contaminated technology in the building 241 (major residues), liquidation of contaminated technology in the building 250 (big chemistry), liquidation of contaminated liquids in tanks in the building 211/5 (decay tanks), liquidation (disposal) of high radioactive wastes from the tanks in the buildings 211/5 (decay tank), liquidation (disposal) of contaminated liquid from tanks in the building 211/5 (decay tanks) and liquidation (disposal) of radioactive wastes form the surface Červená skála under the terms defined in the resolution. The deadline to submit a schedule of the corrective measures was set on 30 June 2002.

4. EMERGENCY PREPAREDNESS

Seven inspections in total were performed in the concerned period to assess emergency preparedness status of nuclear installations and other workplaces, from which two were at NPP Dukovany, three at NPP Temelín, one in ÚJV Řež a.s. and one in SÚRAO – radioactive wastes repository Richard.

In 2001 the Emergency Response Center of SÚJB participated in assessment of the Preoperational Safety Report for Unit 2 NPP Temelín, by providing for its coordination and assessment, including elaboration of the entire Volume II – „Location Characteristics“ and assessment and elaboration of chapter 13.3 – „Planning of Activities in Emergency Situations“.

The Emergency Response Center in 2001 assessed and prepared its positions supporting approval, or approved, internal emergency plans for DIAMO, s.p., branch facility TÚU (for DH I, DH I – draining and DCHT), facility GEAM (for Rožná I, OEAS and CHÚ), Správa uranových ložisek Příbram (for RLP Mydlovary), Léčebné lázně Jáchymov, a.s. and ÚJV Řež, a.s. In 2001 revisions of internal emergency plans were approved for ČEZ, a.s. – NPP Dukovany, ČEZ, a.s. – NPP Temelín, ÚJV Řež, a.s., and SÚRAO – radioactive waste repositories Richard and Bratrství.

In agreement with plans for SÚJB sub-committee for population protection within the Committee for Civil and Emergency Planning, National Security Board and the Czech government, the Emergency Response Center of SÚJB elaborated the document „Provision and Renewal of the National Radiation Monitoring Network “. The document was submitted to and discussed by the Committee for Civil and Emergency Planning, the National Security Board and the government while the latter passed in this connection its resolution No. 478.

In respect to emergency management of SÚJB, works continued on the individual parts of the emergency plan (Methodology of work for SÚJB emergency staff, Powers, responsibilities and tasks of SÚJB, Characteristics of emergency management organization in ÚJV, Basic characteristics of emergency situations etc.).

Fundamental documents were developed for SÚJB emergency staff activities (VDS 016, 019, 021, 031) while the duty planning system was simplified and its organization improved. Since 1 November 2001 a new structure of 11-members emergency staff has been introduced and a number of measures has been adopted in this connection in the training of emergency staff members and improvement of technical equipment of the emergency management workplace.

In November and December the Emergency Response Center organized a training of members of all professional groups in the emergency staff, some of them performed by external specialists. Further, individual trainings started of professional groups in the emergency staff to master software applications available in the Emergency Response Center and to improve their habits and skills.

The SÚJB emergency staff in 2001 took part in drills organized by the surrounding countries and IAEA. In December Emergency Response Center launched its own emergency staff drills and the efforts will continue in 2002.

In connection with the new structure instructions have been developed for each function in the emergency staff and a number of supporting documents issued for the emergency staff work (tables, forms, procedures etc.). Documents for services performed by SMČR were completely reworked.

In the field of technical equipment of the emergency management workplace works started on development of a separate network for the Emergency Response Center, independent of the SÚJB network. Web pages of the Emergency Response Center have been improved, to include more information on emergency management, tasks, obligations and structure of the SÚJB emergency staff , duty planning and documents necessary to carry out functions of the emergency staff.

The Emergency Response Center was intensely involved in development of an agreement on cooperation between SÚJB and Ministry of the Interior – general headquarters of the Czech fire brigades, about communication support in case of an extraordinary event important from the viewpoint of nuclear safety and radiation protection on the Czech Republic's territory and abroad and about operation of the National Warning Point on the Czech Republic through the operations and information center of the Interior Ministry – general headquarters of Czech fire brigades, signed along with other two agreements (on mutual cooperation in performance of tasks under Act No. 18/1997 Coll. and other related legal regulations, and on provision of monitoring tasks) on 31 May 2001.

The Emergency Response Center continued its involvement in assessment of both the external emergency plans developed under the new legislation, establishing regional authorities, integrated emergency system and emergency management. The external emergency plan for NPP Dukovany was approved in June 2001 and the external emergency plan for NPP Temelín in December 2001.

Activities of the Emergency Response Center also included international cooperation – extensive negotiations took place with EU specialists, resulting in a partial supply of equipment for the RODOS program. At the same time the Emergency Response Center received documents defining the scope of assistance by EU DG ENV - RAMG KKC. There were also regular meetings with members of the Emergency Control Center of the Slovak Office for Nuclear Supervision. Initial steps were taken to implement the ECURIE system, i.e. an EU system to communicate information about occurrence of radiation accidents in EU countries. The Czech Republic through SÚJB and OPIS MV GŽ Czech Fire Protection and Rescue Corps ČR participated in ENATOM, i.e. an IAEA system communicating information about occurrence of a radiation accident or radiation emergency and about requested assistance.

Activities of the Emergency Response Center in 2001 concentrated on the provision of its routine operation. In the concerned year preparations were completed for data transmission from NPP Temelín and a database was fine-tuned to store data from NPP Temelín. An in-depth inspection of the Emergency Response Center network was performed and followed by a proposal and implementation of security measures.

Employees of the Emergency Response Center were on regular and pro-active basis involved in the emergency management bodies of the Czech Republic (SOPSCO, POO, Committee for Civil and Emergency Planning) and participated in development of a number of documents important for emergency management (Concept of population protection; Risk of occurrence of emergency situations in the Czech Republic and tasks of ÚSÚ in their prevention and repression …). In cooperation with the Interior Ministry – general headquarters of Czech fire brigades - the employees were involved in preparation of the drill ZÓNA 2002.

The emergency response center also pro-actively participated in preparation and implementation of the IRRT mission.

5. STATE INSTITUTE FOR RADIATION PROTECTION, NATIONAL RADIATION MONITORING NETWORK IN THE CZECH REPUBLIC

The National Institute for Radiation Protection is an organizational unit established by the Chairperson of the State Office for Nuclear Safety through a resolution issued on 26 May 1995, effective from 1 July 1995. The content of its activities is in detail specified in its statute of 15 November 1995. The basic function of the Institute is to provide for professional, methodical, educational, information and research activities associated with state administration in protection against ionizing radiation in the Czech Republic. In 2001 the Institute significantly participated in provision of the following activities:

- function of permanent and emergency services for the major part of operation of the Czech radiation monitoring network , both in the normal and emergency modes,
- population protection through monitoring and regulation of exposure to natural sources, including provision of radon program,
- population protection against exposure to artificial radionuclides in connection with nuclear power facilities,
- evaluation and regulation of medical exposure in radiodiagnostics and radiotherapy,
- research in radiation protection.

The Institute carries out also other tasks, as required by its founder.

A central workplace of the Institute is situated in Prague within the complex of the National Health Institute. The Institute has also two branches: one in Hradec Králové – Piletice, which focuses on the issues of radon and natural radionuclides in the environment; the other branch in Ostrava specializes in radiodiagnostics.

Based on its main activities the Institute is structured into the following three main departments:

- The monitoring department deals particularly with the issues of artificial radionuclides in the environment in association with nuclear power installations, and with the issues of internal contaminations. The department plays an important role in provision of operation of the radiation monitoring network in the Czech Republic.
- The dosimetry department mostly deals with medical exposure in radiodiagnostics and radiotherapy, operates an x-ray laboratory, laboratory of thermoluminiscent dosimetry and other special laboratories and field measurements of dosimetry parameters. The department includes a highly-qualified mobile team.
- The department of exposure regulation deals with population exposure to natural radiation, particularly from radon and other natural radionuclides, and with epidemiology studies of lung cancer in relation to radon.

A detailed description of the long list of activities performed by the Institute, including their results, is every year presented in the annual report on activities of the State Institute for Radiation Protection and, in cooperation with the State Office for Nuclear Safety, also in the annual report on radiation situation on the Czech Republic's territory.

This report presents in detail only results of the Institute's key activity – the national radiation monitoring network.

Activities performed by the national radiation monitoring network are coordinated by SÚJB which, in cooperation with the State Institute for Radiation Protection, also functions as its headquarters. The results of monitoring were as usual submitted in form of an annual Report on Radiation Situation on the Czech Republic's Territory and submitted to the central governmental bodies and to the general public through district offices, hygienic service centers and libraries.

The national radiation monitoring network operates in two modes: the regular mode focuses on monitoring of a current radiation situation and timely identification of radiation accidents while the emergency mode focuses on evaluation of consequences of such accidents. The regular mode is continually executed by the so-called permanent elements of the network while the emergency mode uses also the standby elements of the system. Under normal circumstances the monitoring is performed by several subsystems with the involvement of selected or all permanent elements of the monitoring network. The sub-systems may be structured into the following six groups:

- **early warning network** consisting of 58 measuring points with an automated transmission of the measured levels. The network is operated by the SÚJB regional centers, State Institute for Radiation Protection, Czech Hydrometeorology Institute (ČHMÚ) and CR civil defense,
- **network of 14 permanent measuring points of the CR Army** performing in a normal radiation situation two single measurements per day of photon dose equivalent and the results are regularly transmitted to the central database of the monitoring network. In emergency situations the network performs measurements more frequently, as requested by SÚJB. The network of permanent points is complemented with standby measuring points used in emergency situations based on SÚJB instructions,
- **territorial network of 184 measuring points (TLD network)** with mounted thermo-luminescent dosimeters operated by the State Institute for Radiation protection and SÚJB regional centers,
- **local TLD networks with 91 measuring points in the surroundings of NPP Dukovany and NPP Temelín**, operated by the plants´ laboratories monitoring radiation in the atmosphere and by the SÚJB regional center in Brno,
- **territorial network of 11 measuring points of atmosphere contamination** operated by SÚJB regional centers, laboratories monitoring radiation in the atmosphere of nuclear power plants (one such network contains 6 stations situated around NPP Dukovany, another includes 8 stations around NPP Temelín), State Institute for Radiation Protection and ÚEŘMS,
- **network of 9 laboratories** (laboratories of the SÚJB regional centers, radiation monitoring laboratories in surroundings of the nuclear power plants and laboratories of the State Institute for Radiation Protection) with the equipment for gamma-spectrometry or radiochemical analyses of radionuclide levels in environmental samples (aerosols, fallout, foodstuffs, drinking water, feed etc.).

An important component of the radiation monitoring network are the **mobile teams in the State Institute for Radiation Protection and SÚJB regional centers**. The teams provide for qualified comprehensive radiation situation monitoring, particularly:

- mapping of the radiation situation based on the automated aviation and underground surveys;
- distribution, placing and collection of thermo-luminiscent dosimeters;
- qualitative and quantitative determination of radioactive substances in the outside environment;
- determination of volume activities of radionuclides in the atmosphere;
- collection of samples from soils, plants, foods, water and other materials in the environment;
- looking for sources of ionizing radiation occurring illegally in the environment.

5.1. Monitoring of Artificial Radionuclides in the Environment

The purpose of the monitoring program is to identify distribution of radionuclides activities and doses of ionizing radiation on the national territory in terms of place and time, to obtain, in particular, the long-term trends and to early identify potential deviations from such trends. Attention is paid to artificial radionuclides occurring in measurable quantities and the national radiation monitoring network measures ^{137}Cs, ^{90}Sr, $^{239+240}$Pu, ^{85}Kr - in the atmosphere, ^{137}Cs, ^{90}Sr, ^{3}H - in foodstuffs and ^{137}Cs in human bodies.

5.1.1 Air Contamination

In 2001, similarly as in previous years, no serious deviations were identified in levels of artificial radionuclides in the atmosphere. The volume activities of ^{137}Cs due to the transport for higher atmosphere levels and re-suspending of the original fallout from the soil surface were mostly in the order of $\mu Bq/m^3$ units.

A part of ^{137}Cs in the atmosphere comes from the global fallout due to earlier tests of nuclear weapons in the atmosphere and a part from the Chernobyl nuclear accident. Apart from ^{137}Cs the aerosols also contain ^{7}Be of cosmogenous origin and ^{210}Pb, a decay product of ^{222}Rn. These radionuclides in the aerosols and fallout are determined with semiconductor gamma spectrometry. The average monthly volume activities of ^{137}Cs, ^{7}Be and ^{210}Pb in atmospheric aerosols and average monthly surface activities of the same radionuclides in the fallout are shown as an example of results from measuring points of atmosphere contamination performed by the State Institute for Radiation Protection in Prague since 1986 (Figures 1 and 2). The diagrams show a long-term, currently very slow decrease in the volume activity of ^{137}Cs and seasonal variations in ^{7}Be and ^{210}Pb levels throughout the year.

Figure 1. Volume activity of selected radionuclides in airborne aerosols, monthly average levels - measuring points of atmosphere contamination, State Institute for Radiation Protection in Prague (Volume activity Bq/m3 – Year)

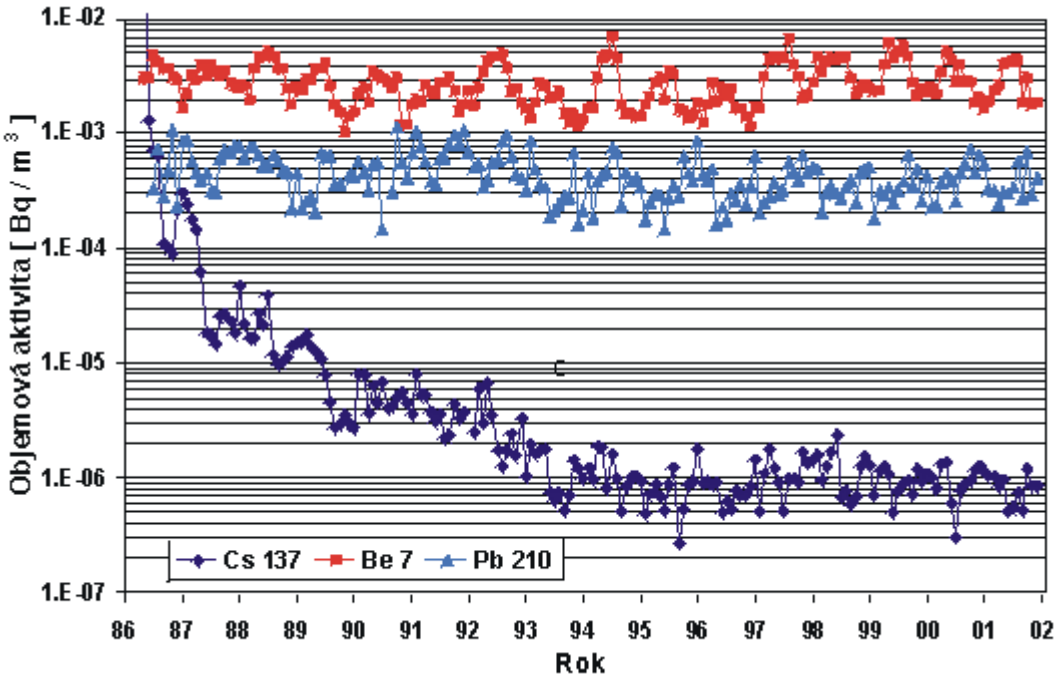


Figure 2. Fallout on water surface, monthly samples - measuring points of atmosphere contamination, State Institute for Radiation Protection in Prague (Surface activity Bq/m3 – Year)

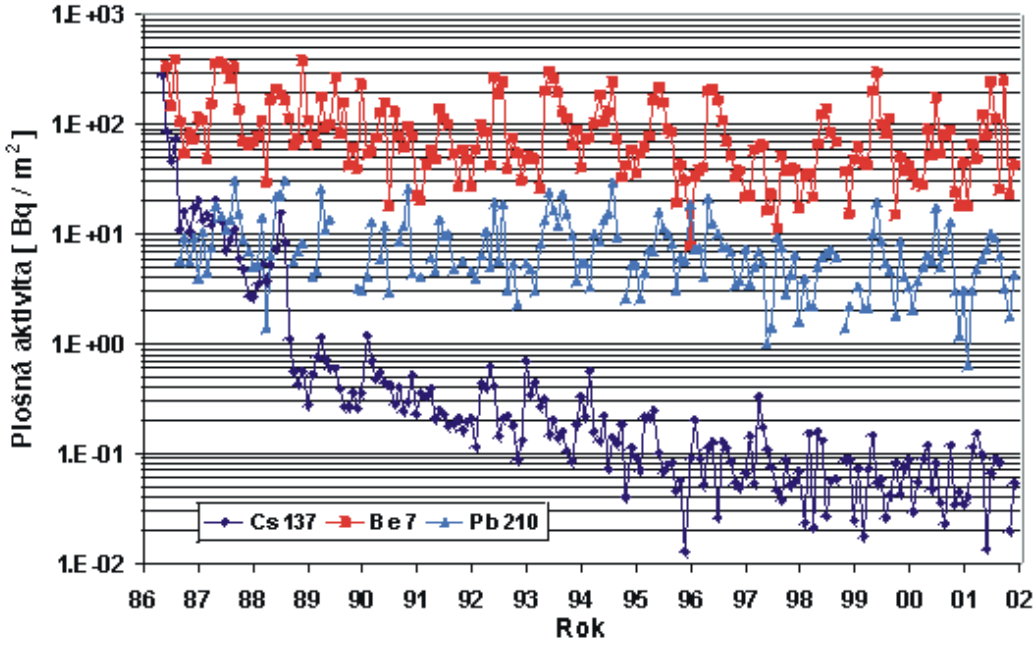


Figure 3. ^{137}Cs in airborne aerosols in 2000 - measuring points of atmosphere contamination, State Institute for Radiation Protection in Prague (Volume activity Bq/m3 – Weeks in 2001)

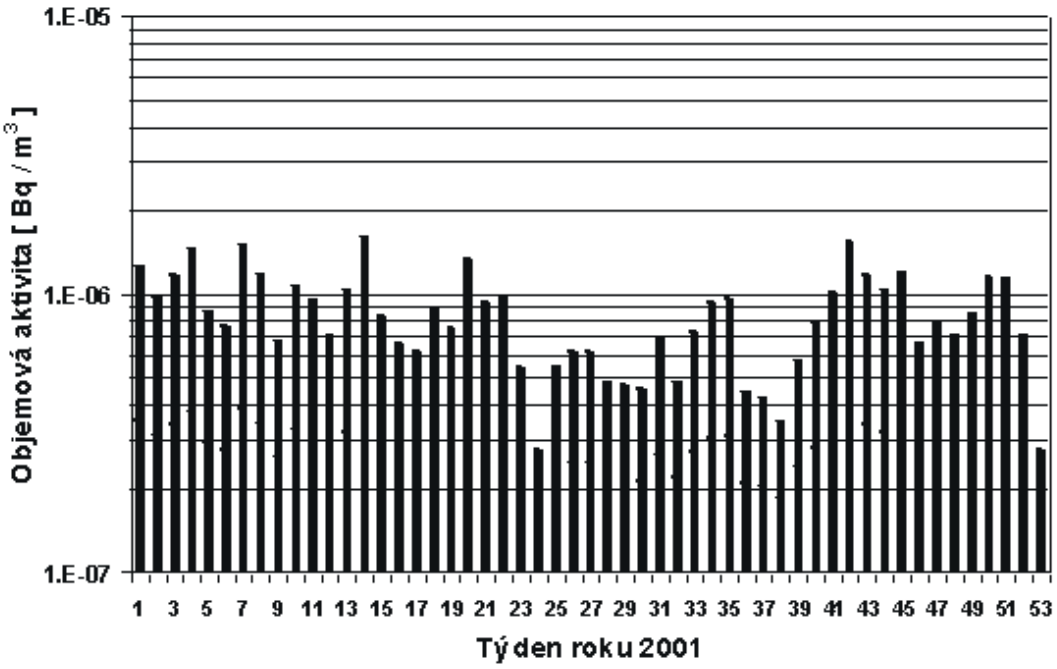
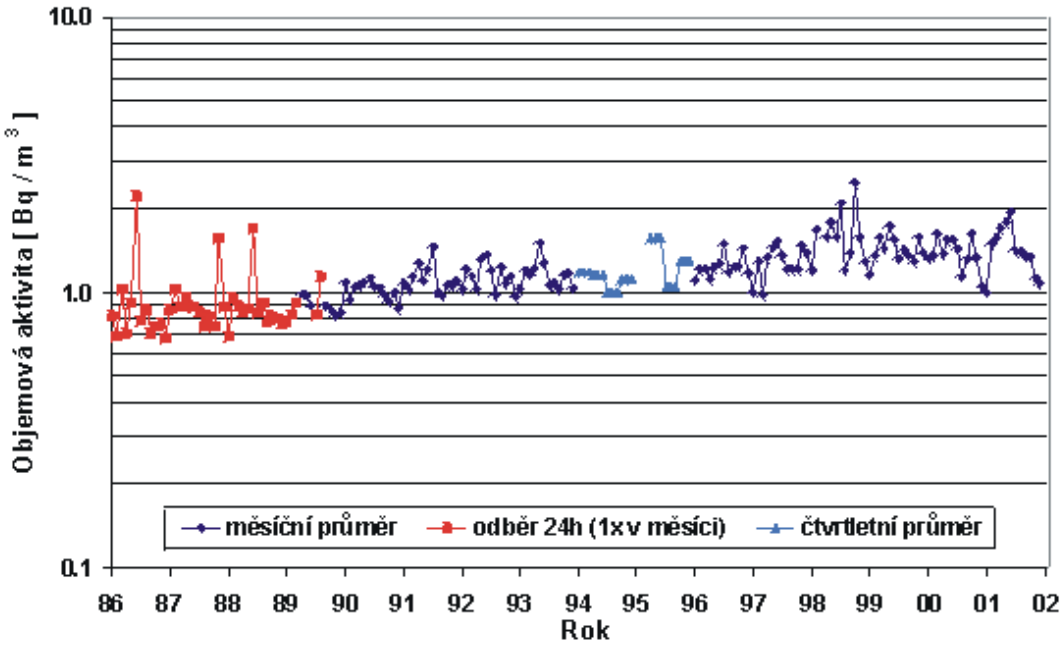


Figure 3 shows weekly average volume activities of ^{137}Cs as measured in 2001 in measuring points of atmosphere contamination by State Institute for Radiation Protection in Prague.

^{85}Kr was included into the monitoring system of radionuclides in the atmosphere back in 1996, as part of the efforts to gradually monitor all artificial radionuclides detectable in the environment. Krypton-85 is a fission product and occurs in small quantities also in nuclear power plants effluents. Still, the main source of ^{85}Kr are now facilities for nuclear fuel reprocessing and in the past also nuclear weapons tests. Measuring of ^{85}Kr volume activities continued the monitoring performed by the Radiation Dosimetry Institute of the Czech Academy of Sciences. The measurements were performed at the same location - in the complex of radiation dosimetry department of Nuclear Physics Institute of the Czech Academy of Sciences (ÚJF ČAV) in Prague 8. Volume activity levels of ^{85}Kr since 1986 are shown in Figure 4.

Figure 4. **Volume activity of ^{85}Kr in the atmosphere, samples from the complex of radiation dosimetry department, ÚJF ČAV Prague 8 – Bulovka (Volume activity Bq/m3 – Year; monthly average: 24 hours sample 1x in a month: quarterly average)**



5.1.2 Contamination of Foodstuffs

Contamination of foodstuffs with radionuclides has been monitored on long-term basis in agreement with a monitoring plan. The plan has been outlined for individual commodities, particularly in respect to their consumption levels. Since no event was detected in 2001 to increase the level of radionuclides in the environment there was also no increase in the foodstuffs contamination levels.

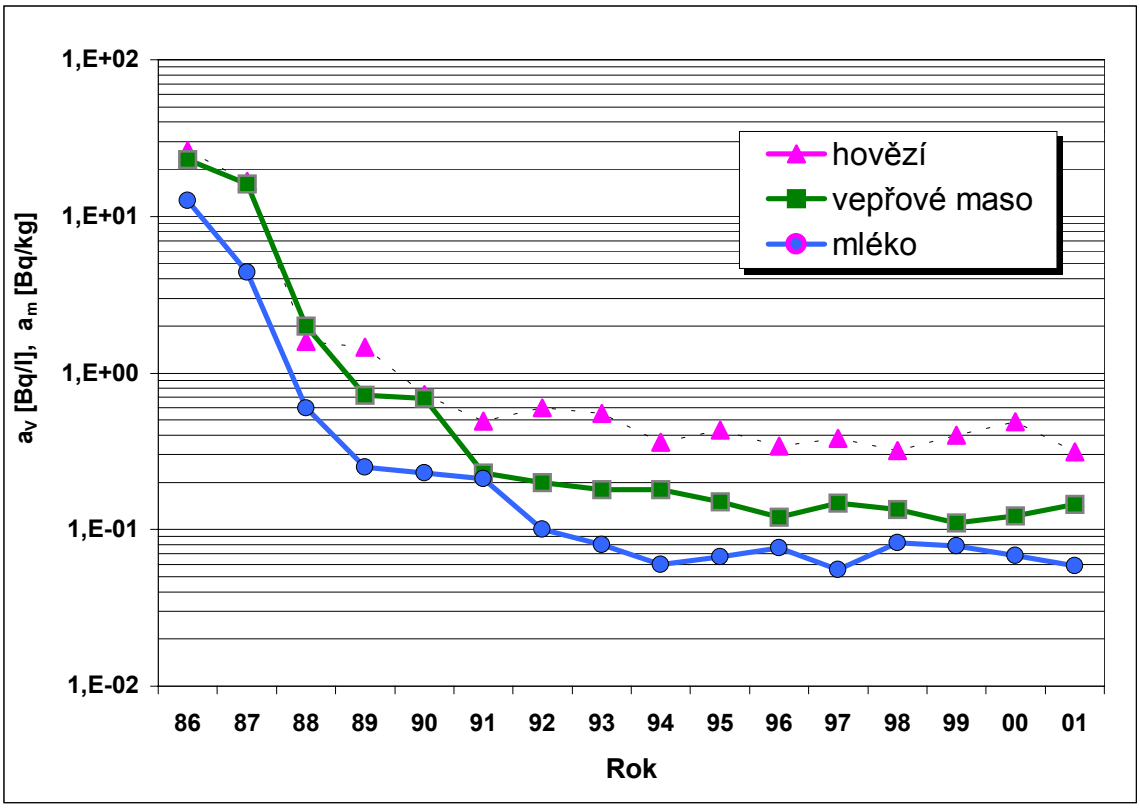
Mass and volume activities of ^{137}Cs in some staple foods – in milk, beef and pork - were in the order of tenths of Bq/kg or Bq/l. Volume activities of ^{137}Cs and ^{90}Sr in drinking water were very low (tenths or units of mBq/l) or below the detection limits. The tritium levels in drinking water were in units of Bq/l and over the years have been steadily decreasing.

Similarly as in other years, the public attention focused on the increased levels of ^{137}Cs in mushrooms, forest fruits and game meat. Although these commodities account only for a minor fraction of the food basket their contamination has been closely monitored since 1986. Results of the measurements have been regularly published in the annual reports on radiation situation on the Czech Republic's territory. Despite the levels of ^{137}Cs in the mentioned food

amount to hundreds of kBq/kg this phenomenon does not represent a significant dose load to the CR population.

Figure 5 presents levels of ^{137}Cs volume activities in milk, beef and pork, as monitored by the national radiation-monitoring network since 1986.

Figure 5. Average annual mass/volume activities of ^{137}Cs in pork, beef and milk



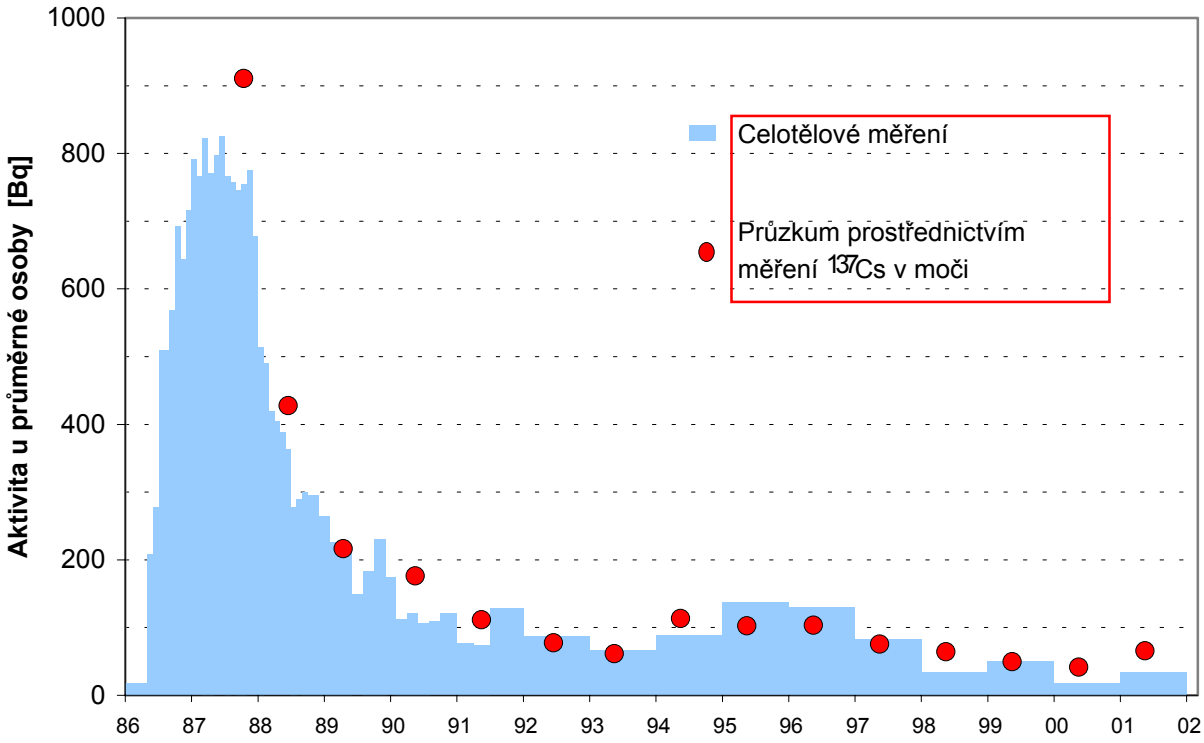
5.1.3 Internal Contamination of Individuals

The whole-body counter in the State Institute for Radiation Protection in Prague was used to continue the monitoring of internal contamination with ^{137}Cs in a group of 30 persons (15 males, 15 females), most of them Prague residents, aged 20 - 64. Considering the very low levels of ^{137}Cs in population the whole-body count is now performed only once per year and long measuring times are applied to reach the lowest detectable limit. The average activity level of ^{137}Cs found by these measurements in one person was 34 Bq.

Similarly as in previous years a national survey of internal contamination with ^{137}Cs was carried out using ^{137}Cs activity measurements in 24-hours urine samples. The samples were collected in May and June 2001 from 42 females and 33 males whose diets roughly represented the national average. The average activity level of ^{137}Cs found in 24-hours urine samples was 0,40 Bq. The corresponding calculated average of ^{137}Cs activity retained in the body was 65 Bq.

Figure 6. Activity levels of ^{137}Cs in the Czech population since the Chernobyl accident

(Activity in an average person - Year : Whole body count: ^{137}Cs measured in urine samples)



5.1.4 Monitoring of External Exposure

Results of monitoring from the territorial TLD network in 2001 are shown in Table 1. Measurements performed for several years with the territorial TLD network have confirmed its capability to identify a potential significant deviation from the normal levels in the given locality. Detailed results from the local TLD networks measured in 2001 will be presented in the Report on Radiation Situation on the Czech Republic's Territory in 2001.

Table 1. Quarterly average photon dose equivalents H_X, as determined by the territorial TLD network on the Czech Republic's territory (nSv/h)

Region Workplace Number of measuring points	Prague SÚRO 13	Central Bohemia SÚRO 25	South Bohemia SÚRO/RC Č. Budějovice 30	West Bohemia SÚRO/RC Pilsen 25
	$H_X \pm s$	$H_X \pm s$	$H_X \pm s$	$H_X \pm s$
I/01	124 ± 16	131 ± 37	149 ± 24	121 ± 22
II/01	116 ± 13	133 ± 42	153 ± 21	126 ± 23
III/01	123 ± 15	134 ± 48	145 ± 21	123 ± 21
IV/01	115 ± 14	125 ± 35	144 ± 22	124 ± 20
Region Workplace Number of measuring points	**North Bohemia SÚRO/RC Ústí nad Lab. 23**	**East Bohemia SÚRO/RC Hr. Králové 21**	**South Moravia SÚRO/RC Brno 26**	**North Moravia SÚRO/RC Ostrava 21**
	$H_X \pm s$	$H_X \pm s$	$H_X \pm s$	$H_X \pm s$
I/01	109 ± 28	118 ± 35	114 ± 17	103 ± 12
II/01	115 ± 28	119 ± 30	126 ± 22	113 ± 14
III/01	117 ± 26	129 ± 27	114 ± 18	105 ± 11
IV/01	111 ± 29	115 ± 26	125 ± 21	111 ± 14

Note: H_X – average value, s – standard deviation
For workplaces marked SÚRO/RC: State Institute for Radiation protection performs measurements and processing of results while the regional center only provides for transport of dosimeters.

Measuring of the equivalent dose rate is carried out continually in the early warning network, average values are measured every 10 minutes. The measured values are transmitted once in 24 hours to a central database of the national radiation monitoring network in the State Institute for Radiation Protection; 10 measuring points in SÚJB regional centers and in SÚRO use modems and telephone lines and 38 measuring points on ČHMÚ workplaces use its communication network to a central ČHMÚ computer and then a dedicated telephone line. If needed, the transmission intervals are shortened.

5.1.5 Extraordinary Action by the Mobile Team of the State Institute for Radiation Protection

In January and February 2001 two members of the Mobile Team of the State Institute for Radiation Protection participated in activities of the special monitoring team to support a radiometric team. The radiometric team was supposed to perform radiation survey on the territory assigned to the Czech military contingent as part of KFOR and SFOR missions in Kosovo and Bosnia-Herzegovina. The survey was to determine potential threat to the soldiers from contamination by depleted uranium in spent ammunition and, in case of such a threat, to evaluate its size. The analysis of physical properties of elements in the uranium and actinium series has shown a very limited ability to discern between isotopes of natural uranium and depleted uranium, as a result of measuring technology which is capable of working in the given environment and in very difficult conditions (see the pictures). Under the given circumstances and limitations due to a small number of personnel, shortage of time and limited measuring equipment, the working team had to focus mainly on the radio-hygienic phenomena described below.

Anticipated types of threat and the methods used for their elimination

The following exposure paths represent a threat to persons due to occurrence of depleted uranium:

- external exposure to gamma radiation;
- internal contamination, i.e. intake of depleted uranium by inhalation, ingestion or through a wound, while both radiation and chemical toxicity may be manifested;
- surface contamination of persons after their contact with contaminated surface.

External exposure of persons was determined with direct measurements of the dose rate. Potential contamination from inhalation was detected in aerosol samples from the atmosphere. Potential ingestion was detected from samples of water and basic foodstuffs, by laboratory identification of all present radionuclides and their activities. Potential surface contamination was identified with direct measurements of surface activity on the surface of stored radionuclides, by detecting alpha and beta radiation. Also soil samples were collected for laboratory tests in the State Institute for Radiation Protection. Along with the local dose rate measurements approximate spectrometric determinations were performed of radionuclides making-up the dose rate.

Performed Measurements

a) Dose Rate

Measurements of dose rates were performed particularly in the places of military forces concentration in Kosovo, on the bases in Šajkovac and Sekirača, in Bosnia-Herzegovina on the bases Bosanska Krupa and Donja Ljubija, as well as on the routes of automobile and passenger traffic associated with the mission. Monitoring was performed from vehicles or by walking individuals.

b) Aerosols

Samples of atmospheric aerosols were obtained by air filtering with a sampling device.

c) Soils

Samples were collected on previously selected points or in places of interest (e.g. explosion craters).

d) Other Samples

Additional samples were collected e.g. of water and food from local sources.

All the collected samples were subjected to spectrometry analysis in the State Institute for Radiation Protection.

Interpretation of the Resulting Data

Both the on-site and laboratory measurements have shown that there were no detectable levels of depleted uranium in the deployment territory of the Czech Republic's army missions KFOR in Kosovo and SFOR in Bosnia-.Herzegovina.

All measured dose rates, representation of radionuclides and their activities, were entirely normal and typical in the natural environment and mostly due to natural radionuclides, particularly natural uranium and its decay products, with insignificant contribution from artificial radionuclides from fallout after nuclear weapons tests and Chernobyl accident.

It has been concluded that members of the Czech KFOR and SFOR missions were not exposed to any risk from depleted uranium radioactivity.

This has been also confirmed by activity measurements in urine of soldiers who returned from the missions. Measurements performed in 2001 in a selected group of returnees and their comparison with a control group failed to confirm any increased uranium activity in the examined group of soldiers.

Detailed data about activities of the team have been presented in a report for the general staff of the Czech Republic Army and briefly summarized in RHD 2001.

6. NATIONAL INSTITUTE FOR NUCLEAR, CHEMICAL AND BIOLOGICAL PROTECTION

The main task of the Institute are measurements to be used in the evaluation of impacts of nuclear, chemical and biological substances on human health and the environment, including evaluation of protection levels by individual and collective means of protection against such materials. Its activities also include research and development in this area, performance of tasks supporting supervision by SÚJB inspectors and fulfillment of tasks required by the constitutional law No. 110/1998 Coll., on CR security and provision of educational and training activities, while all the activities are performed nationwide.

Activities of the Institute are specified as main tasks in its statute and its Organizational Manual establishes organizational arrangements and activities of the individual workplaces.

The organizational structure reflects activities and tasks defined by its statute. Specialized activities are carried out by departments of nuclear, chemical and biological protection and by an independent department supporting supervision. The Institute's operation is provided for by the economic department and bureau. As on 31 December 2001 the Institute had 48 employees – physical persons. Activities of the Institute for Nuclear, Chemical and Biological Protection is partly funded from the state budget and partly by revenues from its specialized services.

The main specialized departments:

- **Nuclear Protection Department**

  The department focuses on measurement and evaluation of radon occurrence, preparation, processing and evaluation of trace detectors in the Radon Program in the Czech Republic and abroad.

  Moreover, the department performs personal dosimetry and monitors surroundings of ionizing radiation sources, as well as other laboratory and field radioactivity measurements.

  Other important activities include calibration, verification and technical tests of approved types of measuring devices, performed by the department as an authorized metrology center. The workplace also deals with research activities in radon dosimetry.

- **Chemical Department Protection**

  The department deals with detection, determination of type, concentration and quantity of chemical substances in the working and general environment, both in the laboratory and in the field, with assessment of quality of anti-chemical and other special personal protective means and with quality of buildings protection, as well as elaboration of testing methods and involvement in their development.

  The department provides technical support in supervisory activities performed by the SÚJB department monitoring compliance with the ban on chemical weapons under Act No. 19/1997 Coll. or Act No. 249/2000 Coll. Workplaces of the department cooperate with the Organization for Prohibition of Chemical Weapons (OPCW) in Hague and TNO laboratories in Hague. Its important activities include research

projects and cooperation with other sectors and agencies, including participation in the Integrated Emergency System in the Czech Republic.

- **Biological Protection Department**

  Activities of the department focused particularly on protection of persons in extreme conditions, including assessment of personal protection means from the viewpoint of thermal load. The department also participates in research. The department closely cooperates with the chemical protection department, including its international activities and cooperation with TNO in Hague.

  More activities will be carried out based on the governmental resolution about the sector in charge of this issue.

- **Independent Department Supporting Supervision**

  The department performs tasks requested by the group in charge of uranium industry and mining works in the SÚJB department for radioactive wastes and the environment (OŽPRAO), i.e. it carries out inspections, on-site investigations, measurements and processing of results from monitoring in former and present uranium industry facilities (now the state enterprise DIAMO, Stráž p.R.), including old loads and works using mining technology all over the country.

  The department also operates **measuring points of atmosphere contamination** within the Czech radiation monitoring network in Kamenná and performs other tasks requested by inspectors from the SÚJB department for radioactive wastes and the environment (OŽPRAO).

Results of specialized activities by State Institute for Nuclear, Chemical and Biological Protection

The workplaces dealing with nuclear, chemical and biological protection have been accredited by the Czech Accreditation Institute /ČIA/. In 2001 regular audits by ČIA were performed and accreditation renewed (under ČSN EN 45 001 for laboratory activities in agreement with the international standard ISO/IEC 17025:1999).

Apart from accreditation of its workplaces the State Institute for Nuclear, Chemical and Biological Protection has been also accredited by the Office for Technical Standardization, Metrology and State Testing (ÚTNMSZ) (see the Certificate of Authorization Ref. No. 174/00/20, Authorization No. 123/2000) to perform official measurements of ^{222}Rn volume activity in the atmosphere and concentration of latent energy of radon decay products (Ra equivalent volume activity).

Due to the amended Act No. 505/1990, as enacted by Act No. 119/2000 Coll. it was necessary to certify the employees – the Office for Technical Standardization, Metrology and State Testing certified 3 employees in nuclear protection and subsequently authorized the State Institute for Nuclear, Chemical and Biological Protection for verification of the specified measuring devices /OAR and EOAR/. As a result the State Metrology Canter became an Authorized Metrology Center (official sign " K", registration number 113)

Due to their nature, activities performed by the State Institute for Nuclear, Chemical and Biological Protection depend upon a number of preconditions specified in legislative regulations. The regulations concern particularly work with chemical substances and ionizing radiation.

The State Institute for Nuclear, Chemical and Biological Protection obtained a license for management of highly hazardous substances, and it also met requirements of Act No. 157/98 Coll. as enacted by Act No. 352/1999 Coll. on provision for management of hazardous materials and preparations by an authorized person. The authorization was granted by the Czech Ministry of the Environment. Similarly, the same ministry granted to the State Institute for Nuclear, Chemical and Biological Protection an authorization for hazardous wastes management, under the Act on Wastes.

The works performed by the Institute in the field of ionizing radiation were permitted and workplaces were approved with respective SÚJB resolutions in agreement with Act No. 18/1997 Coll.

Nuclear Protection Department

The key activity performed by workplaces of the nuclear protection department included measurements, evaluation and research of radon and its decay products, or activities closely relating thereto. One important activity is the radon metrology. Other activities include radiochemical and gamma-spectrometric analyses of samples.

In theoretical research the workplace worked on the research project „Development of Methods for Assessment of Radon Dose Rates " and also on the following:

- Development of the radon measuring method using CR 39 foil.
- Experiments with KODAK LR 115 foil, to identify conditions for its more extensive use in the radon program.
- Assessment of the draft ČSN IEC series 61577 for the Czech Standardization Institute.
- Research of radon behavior, particularly deposition of its decay products on surfaces and the back-reflection phenomenon.
- Measuring of specific radon emission from the subsoil as an alternative method of radon index evaluation.
- Development of the „Optimization Study" concerning water discharged by the spa facility Léčebné lázně Jáchymov.

	Activities in	
	Radon Program in the Czech Republic	**Other physical and legal persons**
	Number of pieces	
Provided detectors	27 336	806
Evaluated detectors	28 729	1 464

Another important activity was personal dosimetry for the state enterprise DIAMO, branch company GEAM Dolní Rožínka (system ALGADE), branch company SUL Příbram and branch company . TÚU Stráž pod Ralskem (system OD 88) */the system covers exposure to a mixture of radionuclides with long half-times, emitting alpha radiation in the uranium-radium series, effective doses of photon radiation identified with TLD and exposure to latent energy /.*

Activities in Personal Dosimetry	

Number of determinations (ALGADE)	5 280
Number of determinations (OD 88)	1 728

Activities in monitoring of former uranium mines surroundings	
	Number of pieces
Preparation and evaluation of dosimeters in the ALGADE system	129
Preparation and evaluation of PSD dosimeters	367
Evaluation of TLD dosimeters	148

The department also performed radiochemical and gamma-spectrometric analyses. In 2001 the department analyzed samples of water, sediments, soil, fallouts, vegetables and filters (VAJ 04 and HUNTER). In total 1 582 analyses were completed. The analyses were performed for measuring points of atmosphere contamination in the radiation monitoring network, and also for legal and physical persons. On similar basis, the measurements included radon diagnostics (12), determination of volume activity of ^{222}Rn in water (74), determination of radon index of a building plot (17) and measurements of radon and its decay products in buildings (45). The department also carried out monitoring of persons and workplaces during liquidation of spoil heap of the former ČSA mine in Rynholec for České lupkové závody and the same was performed for the Administration of Radioactive Waste Repositories in the repositories Bratrství (Jáchymov) and Richard (Litoměřice).

Special activities included calibration of measuring instruments in the AMS calibration laboratory. In 2001 179 measuring instruments were verified for radon volume activity and equivalent volume activity.

Chemical Protection Department

Last year refurbishment of the laboratory interior equipment continued, particularly of HVAC and power supply. Anti-aerosol filters were installed and a new, more powerful diesel aggregate for emergency power supply. A special isolated box was installed for works with hazardous biological material which also enables liquidation of the materials with chemical treatment or exposure to UV radiation, while excluding contact with the personnel. To detects biological substances the workplace was equipped with a special mass spectrometer BMS, which enables to detect selected groups of agents directly in the place of their occurrence in a very short time.

Apart from research, the laboratory focused on the following:

- **Testing of protective means and analyses of chemical substances and unknown samples**
  - The testing concentrated mainly on research and development. Most tests dealt with permeability of clothing in hot and aggressive working environment of chemical plants and tightness tests of hermetic containers for transport of highly hazardous substances.
  - Analyses of chemical substances and unknown samples were usually associated with the mobile laboratories. In all cases hazardous or unknown samples were found. The samples were analyzed and identified as required. Moreover, some analyses and sample identifications were requested by state agencies.

- The laboratory innovated 25 testing procedures used for tests of protective materials, protective means and equipment for monitoring of environmental pollutants with mass and infrared spectroscopy. The activity focused on compliance with the requirements under the standard EN ISO/IEC 17025:1999, particularly in respect to completing and validation of testing procedures and determination of uncertainties. In qualimetry and validation the department continues consulting activities with METROCHEM and EURACHEM.

- **Inspection Activity**

  In cooperation with the department monitoring compliance with the ban on chemical weapons scheduled inspections were performed on workplaces that may store or use chemical toxic substances for laboratory purposes. The inspections were performed by the mobile laboratories, which collected samples, analyzed them and elaborated respective documents. Seven such actions by the mobile laboratories took place throughout the year all over the country.

- **Provision of Extraordinary Projects**

  The most important extraordinary project provided for by the State Institute for Nuclear, Chemical and Biological Protection was „ANTHRAX". The project included delaboration, measurements and analyses of suspected items gathered from all over the country by members of the Czech fire brigades, starting from 15 October 2001, into the Institute facility in Kamenná (and suspected items have been still coming). The laboratory performing chemical monitoring and protection performed or provided for, in cooperation with other workplaces, their analyses. More details are provided below in "Extraordinary Project Anthrax ".

Extraordinary Project Anthrax

The concerns about potential infection by anthrax first appeared in the country in mid-October 2001. At that time several cases of the infection were reported in the United States and suspicions were expressed about potential use of its agent - bacillus anthracis – in terrorist attacks. One hypothesis about the infection spreading was distribution of contaminated postal consignments – specifically "white powder". The country's population was well informed due to an extensive media campaign and in many cases people handed over to the police or fire brigades consignments (both open and sealed) they considered suspicious in the light of the information available. The consignments were of different nature, some were dispatched within the country but most of them came from abroad, and they were addressed to authorities, private persons or companies. Very often they contained e.g. promotional leaflets etc, however, in many cases they included items of value and very important documents. There were also parcels and various items brought to the State Institute for Nuclear, Chemical and Biological Protection that, according to their owners, had been contaminated with the "white powder". It should be mentioned here that many consignments were sent with malicious intent and in some cases the "anthrax powder" was used to contaminate people. The „white powder" was often strewn on public places, in residential houses etc. where fire brigades isolated it and delivered to the State Institute for Nuclear, Chemical and Biological Protection to be tested.

The situation had to be handled with care because of the terrorist attacks of 11 October 2001 in the United States. The central emergency staff of the Czech Republic

decided the consignments should be inspected at the State Institute for Nuclear, Chemical and Biological Protection.

The first items were delivered to the institute on 15 October 2001. From then on tens or hundreds of items were delivered by fire brigades from all over the country nearly every day, including weekends.

Due to the anticipated risks, not only from bacteriological contamination, the following procedure was established to inspect the consignments:

a) check for presence of gamma emitters
b) check for presence of explosives
c) check for presence of highly toxic substances under the List No. 1 Appendices No. 1 and 2 , anthrax agent, Decree No. 50/1997 Coll.
d) check for presence of alpha and beta emitters
e) check for presence of anthrax agent

Sample Inspection Procedure

The samples were received by the Institute employees, in exceptional cases by the security people.

Check for Presence of Gamma Emitters

Each received sample (in a transport package) was screened by nuclear protection people for the external gamma dose rate with RP 114.

Check for Presence of Explosives

Before consignment opening police pyrotechnists checked it for presence of explosives with an x-ray device Controlix.

Subsequently, the consignments were opened by workers of the laboratory for chemical monitoring and protection, who wore special protective clothing, including masks; the consignments were assigned reference numbers, photographed and checked for contamination with alpha and beta radionuclides.

Check for Presence of Anthrax Agent

Whenever possible samples were collected from the opened consignments for bacteriology tests– for presence of bacillus anthracis, the anthrax agent - and other tests were performed in the Center of Epidemiology and Microbiology of the State Health Institute in Prague. The results were reported to the State Institute for Nuclear, Chemical and Biological Protection and the whole process was monitored by the chief hygienic officer of the Czech Republic,.

Check for Presence of Highly Toxic Substances under List 1 and 2, Appendix 1, Decree No . 50/1997 Coll.

Wherever possible the laboratory checked the consignments for presence of highly the toxic substances.

The State Institute for Nuclear, Chemical and Biological Protection kept records about results of all the above described tests and provided the information to other sectors.

All delivered consignments, except those containing items of value or particularly important documents or requested to be returned, were liquidated in agreement with a

methodology specified by the Biological Protection Committee established with the Emergency Staff of the Czech Republic.

The whole project required extensive efforts not only by the laboratory of chemical monitoring and protection but also by other employees of the Institute who were involved in handling of the coming consignments to Kamenná, particularly at the beginning. The workers had to master all specialized works and they had to work late and also on weekends. There was also complicated paperwork associated with the works, as nearly all the consignments were investigated by the Czech Police as suspected criminal cases and the Police required written reports about results of the analyses.

Also significant were the related financial costs of the project.

Biological Protection Department

The most important projects included:

- Measurements and determination of effects of special clothes on thermal condition and working capacity of workers. The clothing was tested in a climatic box.
- Load tests of the new Czech army kit. The measurements simulated various work activities at temperatures - 10 ^{o}C to - 30 ^{o}C in order to compare qualitative parameters of the individual types of the kit;
- Other activities included field expertises; one major project included measurements in the glass works Kavalier – at different workplaces of the company all over the country.

The laboratory also worked on the research project „Improvement of methods for evaluation of various thermal load by monitoring selected parameters in persons working in special protective clothes “.

Independent Department Supporting Supervision

The department activities concentrated on support to supervision performed by the group of uranium industry and mining works within the SÚJB department for radioactive wastes and the environment (OŽPRAO).

The employees operated in Kamenné and Dolní Rožínka and provided for scheduled inspections of underground and overground workplaces of the state enterprise DIAMO, as well as of other workplaces all over the country where mining technology is employed (in 2001 they were involved in 45 inspections in total). They provided for the following activities during the inspections:

- measuring of effective dose rates from outer gamma exposure,
- determination of volume activity of long-term radionuclide mixtures emitting alpha radiation from the uranium-radium series,
- determination of latent energy concentrations of radon decay products,
- determination of surface contamination with radioactive substances emitting alpha particles,
- sampling of water, aggregate and sediments to test specific activities of ^{238}U and ^{226}Ra.

The samples were subsequently processed and analyzed in SÚJCHBO laboratories.

On the inspectors´ request the activities also include local investigations (86 such investigations took place in 2001) for administrative procedures carried out by or with the involvement of SÚJB.

Another important activity performed by the department is collecting and measuring of samples in the monitoring network, focusing on effluents and effects on workplaces – of licensees under Section (§) 9 paragraph 1 of the Atomic Act using natural sources of ionizing radiation.

A significant portion of this activity consists of

- monitoring of old loads, i.e.:
- measurements of equilibrium equivalent radon volume activity using the BUSH method and regular evaluating of TLDs in the monitoring points in the Příbram area, West Bohemia, Okrouhlá Radouň, Mydlovary and Dolní Rožínka, to identify atmospheric contamination with radon and its decay products from the existing and former uranium mining facilities,
- sampling of water for determination of ^{238}U and ^{226}Ra volume activity, including,
    - water samples from the Litavka, Kocába, Ploučnice, Mže, Loučka, Nedvědička, Hadůvka and Svratka river basins (waterways potentially influenced by the mining activities),
    - sampling of waste waters and surface waters in all locations,
    - sampling of underground waters in Dolní Rožínka location to monitor impact of effluents, waste heaps, settling pits or seepages etc. on the water quality.

The department also operates measuring points of atmosphere contamination within the Czech radiation monitoring network in Kamenná – measurements of doses and dose rates, collection of aerosol and fallout samples. The results are transmitted to the headquarters of the radiation monitoring network.

Research

In 2001 the State Institute for Nuclear, Chemical and Biological Protection continued works on the approved research projects:

1. Research project A I

Development of methods for assessment of radon dose rates

In 2001 laboratory tests were conducted of retrospective dosimeters, tests of long-terms methods of radon measurements, pilot test of condition of radon decay products in the field and application of a method using specific radon emission from subsoil.

2. Research Project B I

Quantitative testing of permeability and tightness on protective materials and means, with the employment of corresponding substitutes of toxic substances

In 2001 three substitute chemicals were developed and tested which may simulate penetration of toxic substances through masks and protective clothing. Moreover, a method

was developed for objective and quantitative (spectrometric) identification of color change following penetration through protective materials and by leakage.

3. Research Project B II

Substitution of humans in testing of individual protective means in exposure to extremely toxic substances

The stage performed in 2001 included making of a dummy with a functioning system of joints for walking, squatting, lifting of arms and head turning. The driving and gripping systems have been system resolved.

4. Research Project B III

Analytical procedures to identify presence of explosives

Works on this research project were conducted in cooperation with the Industrial Chemistry Research Institute in Pardubice. Favorable results have been achieved in comparative measurements of devices used in identification of explosives and in verification and installation of standards of the individual explosives in a mass spectrometer.

5. Research Project C I

Development and introduction of mass spectrometry identification methods for biological toxins

In 2001 the following stage of the project was addressed:

Preparation of the mass spectrometer with accessories for identification of biological toxins, personnel training and preparation of the system for work in a mobile laboratory

6. Research Project C II

Improvement of methods to assess effect of thermal load on persons working in special protective clothing

The stage addressed in 2001 included training tests in a climatic box and practical tests of the clothes wearing – verification of individual testing methods in the climatic box (basic three-hours tests, 24-hours tests, all in various micro-climatic conditions).

Training Activities

The State Institute for Nuclear, Chemical and Biological Protection holds a SÚJB license to perform specialized training of selected workers working with sources of natural radiation, i.e. professional training for

- management of works with the sources of ionizing radiation which shall be managed only based on a license,
- systematic supervision of compliance with the requirements for radiation protection,
- managing of the following tests and services in radiation protection:
  - rendering of services in personal dosimetry,
  - measuring and evaluation of occurrence of radon and its decay products on building plots and in buildings,
  - measuring and evaluation of natural radionuclides content in building

materials and in water.

In November 2001 the State Institute for Nuclear, Chemical and Biological Protection organized a course for workers managing works with sources of ionizing radiation and for workers systematically supervising compliance with radiation protection requirements at workplaces with natural radionuclides. The Institute's department for chemical protection participated in organization of a course „Training for Trainers ", which concentrated on practical training in activities relating to manipulation with hazardous chemical substances and preparations in agreement with valid legal regulations.

7. DEPARTMENT MONITORING THE BAN ON CHEMICAL WEAPONS

7.1. Supervising Compliance with the Ban on Chemical Weapons

In 2001 activities performed by the department monitoring the ban on chemical weapons pursued the tasks resulting from the Treaty about the ban on development, production, accumulation and use of chemical weapons and about their destruction, (hereinafter CWC Treaty) and from Act No. 19/1997 Coll., on some provisions relating to the ban on chemical weapons, as enacted by Act No. 249/2000 Coll.

Declaration and Licensing Duties

In agreement with the CWC Treaty declarations were developed about activities performed in 2000 (by 31 March 2001) and declarations about the activities planned for 2002 (by 31 October 2001). Moreover, national programs were announced dealing with protection and transfer of highly hazardous materials in 2000 and 2001.

The data related to declaration of activities in 2000 were reported to SÚJB by 49 organizations and 126 facilities. The summary declaration, as a result of cooperation with the Ministry of the Industry and Trade licensing administration, included data about the actual import and export of specified substances, under 104 licenses granted for these chemicals by the Ministry of the Industry and Trade licensing administration.

Further, SÚJB in 2001 granted 17 licenses for management of highly hazardous materials.

Inspection Activity

In agreement with the approved SÚJB plan of inspection activities for 2001 SÚJB inspectors in 2001 performed 28 inspections of compliance with the valid legislation for management of specific substances in production of certain organic substances.

The purpose of the inspections was particularly the following:

- compliance with Act No. 19/1997 Coll., including the implementing decree No. 50/1997 Coll.,
- inspection of registration of specific substances in agreement with Act No. 19/1997 Coll. and related regulations,
- inspection of preparedness of the inspected person to receive international inspectors.

None of the inspections identified violation of Act No. 19/1997 Coll. Extraordinary inspections were initiated mainly by reports on findings of specified substances or by results of previous inspections.

In some cases the inspection found partial non-observation of the obligations specified in the license and, as a result, violation of Act No. 21/1997 Coll., on inspections of imported and exported goods and technologies subject to international inspection regimes. The shortcomings found in companies exporting or importing items of dual use were redressed in cooperation with the Ministry of the Industry and Trade licensing administration. In some organizations minor shortcomings were found in registration of substances. The shortcomings were promptly removed. Findings of some chemicals of concern pointed to poor practices in registration and liquidation of the substances in the past (1960s and 1970s).

On 8–11 October 2001 an international inspection took place in the joint-stock company Chemopetrol Litvínov. The inspection focused particularly on production facilities for certain organic substances. The inspection confirmed that the inspected organization did not violate provisions of the CWC Treaty and that it carried out its activities in compliance therewith.

Cooperation with Other Sectors

Apart from the system of informal cooperation agreements were concluded during the concerned year with the Ministry of the Industry and Trade and Czech Fire Protection and Rescue Corps. Moreover, an updated agreement on cooperation is ready to be signed with the Defense Ministry and general headquarters of the Customs Office.

A great deal of attention was paid by SÚJB to transfer the civil defense issue from the Defense Ministry to the Ministry of the Interior and its roofing by the Czech Fire Protection and Rescue Corps. Throughout the year the changes were translated both into inspections of substances management and activities relating of findings of hazardous materials.

International Cooperation

From the viewpoint of CWC Treaty, the most important event in 2001 was the 6th meeting of members of the organization for ban on chemical weapons (hereinafter the Organization), that took place in May 2001 in Hague. The meeting was attended by 107 member countries from the total number of 143 member.

The key issue at the meeting was funding of the Organization activities, i.e. the program and budget for 2002, applications from the technical secretariat for a subsequent increase in the 2001 budget and covering of the financial deficit from 2000. The meeting approved the budget for 2002 with a mere 2,8% increase compared to 2001 and refused to provide additional funds from the previous period (the deficit from 2000 will be partly covered by the undistributed surplus from 1999, the lack of funds in 2001 will be addressed particularly through savings).

Financial and organizational matters clearly prevailed over political problems of such importance as delay in liquidation of chemical weapons (Russian Federation), or disputes concerning approach to international cooperation. The next meeting was approved to be held on 9-13 September 2002 (the originally scheduled date was in May 2002) in order to move the conference date closer to the future financial year.

In the course of 2001 the Organization held a number of events attended by Czech representatives. The Czech Republic had its representatives in the Confidentiality Commission, consulting body for administrative issues, in the Protection Network and 3 Czech specialists were working in a commission for evaluation of spectrums of chemical substances relevant to the Treaty. An important event was the nomination of a Czech representative - professor J. Matoušek, DrSc. - into the scientific consulting body of the Organization.

7.2. Supervising Compliance with the Ban on Development, Production and Accumulation of Bacteriological (Biological) and Toxin Weapons and their Destruction

SÚJB provides for the issues of bacteriological and toxin weapons based on the governmental resolution No. 306/2000 Coll.

SÚJB developed a draft act on some provisions relating to the ban on bacteriological (biological) and toxin weapons and on changes in the Trade Licensing Act which should be discussed by the Czech government. The proposed act has a similar structure and system of provisions as the act on some provisions relating to the ban on chemical weapons

In late 2001 SÚJB started to function as a coordinator in the basic system for population protection in the Czech Republic against highly hazardous and hazardous biological agents and toxins, based on the governmental resolution No. 1039 of 10 October 2001.

SÚJB requested expert reports dealing with methodology of the following inspection activities:

- collection of biological samples,
- transport of biological samples,
- detection of biological agents.

In early 2001 SÚJB requested input materials from the concerned organizations, and processed them and handed over to the Ministry of Foreign Affairs in form of a declaration required under the treaty about the ban on development, production and accumulation of bacteriological (biological) and toxin weapons and their destruction (BWC Treaty)

On 19 November – 7 December 2001 the 5th assessment conference of the BWC member countries was held in Geneva. Despite all efforts of the present delegations to adopt a final declaration and the demonstrated willingness to do so, no specific conclusions were approved and the conference has been suspended until November 2002.

SÚJB employees attended several workshops about biological weapons and terrorism using mass destruction weapons. SÚJB, in cooperation with the Military Medical Academy in Hradec Králové and TNO (the Netherlands) organized a specialized workshop at the end of the year on detection of biological agents.

8. MANAGEMENT AND TECHNICAL SUPPORT

8.1. Personnel Training and Qualification

Four scheduled inspections took place at NPP Dukovany in 2001 which focused on preparedness of the shift personnel before the start-up of units after refueling. At NPP Temelín two inspections concentrated on specialized training of selected personnel by the training department and preparedness of the personnel before non-active tests on Unit 2. No shortcomings were identified during the mentioned tests, which would contradict to legislative requirements.

In 2001 SÚJB performed a general review and updating of tests for the selected personnel at NPP Dukovany, NPP Temelín and research nuclear installations.

Since 2001, in connection with the introduction of symptom-oriented emergency procedures at NPP Dukovany and NPP Temelín, the knowledge about liquidation of abnormal and extraordinary (emergency) conditions have been tested on full-scale simulators of control rooms in NPP Dukovany and NPP Temelín.

The state examining board for selected personnel of nuclear installations met 17 times in 2001. Special professional competence was tested in 105 individuals - selected personnel of nuclear installations, from which 8 failed in the theoretical part of the tests. The percentage of passing the tests at the first attempt was thus 92 %. In agreement with the valid legal regulations 7 individuals repeated the theoretical part of the tests and succeeded while one person gave up. For the successful applicants SÚJB issued a resolution about the authorization to carry out activities of selected personnel at nuclear installations in the Czech Republic.

Tests of Special Professional Competence:

Testing of special professional competence continued for activities particularly important from the viewpoint of radiation protection before SÚJB examining boards. The special professional competence was tested for 2582 physical persons in total, from which 2444 passed and resolutions were issued about their special professional competence and 138 of them failed.

Table. Assessment of special professional competence for activities particularly important from the viewpoint of radiation protection before specialized SÚJB examining boards in 2001.

Examining Board	**Tested**	**Passed**	**Failed**	Note
RC České Budějovice	162	157	5	
RC Prague	310	292	18	2 withdrew from the test
RC Ostrava	988	951	37	
RC Pilsen	124	122	2	
RC Hradec Králové	394	387	7	
RC Brno	179	143	36	
RC Ústí nad Labem	323	296	27	
Other	102	96	6	
Total	2582	2444	138	

8.2. Legislative Activities in 2001

In agreement with legislative plan of the Czech government for 2000 an amended Act No. 18/1997 Coll. (Atomic Act) was submitted to the Czech government in late 2000. The draft was discussed in the working commissions of the government´ s Legislative Board and subsequently by the Board itself. The negotiations were interrupted and the draft was finalized, particularly the wording of technical definitions and some provisions were modified to suit better the wording practices in the Czech legislation. The material was then submitted to the Czech government, approved and submitted to the Parliament. The Parliament approved the draft with several minor comments and handed it over to the Senate. The Senate returned the Act and proposed several additional modifications. The Parliament subsequently approved the original wording. The Act was declared on 16 January 2002 under No. 13/2002 Coll.

Intense works were under way at the same time on preparation of implementing regulations for the Atomic Act to come into effect along with the amended Act, on 1 July 2002. They are 8 decrees which partly amend or modify the existing decrees or address issues so far not addressed by the legislation (e.g. personal radiation passes).

8.3. International Cooperation

International relations of SÚJB in 2001 were significantly influenced by the commissioning of Unit I at NPP Temelín and particularly by its participation in related negotiations with Austria. Moreover, similarly as in the past, SÚJB focused on compliance with the obligations resulting from concluded international agreements and on maintenance and development of relations with partner regulatory bodies. Last but not least SÚJB, in agreement with § 3, paragraph 2, letter p) of the Atomic Act, provided for coordination of international technical cooperation within the scope of its responsibilities, particularly as an upholder of professional cooperation with IAEA. Also important was the SÚJB involvement in technical negotiations within the EU accession process of the Czech Republic.

Bilateral Cooperation

One of the SÚJB long-term priorities in bilateral relations has been cooperation with the neighboring states, i.e. Germany, Slovakia, Austria and Poland. In connection with the NPP Temelín commissioning the mentioned countries dominated the bilateral international cooperation in 2001. Other bilateral SÚJB relations are those with EU countries and countries with major programs for peaceful utilization of nuclear energy and ionizing radiation, e.g. France, USA, Japan, France and Russian Federation. Also significant were contacts with other countries in the region, including Hungary and Slovenia.

Federal Republic of Germany

Federal Republic of Germany

There was a regular annual meeting organized based on an agreement between the governments of the Czechoslovak Socialist Republic and Federal Republic of Germany on the issues of common interest in nuclear safety and radiation protection, held in May in Prague. Both the parties used the meeting to exchange information on the latest developments in nuclear area and also to discuss the course of consultations between specialists about selected nuclear safety issues at NPP Temelín. The German party had earlier and again at the mentioned meeting stated that the final assessment of nuclear safety and radiation protection at NPP Temelín shall be within exclusive authority of the national regulator and the consultations may only contribute with new views. A significant part of the annual bilateral meeting was dedicated to discussions about future cooperation. A general principle in planning joint activities should be reciprocity and diversification of topics, i.e. particularly removal of nearly the hundred percent dominating topic of NPP Temelín. A very good example of a new form of cooperation was a lecture by SÚJB experts at a workshop organized in July by the German Commission for Reactor Safety, on storage of spent nuclear fuel. More joint activities focusing on sharing of the Czech experience gained during 1990s have been already agreed to take place in early 2002. Moreover, at the turn of November and December a workshop was organized in Prague on beyond-design accidents of nuclear power installations. The experts presented here an integral set of information in the German approach to this very specific issue. A subsequent discussion confirmed that the basic approach of the Czech party to beyond-design accidents of nuclear power plants is similar to that adopted by Germany and other countries.

The individual meetings were attended and prepared by representatives of Czech and German entities in charge of nuclear safety and radiation protection, as well as by experts from cooperating institutes, including the German GRS, TÜV and Öko-Institut Darmstadt and Czech ÚJV Řež, a.s., NPP Temelín, NPP Dukovany and Energoprojekt Praha. The growing number of organizations involved in the negotiations is viewed as a positive trend by SÚJB, which enables to present in the discussions a wide range of professional opinions of the individual topics.

Apart from the official bilateral meeting SÚJB and BMU exchanged in written a number of specific information concerning particularly nuclear power installations.

Austria

Last year most SÚJB activities in respect to Austria focused on support of a professional part of the so-called „Melk process", based on a Protocol resulting from talks between the two governments represented by the Czech Prime Minister Zeman and the Chancellor Schüssel and in presence of the EU Commissioner Verheugen (hereinafter the Protocol) in December 2000 in the Austrian town of Melk.

Under the governmental resolution No 65/2001 SÚJB shared responsibility for fulfillment of that part of the protocol relating to its responsibilities, i.e. nuclear safety, radiation protection and emergency planning. Considering the Protocol structuring (see the website of the Czech Ministry of Foreign Affairs) this included the following:

Chapter I , i.e. the so.-called . „hot information line",

Chapter II, i.e. the so-called „early warning system", and

Chapter IV, i.e. the so-called „trialogue“ on nuclear safety issues (with the involvement of EC experts).

The “hot information line” has been introduced to improve mutual confidence in respect to events on nuclear installations not covered by the valid internationals treaties or Czech-Austrian bilateral agreement. On the Czech side the obligations resulting from the Protocol are discharged by SÚJB in cooperation with ČEZ, a.s.

To boost existing tools of the early warning system in case of a radiation event the SÚJB regional center in České Budějovice in agreement with the Protocol installed and put into trial operation a measuring station which is also a part of the Austrian monitoring network. Employees of the regional center provide the technical service necessary for operation of the Austrian measuring equipment.

The fulfillment of obligations resulting from the Protocol in respect to nuclear safety of NPP Temelín required a series of intensive trilateral technical negotiations of experts delegated by the European Commission. According to SÚJB the so-called „trialogue“ within the Melk process has met its main objective as established by the Protocol, i.e. facilitation of a dialogue about nuclear safety between the Austrian and Czech governments. Still, final conclusions from the technical discussion about nuclear safety issues cannot be expected until a set of criteria is positively defined , i.e. European or other internationally recognized standards, and particularly until the discussion is spared its political aspects. Therefore the logical outcome has been an agreement between the Austrian and Czech parties on monitoring of seven areas of nuclear safety within the existing bilateral agreement.

Two official meetings were held in 2001 under the agreement between the governments of the Czechoslovak Socialist Republic and Austria on the issues of common interests in nuclear safety and radiation protection.

The first extraordinary meeting took place on 6 September 2001 in Prague on request of the Austrian party. The meeting’s agenda concentrated on a very specific topic of beyond-design accidents, naturally in association with NPP Temelín. There are no uniform international rules applied for these very unlikely events. Individual national approaches focus on analyses of potential events and implementation of mitigating measures, as practicable. At the extraordinary meeting the Czech party summarized all information transmitted so far on the issue and provided more details, particularly relating to the most frequently asked questions. A discussion followed, mostly dealing with radiological consequences of selected beyond-design accidents. The two parties concluded that differences remained in the approach to assessment of some important aspects of the formation and development of the events. According to the Czech party a mixed working group would be a suitable tool to remove the existing differences and to get the discussion on a purely professional level.

A regular annual bilateral meeting was held on 11 December 2001. The usual agenda included particularly mutual exchange of information on peaceful use of nuclear energy and ionizing radiation. A significant issue was a follow-up of obligations from the so-called „Melk process“, based on the existing bilateral agreement. In this connection both the parties favorably assessed function of the so-called „hot information line” and smooth installation and start-up of the Austrian monitoring equipment situated in České Budějovice. At the meeting the two parties, in agreement with a plan for implementation of conclusions drawn by the countries´ prime ministers in Brussels, agreed to establish a joint working group to

compare methodologies used for calculation of radiological consequences of selected beyond-design accidents.

France

Last year the cooperation with the French regulatory body - DGSNR – concentrated mainly on the following two areas :

The professional cooperation included technical consultations about freely programmable instrumentation and control systems. Their specific goal was to obtain information on Framatom and Schneider Electric systems which represent a platform for modernization of the I&C system at NPP Dukovany. SÚJB specialists were also interested in French experience in safety assessment of products supplied by the mentioned companies and procedures and practices used in this field in France.

In October 2001 IRSN (technical supporting organization for the French regulatory body) in cooperation with the German GRS organized another year of the international conference Eurosafe. Eurosafe has become one of the most prestigious meetings of experts dealing with assessment of nuclear installations safety. The conference traditionally hosts discussion panels dedicated to topical issues and this year it was for the first time attended by representatives of environmental groups. This year the SÚJB chairwoman was invited to participate in the panel discussion "Environmental impact of normal operation of nuclear installations".

Slovakia

In 2001 the cooperation between SÚJB and the Slovak Office for Nuclear Supervision 2001 was mostly informal, including consultations on topics of common interest and sharing of technical information. The regular bilateral meeting was postponed for organizational reasons and it will be held in 2002. The cooperation has proved useful also in taking joint positions in the EU accession process and in planning of multilateral projects in technical cooperation.

Poland

The cooperation between SÚJB and the Poland's Atomic Energy Agency stressed sharing of information on nuclear safety and radiation protection, particularly in respect to NPP Temelín. In 2001 preparations continued of the intergovernmental agreement about the early warning system in case of nuclear or radiation events on territories of both the countries.

United States

The technical cooperation in 2001 took place under the agreement between regulatory bodies of the two countries concluded in 2000 and outlining the framework of cooperation between US NRC and SÚJB, in line with the agreement concluded by governments of the Czech and Slovak Federal Republic and USA on cooperation in peaceful use of nuclear energy. As with other countries, the scope of joint activities was affected by SÚJB obligations associated with the commissioning of NPP Temelín. Regular activities continued as a basis of the mutual cooperation.

SÚJB organized an annual meeting of RELAP software users, attended by fifty experts from twelve countries; the software was developed under the auspices of the US regulatory body and in the Czech Republic and other countries it has been used as one of the primary tools for NPP safety analysis. One US NRC expert in I&C spent a week at the local SÚJB workplace at NPP Temelín within a program of experts exchange

Japan

Last year continued an extensive project organized by the Japanese government, focusing on experience sharing through exchange of experts from Central and Eastern Europe and Southeastern Asia, in the sphere of nuclear safety and radiation protection. SÚJB acts as a coordinator for the scheme in the Czech Republic. In 2001 the project made it possible for 15 Czech experts to attend a number of training courses oriented generally on control of operation and maintenance of nuclear power plants, on I&C for technological processes and electric systems and, last but not least, on nuclear waste management.

On the occasion of the project's tenth anniversary a joint assessment meeting was held in Prague in October 2001 which concentrated on the Czech Republic's participation. Both the parties concluded that the project represents a unique platform for experts from both the countries to compare their approaches to individual aspects of nuclear safety at nuclear installations. The Czech party also highly praised the preparation and organization of the project by the involved Japanese organizations.

Russian Federation

The cooperation between Czech and Russian regulatory bodies was in line with the agreement between the Czech and Russian governments on cooperation in nuclear energy area and in the reported period it was represented by only one Russian expert in the nuclear safety advisory body for the SÚJB chairwoman. Broader cooperation between experts from the national regulatory bodies occurred within multilateral projects of technical cooperation, particularly those supervised by IAEA.

Hungary

Within the 45th IAEA general conference in Vienna in September 2001, a working meting was held with representatives of the Hungarian nuclear safety regulatory body. The talks concerned potential extending of technical cooperation between the organizations, particularly in respect to power plants using WWER 440/213 reactors. In 2000 there were also technical consultations, particularly concerning planned multilateral programs of technical cooperation supervised by IAEA and an agreement was prepared on mutual cooperation between the two bodies.

Multilateral Cooperation

As in the past SÚJB multilateral activities in 2001 were oriented at international organizations such as IAEA, preparatory committee for monitoring of compliance with the treaty on general ban on tests of nuclear weapons (CTBT - Comprehensive Test Ban Treaty) or OECD nuclear agency (NEA - Nuclear Energy Agency), and also at fulfillment of obligations resulting from specific multilateral international agreements. The category of multilateral SÚJB activities included also its contacts with the European Commission and its advisory bodies and participation in activities of the Association of regulatory bodies in countries operating WWER reactors. In 2001 continued professional contacts with WENRA (Western European Nuclear Regulators Association) which started in 2000.

International Atomic Energy Agency

Similarly as in the past SÚJB priority focus in multilateral cooperation was on the professional cooperation with IAEA. SÚJB provided for participation of Czech representatives in activities of IAEA advisory bodies, technical committees and specialized groups.

One of the most important services provided by IAEA to its member states is independent assessment of various fields relating to nuclear safety and radiation. IAEA, on request submitted by the respective governments, sends inspection teams made up of experts from a wide range of countries. The inspection teams follow a fixed methodology and use clearly defined assessment criteria.

In the first two weeks of July 2001 the IARA inspection mission by IRRT (International Regulatory Review Team) took place in the Czech Republic and has been viewed by SÚJB as one of the most important events in 2001. Twelve experts from nine countries (Germany, Great Britain, USA, Switzerland, Finland and other) performed a detailed review of all aspects of the state supervision of peaceful utilization of nuclear energy and ionizing radiation, as performed by SÚJB pursuant to the Atomic Act. The review included supervision of nuclear safety, radiation protection, emergency planning and transport of radioactive material. The resulting expert report has been issued by IAEA at the turn of July and August and its full text has been available on the SÚJB website. Based on the review the experts concluded that the legislative framework within which SÚJB operated and the state supervision performance were both adequate and complied with the good worldwide practices. Considering results of the review and the position of the national regulatory body in the state administration structure, the team members particularly appreciated the fact that SÚJB had achieved independence not only „de jure“, but also „de facto“. The experts naturally also made specific recommendations whose implementation may further increase the standard of supervision in the Czech Republic. The recommendation concerned planning of inspection activities, emergency plan drills, employment of probability assessment of safety and some administration aspects of licensing. The review team members also identified a number of good methodologies used by SÚJB and recorded them so that they can be recommended to regulatory bodies in other countries.

In 2001 there were two OSART (Operational Safety Review Team) missions organized by IAEA - in February (NPP Temelín) and November (NPP Dukovany) - to assist the efforts to increase operational safety of the nuclear power plants. In October there was another mission at NPP Temelín, which focused on dealing with safety issues generally identified for WWER 1000 units under a special IAEA scheme in the early 1990s. All the three missions at Czech nuclear power plants demonstrated the open policy of the utility company in respect to the international professional community and general public and their results confirmed a very high level of nuclear safety and operating culture of the licensee. Experts from more than fifteen countries (including observers from Austria), who participated in the above-described missions, naturally made a number of recommendations which may in their opinion increase operational safety of both the plants and they also found a number of good methodologies to be offered by IAEA to other member states as examples of good practices. According to SÚJB the results of all the missions corresponded to the long-term results of supervisory activities at the two plants.

Another pillar of IAEA activities has been the Technical Assistance Program in peaceful utilization of nuclear energy. Pursuant to the Atomic Act SÚJB has functioned as a coordinator of the program in the Czech Republic. The program is divided into the so-called „national“ part (separate for each member country, usually in two-years cycles) and “regional” part (more countries are involved, usually in four-years cycles). The following national projects have been under way, most of them launched in early 2002:

CZR4009 - Evaluation of Radiation Damage Attenuation in WWER Reactor Pressure Vessel and Core Internals – dealing with the reactor vessel, including an expert system to evaluate properties of the in-core structures at high flows.

- CZR4010 - Automatic Data Acquisition and Evaluation System for Research Reactor – an automatic system to collect and process operational and experimental data at a school reactor, to train experts from nuclear power plants and students of the Faculty of Nuclear Science and Physical Engineering of the Czech Technical University in Prague (FJFI ČVUT);
- CZR4011 - Non-Destructive Examination of Radioactive Waste Packages Containing Transuranic Elements – a common project of three workplaces of ÚJV Řež, a.s. concerning:
  - introduction of passive and active non-destructive examination of encased low- and medium-active wastes containing transuranic elements;
  - development, introduction and validation of special chemical analytical methods in the central laboratory of ÚJV Řež, a.s.;
  - establishing a workplace to identify migration parameters of materials used as barriers in radioactive waste repositories.
- CZR9013 - Establishment of Radiation Protection and Safety Training Center – a training center for radiation protection workers in the Faculty Hospital in Prague - Motol.

Also some national projects started earlier were completed in 2001. In this connection the continuing beneficial activities of the PET Center in the Na Homolce hospital should be mentioned; the center has been a product of very successful technical cooperation project implemented in 1997 - 1999.

At the end of 2001 SÚJB handed over to the IAEA secretariat proposals for the following technical cooperation projects for the planning period 2003-2004:

- Implementation of PSA methods and further assistance in evaluation of problems, to increase powers of the regulatory body in respect to nuclear safety;
- Spectrometry and dosimetry for BNCT and improved utilization of the LVR-15 reactor;
- Support for the national center of nuclear analytical methods to maintain and further develop its human sources.

In the so-called „regional“ part of the Technical Assistance Program organized by IAEA for European countries SÚJB and other Czech organizations were involved in a number of events in 2001. Two specialized workshops were organized in the Czech Republic in the concerned period. The events were very diverse and included e.g. qualification of inspection systems, safe operation of nuclear installations and their technical assessment. More than 75 experts from the Czech Republic participated in other activities (conferences, meetings, workshops, training courses) organized within the regional part of the IAEA Technical Assistance Program, mainly focused on safety of WWER power plants, radiation protection and emergency preparedness.

In addition to the mentioned events and beyond the regional projects, a workshop was organized in SÚJB headquarters on the international scale for assessment of nuclear events (INES – The International Nuclear Event Scale Information Service).

The Czech Republic participated in the IAEA Technical Assistance Program not only as a recipient but also as a country contributing to projects in other countries. In 2001 the Czech Republic donated 1 million CZK for technical assistance in Bulgaria, to increase safety of NPP Kozloduj and to develop capacity and perform training of specialists, including transfer of know-how for non-destructive tests (identification and determination of defects sizes). Additional 2 million CZK were provided for continuation of technical assistance to Armenia, aimed at analysis and optimization of primary circuit integrity at NPP Medzamor

which uses WWER 440. 0,6 million CZK were provided for technical assistance to Georgia, dealing with organization and reviewing of the national course in radiation protection in x-ray diagnostics and purchase of dosimetric instruments to assure regulatory body inspection activities and monitoring of radiation situation in the country.

In 2001 SÚJB, within the multilateral technical cooperation with IAEA, continued to provide for professional and organizational aspects of secondments and the so-called scientific sojourns for specialists from member countries, particularly Central and Eastern Europe, Asia, Africa and South America. Within this program 67 workers and specialists were trained in 2001 in the Czech Republic in various fields of peaceful utilization of nuclear energy. The project included long-term secondments (3 - 6 months) in radiation protection and nuclear medicine and 2-months-long secondments in nuclear waste management, reactor technology, nuclear physics, nuclear methods of plant cultivation etc. There were also short-term (1-2 weeks) excursions in nuclear safety, execution of state supervision, legislation and emergency planning.

In 2001 SÚJB contributed to the IAEA technical assistance fund on behalf of the Czech Republic USD 77.380.- and USD 28.430.- which represented 8% from the total volume of technical assistants received by our experts in 2000.

Nuclear Safety Treaty

In agreement with international obligations of the Czech Republic SÚJB coordinated development of the CR National Report revision for the purposes of the Nuclear Safety Treaty. The report was handed over in October to all signatories as an input document for the second assessment meeting of the Treaty members to be held in Vienna in 2002.

OECD/NEA

In 2001 SÚJB continued to cooperate with OECD/NEA. SÚJB representatives attended regular sessions of the permanent Committee for Nuclear Regulatory Activities and activities organized by other permanent NEA committees, e.g. the Committee for Radiation Protection and Public Health dealing with the development of national exposure registers, WGIP (Working Group on Inspection Practices) or WGPCRO (Working Group on Public Communication of Regulatory Organizations). Also important was SÚJB involvement in organization of the international workshop "Licensing and Operating Experience of Computer-Based I&C Systems" held in Hluboká in October 2001.

Preparations to EU Accession, European Commission, its Advisory Bodies PHARE Program

In connection with the efforts to prepare accession of the Czech Republic to EU SÚJB performed tasks established in the Accession Partnership from 1999 and in the National Program for preparation of the Czech Republic to EU membership, approved by the Czech government in May 2001. SÚJB also participated in development of strategic documents for this preparatory period, coordinated by the Ministry of Foreign Affairs and Ministry of the Environment.

Practically concurrently with the process initiated by the Melk agreement an ad-hoc organized working group in the first half of 2001 dealt with the issues of nuclear safety in connection with the EU accession. The working group was established by EU Council to assess situation in this filed in the individual candidate countries. One of the SÚJB priorities last year was to hand over the information requested by the working group. Subsequently, SÚJB in cooperation with the concerned entities prepared information about implementation of recommendations contained in the report, discussed and approved by a permanent

committee of member countries´ ambassadors in Brussels at its meeting on 6 June. The information was handed over to the European Commission as the 6th and 7th additional information to the energy industry chapter. After the handover and completion of the so-called Melk process the negotiations on the energy industry chapter were preliminarily concluded in 2001.

Other activities of SÚJB in connection with preparation of the Czech Republic to EU accession included harmonization with EC law in radiation protection and guarantees and preparations to implement EC regulations. In radiation protection 12 implementation plans were developed back in 2000, which specify gradual steps for implementation of requirements in EC regulations for the individual partial areas. Along with other plans from the environmental field the documents were in October 2000 handed over by the Minster of the Environment, Mr. Kužvart, to EC commissioner, Mrs. Wallström. The implementation plans establishing gradual steps for implementation of requirements specified in EC regulations in radiation protection were updated in 2001. Negotiations took place with the concerned sectors about introduction of a mechanism monitoring movement of radioactive materials and radioactive wastes across borders. In November 2001 SÚJB issued a publication informing the concerned entities about the prepared changes in transport procedures for sealed radiation sources and radioactive wastes. Negotiations also continued with the concerned sectors on control mechanisms concerning food and feed contaminated with radionuclides. The issue will be further addressed as part of activities under the governmental resolution No. 1320 on the strategy for safe food assurance in the Czech Republic.

In cooperation with the governmental office - department of compatibility – translations were ordered and revisions performed of additional 20 EC regulations, i.e. by now 42 EC regulation in total. Late in 2000 an internal EU page was posted on the SÚJB intranet and later updated and amended, which provides to SÚJB people databases of EC regulations, implementation plans and more information concerning EU.

In connection with the results of negotiations on the energy industry chapter in December 1999 EC was given additional information concerning NPP Temelín and modernization of NPP Dukovany. In the course of 2001 EC received information about the licensing and commissioning of NPP Temelín on a quarterly basis. At the same time an information was prepared, in cooperation with the Ministry of the Industry and Trade, about fulfillment of the EU Council conclusions in respect to nuclear safety to be discussed by the Czech government. SÚJB continually monitored and, as practicable, attended meetings of EC working groups about the EC approach to assessment of nuclear safety standards in candidate countries.

As part of preparations to implement obligations resulting from EU membership and harmonization of SÚJB practices with those of regulatory bodies in EU member countries consultations were held in 2001 with experts from bodies supervising nuclear safety and radiation protection in Finland, France and Belgium. SÚJB representatives also attended meetings with EC dealing with involvement of candidate countries into a system monitoring radiation situation operated in ČS EU – ECURIE. A consultation started about agreement between candidate countries and Euratom which should become a legal basis for participation of candidate countries into ECURIE.

SÚJB participated in preparation of the Czech Republic for EU accession in activities coordinated by the Ministry of Foreign Affairs and also in a structured dialogue with the respective EC general directorates (DG ENV and DG TREN). SÚJB representative during the year attended the regular events, including regular meetings of the CONCERT group, a

platform for information sharing and harmonization of practices of regulatory bodies in EU countries and candidate countries in Central and Eastern Europe, a meeting of the permanent advisory group of regulatory bodies in EU countries (NRWG = Nuclear Regulatory Working Group) and meeting of the ACCESS Project Steering Committee, whose objective is to assess situation in application of guarantees in candidate countries and to prepare training for holders of licenses for radioactive waste management in these countries to meet requirement of the EURATOM guarantee system once they join EU. In 2001 SÚJB organized two workshops: in February for holders of licenses for management of nuclear materials in large quantities or in bulk form and in December for other licensees from Moravia and Eastern Bohemia. An SÚJB representative was a member of the four-member presidium of an advisory group for safety of European nuclear installations (ENIS-G =European Nuclear Installations Safety Group). The purpose of all these activities is to enable maximum involvement of candidate countries in joint activities of EU countries, particularly in nuclear safety of nuclear power installations not governed by the community law.

SÚJB activities within the supranational PHARE program „nuclear safety“ in 2001 was limited to preparation and defending of specifications for the two following projects:

- Assessment and validation of computer codes for termohydraulic calculations for nuclear reactors based on experimental data;
- Reassessment of mechanical properties of reactor internals, based on investigation of exposed samples from dismounted v Greifswald reactor.

In cooperation with the new EC administration for program management the following projects have been resumed, with previously approved programs and funding:

- Support of supervision during licensing of NPP Dukovany renewal project;
- Assessment of safety of the reactor bubbler system on WWER 440/213 reactor.

Other projects are being prepared in addition to the mentioned ones. In connection with the transfer of powers EC is currently evaluating efficiency of the PHARE program and preparing a new strategy to support the accession process of the candidate countries.

CTBTO Preparatory Committee

In 2001 SÚJB continued to function as a national agency under the Comprehensive Test Ban Treaty. In the reported period SÚJB representatives, along with representatives of the CR permanent mission with UN and other international organizations in Vienna, attended meetings of the Treaty working bodies and jointly with the Earth Physics Institute in Brno and with the State Institute for Radiation Protection in Prague provided for the fulfillment of Czech Republic’s commitments under the said Treaty.

Other Multilateral Activities

SÚJB is a founding member of the Forum of Regulatory Bodies of Countries Operating WWER Reactors, established in 1993 to support nuclear safety and radiation protection by sharing experience, exchanging information and coordinating efforts in this field. In 2001 SÚJB representatives attended a regular annual summit of the Forum organized by Bulgaria in Sophia to conclude its one-year presidency. In the reported period leading Czech specialists continued their working efforts in the Forum groups (e.g. in the group dealing with the fuel cycle end).

9. DISCLOSURE OF INFORMATION UNDER ACT No. 106/1999 COLL., ON UNRESTRICTED ACCESS TO INFORMATION

In connection with the disclosure of information under Act No. 106/1999 Coll., on unrestricted access to information, the State Office for Nuclear Safety in 2001 received 258 requests for information from physical and legal persons.

Two petitions were filed against SÚJB on the grounds of violation of the mentioned Act by the Civil Initiative for Environment Protection represented by JUDr. Papež, first against a fictional negative resolution not to provide information and subsequently a petition against the SÚJB appeal which confirmed the SÚJB resolution not to provide the requested information (= specific information about the shortcomings and problems identified during inspections at NPP Temelín – the first petition was filed with the Supreme Court in Prague on 23 October 2000). A petition advised by the Calla association at the turn of 2000 and 2001 has not yet been received by SÚJB and no investigations have been made in this connection.

In 2001 no court verdict was issued for non-observation of the said Act.

The information was requested (and also provided) using all forms acceptable by law: orally, by phone, electronic mail or in written. In terms of topics, the requests may be structured as follows:

a) NPP Temelín commissioning

b) Other nuclear installations

c) Radiation protection and monitoring of the radiation situation in the Czech Republic

d) Amended Atomic Act

e) Other

In addition to the above mentioned forms of information SÚJB provides some information on its web site address: www.sujb.cz. In 2001 the site registered 102432 visitors from 7234 computers. In this way the general public has access to the latest news about SÚJB activities and to the basic information about SÚJB position in the state administration, its organizational structure and legal framework in which SÚJB operates. The website also presents important contact addresses, a number of documents and reports relating to SÚJB activities. One example is the National Report of the Czech Republic for the purposes of the Nuclear Safety Treaty or SÚJB annual report submitted to the Czech government. Most information is available both in Czech and English.

Pursuant to the Atomic Act SÚJB representatives informed heads of district offices about radioactive waste management on their respective territories and about transport of nuclear materials into Czech nuclear installations.

SÚJB met its obligations to inform general public also by publishing a bi-monthly bulletin „Nuclear Energy Safety“ and irregular bulletin „Safety of Nuclear Installations “ which contain general information about nuclear safety and detailed requirements and instructions for its assurance. More information about how to obtain the bulletins is available from Ústav jaderných informací, ul. Elišky Přemyslovny, Praha 5 - Zbraslav.

Throughout the concerned year SÚJB informed the press agency ČTK and other media about the issues within its competence. SÚJB organized a press conference on the occasion of issuing its annual report.

Apart from the above mentioned petitions on the ground of violation of Act No. 106/1999 Coll. SÚJB faces the following petitions (status as on 11 February 2002):

1) Petition by South Bohemian Mothers, represented by JUDr. Kužvart, to review the SÚJB resolution of 17 July 2000, settling the appeal filed by South Bohemian Mothers – the resolution concerned specification of the external emergency planning zone for NPP Temelín, and the petition required participation in the procedure defining the zone – the petition was filed with the Supreme Court in Prague on 1 August 2000.
2) Petition by South Bohemian Mothers, represented by JUDr. Kužvart, to review the SÚJB resolution of 2 October 2000, dismissing the appeal filed by South Bohemian Mothers – against a resolution permitting physical start-up of NPP Temelín – the petition was filed with the Supreme Court in Prague on 6 December 2000
3) Constitutional complaint filed by Ladislav Folkman, Horst Lampert and Civil Association, concerning the emergency zone of NPP Temelín, to cancel the SÚJB resolution Ref No. 10124/3.1/2000 and to cancel § 14 of the Atomic Act; the parties are represented by Mgr. Henyš – the complaint was filed with the Constitutional Court on 21 June 2001.