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INTRODUCTION

This Report presents an overview of activities of the State Office for Nuclear Safety (SÚJB) in the supervision of nuclear safety of nuclear facilities in the Czech Republic in 1997. By issuing this Report, the SÚJB meets its information obligation under Act No. 18/1997 on Peaceful Uses of Nuclear Energy and Ionizing Radiation and on the Amendment of Some Acts (Atomic Act), Article 3 para 2.

Among the most important nuclear facilities that are currently operated in the Czech Republic and which are covered by state supervision of nuclear safety and radiation protection are the four VVER 440/213 reactor units of the Dukovany nuclear power plant (NPP), two research reactors (LVR-15 reactor with a maximum power of 10 MW and LR-0 zero-power reactor) operated by the Nuclear Research Institute in Øež (ÚJV Øež a.s.) and a teaching reactor, VR-1P, operated by the Czech Technical University in Prague.

Supervision by the SÚJB also concerns nuclear safety and radiation protection of the construction of the Temelín nuclear power plant. In this case, inspection activities primarily concentrate on the quality of installation work and building activities, personnel preparation, safety documentation reviewing, and overall preparedness of the plant for commissioning and start-up.

In addition, the SÚJB supervises the radioactive waste storage facility at the Dukovany site, radioactive waste repository in the "Richard" mine near the town of Litomìøice, and high level radioactive waste storage facility at the Nuclear Research Institute in Øež.

Apart from nuclear facilities, there are nearly 7000 workplaces with over 8700 simple and significant radiation generators and with approximately 5800 and 400 facilities involving sealed and unsealed simple significant or very significant radionuclide radiation sources, respectively; these all fall under the radiation protection supervision responsibility of the SÚJB as well.

Activities related to state supervision in the field of nuclear safety and radiation protection were performed by the SÚJB in 1997 in the same manner as the previous years, in compliance with applicable legislation. Prior to 1 July 1997, this legislation primarily included the State Supervision of Nuclear Facilities Act No. 28/1984 and Act No. 85/1995 amending the State Office for Nuclear Safety Responsibilities Act No. 287/1993. On 1 July 1997, the Atomic Act entered into force, whereby all the above Acts were superseded.

Major SÚJB's attention was centered on safety assessment of nuclear facilities and on the radiation protection assurance standard in the Czech Republic. This was based on an analysis of the documentation and information regarding the operation of the nuclear facilities and workplaces handling ionizing radiation sources, SÚJB's own inspection activities and checking of how the requirements imposed by the supervisory (regulatory) authority are satisfied. Where necessary, the SÚJB – based on the results of its analyses and inspections – laid down requirements and conditions for continuing performance of the facilities or workplaces concerned. Due attention was also paid to the physical protection and security of nuclear facilities and nuclear materials. Within its responsibility in the inspection regimes to strengthen the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), the SÚJB performed periodical inspections of nuclear materials and met other commitments under the Agreement between the Czech Republic and the International Atomic Energy Agency (IAEA) for the application of safeguards in connection with the NPT and the Convention on Physical Protection of Nuclear Materials.

No major failure bringing about radioactivity release into the environment and/or radiation endangerment of the personnel and the public above regulatory limits and/or increase in the monitored contamination of the components of the environment by artificial radionuclides in comparison to the previous period occurred in 1997.

None of the facilities or workplaces falling under the SÚJB regulatory authority exhibited such deficiencies as would require suspension or withdrawal of licence granted by the SÚJB.

Of special importance in 1997 was the safety review of Dukovany units 3 and 4 in first 10 years of operation, based on which the SÚJB granted licence for a continued operation of the units.

STATE OFFICE FOR NUCLEAR SAFETY

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

The SÚJB is a regulatory body responsible for governmental administration and supervision in the fields of uses of nuclear energy and ionizing radiation and of radiation protection. The authority and responsibilities of the SÚJB, as stipulated by Act No. 18/1997 on Peaceful Uses of Nuclear Energy and Ionizing Radiation (Atomic Act), include the following issues in particular:

- State supervision of nuclear safety of nuclear facilities, nuclear items, physical protection of nuclear facilities, radiation protection, and emergency preparedness of nuclear facilities and workplaces handling ionizing radiation sources.
- Licensing of activities as specified by Act No. 18/1997, e.g. for the siting and operation of nuclear facilities and workplaces handling very significant ionizing radiation sources, for handling ionizing radiation sources and radioactive wastes, transportation of nuclear materials and radionuclide emitters.
- Reviewing and approving documentation related to nuclear safety and radiation protection as laid down by the Atomic Act, limits and conditions for the operation of nuclear facilities, ways to ensure physical protection, emergency rules for the transport of nuclear materials and selected radionuclide emitters, and internal emergency plans of nuclear facilities and workplaces handling ionizing radiation sources.
- Specifying conditions and requirements for radiation protection of the public and personnel handling ionizing radiation sources (e.g. laying down limits and defining controlled zones), specifying emergency planning zones and licensees' emergency preparedness requirements under the Atomic Act.
- Monitoring the status of exposure of the public and personnel handling ionizing radiation sources.
- Coordination of activities of the Radiation Monitoring Network in the Czech Republic and international exchange of radiation situation data.
- Maintaining the national system of nuclear materials accountancy and control, national record-keeping systems for licensees, selected import and export items, ionizing radiation sources, and exposure of the public and personnel handling ionizing radiation sources.
- Professional cooperation with the International Atomic Energy Agency.
- Providing relevant information concerning radioactive waste management to communes and district administration bodies and relevant information concerning the results of activities of the SÚJB to the Government of the Czech Republic.

In accordance with the responsibilities, the Office is divided into three Sections, headed by SÚJB Deputy Chairmen, and an independent Department:

Nuclear Safety Section, which includes the Department of Nuclear Safety Assessment, Department of Components and Systems, and Department of Nuclear Materials;

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

Management and Technical Support Section, which includes the Department of International Cooperation, Department of Financial Management and Administration, and Office Bureau.

Independent **Emergency Preparedness Department** (reporting directly to the SÚJB Chairman), which fulfils the function of the Emergency Response Centre and coordinates the Radiation Monitoring Network.

The systemized number of SÚJB personnel was 139 employees (converted number: 136) in 1997, in this 43 nuclear safety inspectors and 47 radiation protection inspectors.

The cost of running the SÚJB is fully covered by the national budget. The sum, after governmental provisions to balance the national budget and other budget provisions, was Kè 154.9m.

The SÚJB also incorporates its **Regional Centres** in Prague, Plzeò, Èeské Budìjovice, Ústí nad Labem, Hradec Králové, Brno, and Ostrava, and two local offices at the Dukovany and Temelín nuclear power plants.

The SÚJB is the managing authority of the **National Radiation Protection Institute (**NRPI) in Prague.

STATE SUPERVISION OF NUCLEAR SAFETY

DUKOVANY NUCLEAR POWER PLANT

No event resulting in intolerable radioactivity leaks into the environment occurred at the Dukovany nuclear power plant in 1997. The operation of all reactor units was evaluated by the SÚJB as safe and reliable. From among the events recorded, 60 could be rated on the INES scale, viz. 2 events as level "1", the remaining as level "0", i.e. deviations of no safety significance. In 16 events the status of the facility required unscheduled power reduction at some of the reactor units, the remaining events had no effect on the reactor power output. The causes and course of the events were rated by the supervisory body as low significance, without major impact on nuclear safety.

Planned outages for refuelling and annual maintenance and repair were accomplished at all of the 4 reactor units. Extended maintenance and repair were performed at units 3 and 4, including removal of all fuel from the reactor cores and extended in-service inspection with emphasis on the inner walls of reactor pressure vessels.

The SÚJB reviewed nuclear safety of units 3 and 4 in 10 years of operation and granted licence for continued operation of the units. As in the case of units 1 and 2, the licence will only be valid after a number of requirements, specified by the SÚJB Decision, are satisfied.

The Dukovany units were run in 1997 in the baseload mode or in the primary frequency control mode, as required by the load dispatching centre; the so-called island mode, which is the first part of the comprehensive plan of distribution grid restoration in the event of its breakdown, was also tested. The trial operation in the primary control mode and the tests in the island mode gave evidence that the Dukovany plant is capable of meeting the demanding requirements of connection to the Western European grid (UCPTE).

Reactor scram was triggered by the **HO-1** emergency protection system three times in 1997, which is 3 event less than in 1996.

The **HO-2** emergency protection system intervened two time, which is one event more than the previous year.

Intervention of the **HO-3** emergency protection system occurred 7 times – three times more than the previous year.

The **HO-4** emergency protection system, which locks power increase in the automatic as well as manual mode of reactor power control, was activated 3 times, which is 7 times less than in 1996.

Dukovany nuclear power plant
(Photo: ÈEZ, a.s. – Dukovany NPP archives)

Intervention of the emergency reactor protection systems

No/	Date	Power	Type	Cause
Unit 1				
1	12/1997	98%	HO-3	Failure of 3 MCP following lubricant oil pressure drop when the relief valve of the MCP oil pump failed to shut
2	9/2/1997	97%	HO-3	False activation of the power limiter control
Unit 2				
1	25/6/1997	$6x10^{-2}$%	HO-1	Failure of the power setting system
2	19/12/1997	100%	HO-3	Water level decrease in steam generator
3	19/12/1997	100%	HO-1	Closing of the quick-closing valves of the last working turbogenerator due to failure of the level control system
Unit 3				
1	18/5/1997	PZ	HO-3	Failure of the power setting system at a minimal controlled reactor power (reactor start-up)
2	19/5/1997	MP	HO-2	Operator's improper action while resetting the power setting system
3	7/611997	100%	HO-3	Turbogenerator failure
4	9/8/1997	100%	HO-3	MCP failure following electricity loss without backup
5	20/10/1997	100%	HO-3	MCP failure during improper intervention while testing the “Main Steam Header Break” signal within the unit protection system testing
Unit 4				
1	9/10/1997	0%	HO-2	Improper operator's intervention during reactor power start-up
2	11/10/1997	19%	HO-1	Reactor shutdown by the primary circuit operator during power start-up testing

MCP = Main Circulation Pump

Failures – events categorized as level 1 on the INES scale

1. *23 June: The manually operated valves in the super emergency feedwater line of the steam generators were found shut after unit start-up following refuelling, whereby the limiting conditions for the “Emergency and Super Emergency Steam Generator Feedwater System” were violated. This event was due to the human factor; deficiencies in documentation maintenance were also revealed.*
2. *11 October: Scram at unit 4 took place by activation of the HO-1 protection system pushbutton. This was also due to the human factor. Following misunderstanding in communication between the I&C shift engineer and the operating physicist who controlled the test during the reactor power start-up, the HO-2 system was activated, whereby the reactor was scrammed. The reactor operator activated HO-1, in compliance with the operating rules, whereby the measuring ionization chambers of the source zone displaced to a position where the neutron flux level is measured with an accuracy corresponding to the reactor power.*

Limits and Conditions

Based on operator's application and following review of the relevant documentation submitted by the operator, two short-term changes in the Limits and Conditions for the normal operation mode were licensed for the necessary repair work. Four such changes were licensed by the SÚJB in 1996.

The Limits and Conditions for normal operation of the Dukovany NPP were violated three times in 1997, as in 1996. Two additional instances of suspect violation, however, are under examination.

Violation of Limits and Conditions

No.	Date	Cause
Unit 2		
1	23 June	Manually operated valves in the super emergency feedwater line shut
Unit 3		
2	7 June	Obligation to report within 72 hours any intervention of the HO-3 protection system violated
Units 1 – 4		
3	15 December	Incomplete electrician shift personnel

Dukovany NPP control room
(Photo: ÈEZ, a.s. – Dukovany NPP archives)

Supervisory activities at the Dukovany NPP

Among important results of SÚJB's supervisory activity was the safety review of units 3 and 4 in ten years of operation. The review by the SÚJB inspectors was based on applicable legislation which formed the criterial basis, and on IAEA recommendations and results of international missions. Operating safety reports documenting the status of nuclear safety in 10 years of operation were also reviewed.

Licence for continued operation of units 3 and 4 was granted by the SÚJB based on:

- review of the above safety reports
- special inspection visits concentrating on the operability of the facility and Quality Assurance in the implementation of selected approved changes during the unit outage, and
- checking the implementation of requirements of previous decisions and results of annual maintenance and repair.

The licences for continued operation of units 3 and 4 cover the next 2 refuelling periods. Moreover, they include requirements which must be satisfied for the licences to be renewed for a longer period.

The SÚJB's supervisory activities are documented by 116 protocols and 213 decisions.

Routine inspection activities concentrated themselves on the limiting and safety parameters according to the "Periodical Inspection Programme"; these were performed by the SÚJB site inspectors. The inspections showed that the operating rules were observed and the parameters were consistent with the design values.

The safety limits and protective safety system settings were consistent with the Limits and Conditions ("L&C") except for the above instances.

The routine inspection activities also included systematic operability testing of the protective safety systems of the units along with the automatic start-up of the backup dieselgenerators of the 2nd category supply. The test results were favourable.

Attention was also paid to how the events are dealt with by the Event Committee of the Dukovany NPP. The SÚJB found that the events were properly handled, and identified no major deficiencies.

During the periodic integral tests of hermetic compartment leaktightness at the individual reactor units at the end of refuelling outages, the inspections concentrated on how the L&C were observed and on the approved methods of leaktightness testing. The inspectors found the tests to be carried out as prescribed and the leaktightness of the outer boundary of the hermetic space to be consistent with the L&C.

Systematic attention was also paid to the process of reactor shut-down for refuelling, reactor start-up to reach criticality after refuelling, and selected physical and power start-up tests. The processes were found to proceed as prescribed by the L&C and no major deficiencies were identified.

The preparedness of the units for refuelling was also checked. Based on documentation, SÚJB inspectors checked how the fresh fuel was prepared for inserting into the reactor core, whether the system for seeking leaking fuel assemblies worked well, whether the reactor core, the refuelling pool, the spent fuel storage pool, and the fuel cask cavity were free from any foreign object, and whether their purity complied with nuclear fuel handling requirements. The preparedness of the refuelling machine and the refuelling schedule were checked. No deficiencies that would stand in the way of refuelling were found.

During annual maintenance, inspection activities concentrated on planned modifications of and changes in the mechanical part of the technological equipment, particularly the pressurizer relief valve node. Quality Assurance documentation for this activity was found to comply with SÚJB requirements.

Furthermore, work on and inspection of steam generators following the relevant in-service inspection schedule was examined, and it was found that all non-compliances identified during in-service inspections were dealt with properly. No major deficiencies were detected.

Special attention was paid by the SÚJB to inspections before start-up of the reactor units after refuelling. The following issues were examined:

- *In-service inspections, implementation of modifications and preparedness of the mechanical parts, electrical systems and Instrumentation & Control systems for start-up following refuelling and annual maintenance. No deviations from the In-Service Inspection Plan or other deficiencies were identified, and the procedures were found to run in accordance with the outage schedule.*
- *Preparedness of the staff, particularly selected unit control room personnel, for reactor unit start-up after refuelling.*
- *Compliance with requirements of previous SÚJB Decisions regarding the operation of the reactor units. SÚJB inspectors found that the requirements had been met by the licensee.*

The results of the inspections gave evidence that nuclear safety of the Dukovany reactor units is assured by the licensee in compliance with applicable regulations.

Inspection actvities of SÚJB inspectors at the Dukovany NPP
(Photo: SÚJB archives)

Assessment of the Dukovany NPP by the modified SALP system

A new system for nuclear safety inspection activities planning, implementation and evaluation, based on experience gained by the US NRC, was launched in 1997. This system is based on the SALP system (Systematic Assessment of Licensee Performance) and is adapted to the conditions of the Czech nuclear power sector. In this system, the inspection activities are divided into 4 main areas, viz. operation, maintenance, engineering[1], and support[2] related to the operation of nuclear facilities, and subsequent rating of the inspection activity findings as 1, 2, or 3. Rating 1 means the best assessment, whereas rating 3 denotes a poor, yet acceptable status, requiring that corrective actions be taken by the licensee. A qualitative evaluation of the results serves the regulatory body for improving its inspection activities and for its planning and, at the same time, gives indication to the nuclear facility operator as to which areas require more attention with respect to nuclear safety and operational safety culture.

Thereby, a third independent and progressive system of nuclear safety assessment is introduced besides the system of direct assessment of how the requirements of the generic obligatory and operational rules are met and the system of assessment which uses a set of safety indices.

The rating in the 1st and 2nd halves of 1997 was as follows:

	Operation	**Maintenance**	**Engineering**	**Support**
1997	1st/2nd half	1st/2nd half	1st/2nd half	1st/2nd half
Dukovany NPP	2/2	2/2	3/2	2/1

Operation: rating 2

T*he routine and planned inspections gave evidence that the licensee was paying due attention to nuclear safety during plant operation. The procedures and rules largely comply with the requirements of applicable legislation. Shortcomings were identified in the rules for elimination of failures, which are not symptomatically oriented and fail to fully respect the requirements of the approved Limits & Conditions; the latter are not always unambiguous. Efforts in the area of own assessment of the facility operation are at a good level. Remedial actions are mostly efficient, although some fail to be fully completed during the period specified.*

Maintenance: rating 2

It follows from the inspections that the licensee pays due attention to nuclear safety during maintenance activities. The procedures and rules basically comply with the requirements of applicable legislation. Remedial actions are mostly efficient, although some fail to be fully completed within the period specified. Inspections dealing with the preparedness of the reactor units for start-up following refuelling outages identified no deficiencies preventing the units from start-up.

[1] Engineering encompasses technical and engineering support of all activities at the nuclear facility related to the project control, design, installation, and testing of modifications, engineering and technical support of the operation, outages and maintenance, testing and identification of the status, inspection of supplies, organizational control system, use of the results of own assessment and training of technical support and control presonnel.

[2] Support encompasses all the remaining operator's activities, e.g. in radiation protection, radioactive waste handling, dosimetric control, emergency planning, physical protection, chemical regimes, and fire protection.

Engineering: rating 2

The situation in the field of engineering improved in the second half of the year because the licensee paid more attention to nuclear safety. The procedures and rules largely comply with the requirements of applicable legislation. Some shortcomings persist: rules detailing the basic system standard for the methodology of creating the various types of documentation fail to exist, planned methodologies are not available, e.g. for the creation and updating of safety reports, for setting up emergency and safety guidelines and working procedures; the Quality Control and Organization Department fails to sufficiently review the control documentation in working points identified by the distribution list for the document in question. Remedial actions are mostly efficient, although some fail to be fully completed (e.g. reactor pressure vessel temperature sensors).

Support: rating 1

The situation improved in the second half of the year owing to fact that the licensee enhanced the standard of compliance with applicable nuclear safety requirements. The procedures and rules agree with legislation. Remedial actions are technically comprehensive and complete.

Assessment of safety indicators

Input data for calculation of the NPP nuclear safety indicators are based on the records of measurements that the NPP operator is obliged to perform and maintain, and on protocols developed by SÚJB inspectors and on reports by the site inspectors. A complete manual defining the way of calculating the indicators, along with the data employed, is included in the internal SÚJB document "Safety Indicators". The set assessing a total of 6 areas was extended in 1997 to encompass a total of 24 different indicators.

Overall, the results of evaluation of the various indicators in 1997 suggest a favourable trend as compared to 1996 (although in 1996 the operation of the Dukovany NPP was safe as well, the assessment of selected parts of the plant operation based on the set of safety indicators revealed no hazards in the Dukovany plant operation).

For the majority of indicators associated with safety-related events, the values were mostly lower than or the same as in 1996. However, rather than the individual values it is noteworthy that both of the safety-related events classed as INES level 1, all L&C violations, and one of the 3 interventions of the HO-1 protection system were due to the human factor. This indicates that the operator should continue to pay attention to the culture of operation and personnel education and training.

The safety systemsbasically exhibit favourable trends, including the spray system which, although continuing to be the most frequently inoperable equipment, displayed a 21% improvement against 1996. The last 3 years, however, saw a continuous increase in the inoperability of the low-pressure emergency core makeup system.

Electricity generation losses at Dukovany Unit 1 in 1997

1	8 – 9 Jan	Unit power drop following main circulation pump (MCP) shutdown
2	1 Feb	Failure of 3 MCP following lubricant oil pressure drop, intervention of HO-3 protection system
3	9 Feb	Intervention of HO-3 protection system
4	1 – 3 Mar	Planned turbogenerator shutdown for secondary circuit repair
5	9 Jun	Start of reactor operation using the power effect
6	27 Jun	Unit shutdown for refuelling and annual type-repair
7	11 – 12 Aug	Unit start-up following refuelling and maintenance, physical and power start-up tests
8	30 Aug	Turbogenerator shutdown for safety device relay repair
9	27 Oct	Reactor power reduction because of increased H_3BO_3 concentration in coolant
10	21 Dec	Reactor power reduction as required by the national load dispatching centre

Electricity generation losses at Dukovany Unit 2 in 1997

1	9 Mar	Turbogenerator shutdown for secondary and tertiary frequency control regime tests
2	1 May	Reactor start-up using the power effect
3	16 May.	Unit shutdown for refuelling and annual maintenance
4	17 May-23 Jun	Unit outage for refuelling and annual maintenance
5	24 – 30 Jun	Unit start-up after refuelling, physical and power start-up tests
6	11 – 31 Jul	Unit shutdown for routine repair work
7	7 – 8 Aug	Power reduction for heat transfer to Unit 1
8	19 Dec	Intervention of the HO-3 and HO-1 protection systems following failure of the steam generator level control system

Electricity generation losses at Dukovany Unit 3 in 1997

1	5 Feb	Start of reactor operation using the power effect
2	7 Mar	Unit shutdown for refuelling and annual maintenance
3	8 Mar-28 May	Unit outage for refuelling and annual maintenance
4	29 May	Unit start-up after refuelling, power start-up tests
5	5 – 6 Jun	Unit power reduction to perform “island operation” tests, turbogenerator failure
6	6 – 10 Jul	Unit power reduction as required by the national load dispatching centre
7	9 Aug	Unit power reduction following main circulation pump failure, intervention of the HO-3 protection system
8	22 – 25 Aug	Unit power reduction for planned secondary circuit repair
9	9 Oct	Unit power reduction due to increased coolant water temperature, cooling tower no. 8 shut down for reconstruction
10	20 Oct	Main circulation pump failure, intervention of the HO-3 system
11	6 Dec	Turbogenerator failure
12	27 Dec	Power reduction to eliminate leak at the turbogenerator withdrawal end

Electricity generation losses at Dukovany Unit 4 in 1997

1	4 – 5 Jan	Gradual turbogenerator shutdown for repair of the high-pressure part and of the generator
2	9 – 11 Aug	Unit outage for refuelling and annual maintenance
3	10 Oct-1 Nov.	Unit start-up after refuelling, physical and power start-up tests; HO-3 intervened on 11 October, transition to HO-2, reactor shutdown by operator, HO-1 followed
4	31 Oct-4 Nov	Testing the "island operation" regime

TEMELÍN NUCLEAR POWER PLANT

Construction and licensing process

In general terms, the buildings and technological sets of Unit 1, including auxiliary facilities, are largely complete. At Unit 2, installation of technological facilities of the primary circuit was under way.

UNIT 1

Checking installation of the reactor internals was finalized in the reactor hall, passivation of the reactor cavity and spent fuel storage pool was performed, and final work on the installation of the polar crane was made. The steam generator heat transfer tubes were cleaned and inspected by the eddy current method.

As to civil engineering work, the building of the unit and emergency control rooms was completed and the panels and control desks were installed. Installation of Westinghouse (WEC) stands and of the impulse piping of the control system in the reactor hall was commenced. Transport of cabinets of the safety and other parts of the control system continued, and the first part of the systems was prepared for start-up testing. In the switching stations and the turbine hall, surface coating and installation work was under way and the cable ducts were modified.

Final installation work and preparation for construction tests and post-installation cleaning operations took place at the primary circuit auxiliary systems.

The turbine hall equipment was in the air drying regime, Modifications of the oil system of the turbine were implemented.

In the electrical sector, work continued on modifications of the connection of some substations, installation of steel structures for cabling, cable laying, and installation of fire partitions. In Building 800, about 250 km out of the presumed 950 km have been laid during the past period. The cable laying has been suspended after finding that the segregation distances as specified by the supplement to the initial project have not always been observed.

The spent fuel pool and reactor cavity leaktightness testing was finalized by pickling and passivation. The pre-complex testing of the electrical systems continued. Preparatory work was started for putting the dieselgenerator stations and related technological systems into operation, with the objective to use them as a peak power source during winter of 1997–1998.

UNIT 2

In the reactor hall of Unit 2 continued installation of the fuelling machine, welding of the steam headers, installation of GERB dampeners and of the emergency core cooling system (ECCS) piping, reconstruction of steam generator internals, and installation of the ECCS pumps. Installation of the technological water lines, of the deactivation system, and of the normal primary circuit makeup system proceeded. Installation of platforms in the transport corridors, construction of vaults for WEC and the radiation monitoring system, and installation of boron pool screens were at their final stages.

Work in the turbine hall and in the switching stations included installation of anchoring components, installation of forming for walls of tanks under the transformers and their concreting. The generator, steel structures and condensate and oil piping were installed in the turbine hall. Steel structures, switchgear frames, and the first cable ducts were installed in the switching station rooms.

The cooling towers were coated and the vertical channel of tower No. 1 was repaired, and finalization of civil engineering work occurred at the active auxiliary operations building.

Overall view of Temelín Units 1 and 2

In relation to the licensing procedure, SÚJB mainly concentrated on the assessment of the Preliminary Safety Report Supplement, for both the part developed by Czech organizations and the part prepared by WEC.

SÚJB's comments were discussed thoroughly with ÈEZ utility, Škoda Praha, and EGP. It was concluded that the comments would be taken into account when developing the Pre-operational Safety Report but, since the replies from the organizations should be reviewed thoroughly and in a short time, the SÚJB requested from ÈEZ reply in the shortest time possible. It is SÚJB's aim that the requirements for corrections or amendments of the report should not cause any delay of the physical start-up process.

ÈEZ submitted to the SÚJB some of the answers relating to the documentation developed by WEC regarding nuclear fuel, the I&C sytem, and emergency analyses. The answers have already been partly reviewed by SÚJB staff.

Supervisory activities

A total of 31 inspections, including routine supervisory activities performed by site (resident) inspectors, were carried out in 1997, mainly concentrating on the quality of the construction, installation and start-up work. In accordance with the progress in the construction process, the inspection activities were centered on compliance with the requirements of the relevant approved documentation.

The SÚJB issued 141 Decisions in 1997, mainly regarding Quality Assurance programmes and selected pre-complex and complex testing programmes.

Following a successful mechanical operation test of the 1000 MW turbine in 1996, the activities of SÚJB inspectors in the field of plant preparation for start-up concentrated on the results of the spent fuel storage pool leaktightness testing. Here, additional tests were required to demonstrate that the requirements laid down previously had been met. Furthermore, the testing of electrical systems of Unit 1 was reviewed. In some cases, requirements specified by the approved documentation were found not to be observed, and corrective actions were ordered.

Tests were performed on the service water system. Furthermore, the safety dieselgenerators, which serve as emergency electricity sources, were tested at the end of the year. No major shortcomings were detected by the SÚJB, except for damage of the crankshaft of one of the dieselgenerators.

In the area of installation work, inspection activities were aimed at checking how the installation and Quality Assurance requirements were met. A few cases were detected where the installation work quality requirements had not been satisfied: the areas with non-compliances included the prescribed installation regime, stainless steel material handling, and welding quality assurance. The SÚJB started a set of inspections of welds at the most significant technological nodes. The results of checks of welds performed during the assembling were evaluated. Inspections of welds are to be continued in 1998. The partial inspection results so far point to an acceptable quality of the welds.

Administrative procedure dealing with non-compliances in the field of the Individual Quality Assurance Programme (double lining) during installation work at Unit 2 was concluded by imposing a fine of Kè 200 000 on the utility. The penalty was imposed due to repeating non-compliances in the area of order and technological cleanliness at the construction site during the assembling work.

In relation to the repeating non-compliance with the Quality Assurance programmes and the relevant documentation, another administrative procedure against ÈEZ was started in late December 1997.

The quality aspect is also under surveillance with regard to the installation of the Westinghouse Instrumentation & Control system. No major shortcomings were detected during 1997.

Overall it is concluded that although some improvement in the observation of installation quality requirements is seen, the approved Quality Assurance and technical specification requirements fail to be consistently met. Although the SÚJB is constantly exerting pressure in this respect, progress is very slow. The deficiencies are mainly due to too complex supplier–customer relationships, not very efficient remedial provisions, underestimating this issue, and the fact that the start-up of the two units is postponed again and again.

Summary rating by the modified SALP method

	Operation	**Maintenance**	**Engineering**	**Support**
1997	1st./2nd half	1st./2nd half	1st./2nd half	1st./2nd half
Temelín NPP	N/N*	N/N*	3/3	2/2

*N – not rated, sufficient data are unavailable.

Engineering: rating 3

Inspections have shown that in the area of engineering (in particular, in the field of inspection of contracted services – welding – by the licensee), attention that the licensee is paying to compliance with prescribed requirements is not very good yet acceptable. Among issues which do not fully comply with standards and regulations is, for instance, welders' qualification. The Czechoslovak standard ÈSN 05 0710 has not been duly observed, despite the fact that the SÚJB repeatedly pointed to this deficiency. Some programmes, procedures and internal rules fail to provide sufficient control over activities in the relevant areas and/or are not adhered to. It has been found, for example, that the procedure for welded joint repairs in the spent fuel storage pool failed to include some requirements for quality, and not all necessary data concerning this repair have been recorded.

The licensee's own assessment fails to deal with problems before these become quite conspicuous. Corrective actions are not always carried out in due time. For the above reasons, this area requires increased SÚJB's as well as licensee's attention.

Support: rating 2

The inspections revealed that in the field of support, the licensee is paying sufficient attention to the nuclear safety assurance aspects. The procedures and internal rules comply with the legislative requirements, although some shortcomings have been detected. Corrective actions are usually efficient.

Fresh Nuclear Fuel Storage Facility at the Temelín site

Trial operation of the Fresh Nuclear Fuel Storage Facility was started 21 May 1997 by placing there the first batch of fuel assemblies. A total of 134 fuel assemblies were stored in the facility by the end of 1997.

In addition to inspection of the fuel assembly transport to the facility, SÚJB inspectors also inspected twice the facility itself with respect to the Limits and Conditions for Trial Operation. No deficiencies or deviations from the approved documentation were identified.

Turbine hall of Temelín Unit 1
(Photo: ÈEZ, a.s. – Temelín NPP archives)

NUCLEAR RESEARCH FACILITIES

LVR-15 reactor at the Nuclear Research Institute in Øež

The LVR-15 reactor provided 14 686 MWh in 1997. The total power provided by the reactor since the start of operation after the reconstruction in 1989 is 123 296 MWh. All experimental work was implemented as planned. The reactor primarily served the needs of customers from abroad, mainly in the area of materials examination of nuclear power facility components. The operation of the reactor was safe and reliable, except for the failures described below.

On 26 May, remedial actions were taken to eliminate impacts of an external electricity failure; during that process, 1st category reactor supply failure took place for a time shorter than 20 s in such a manner that the reactor cooling feedwater supply systems failed completely. Owing to this failure and to its flawless identification and prompt elimination by the reactor protection systems as well as by the operators, an inaccuracy in the formulation of one of the limiting conditions for the reactor operation was detected. The SÚJB ordered this failure to be subjected to safety analysis, the limiting conditions to be refined, and provisions to be made so as to eliminate impacts of failures of this kind in the future. The failure was classed as level 1 on the INES scale.

On 1 and 2 July, the limiting conditions defining the maximum permissible weekly releases of the isotope I 131 from the special venting system of the Nuclear Research Institute was violated; these releases did not exceed 12% of the permitted annual releases and had no adverse impacts on the surroundings of the Institute or on its personnel. Based on a follow-up inspection, the SÚJB ordered an extensive set of corrective provisions to be implemented and initiated administrative proceedings under Act No. 18/1997, Article 41, to impose penalty for a gross violation of the Limits and Conditions as identified by SÚJB inspectors. The event can be classified as level 1 on the INES scale.

Other nuclear research facilities

The LR-0 reactor at the Nuclear Research Institute in Øež as well as the VR-1P teaching reactor at the Faculty of Nuclear Science and Physical Engineering, Czech Technical University in Prague, were in a safe and reliable operation in 1997, in compliance with the approved Limits and Conditions.

No deficiencies in the operation of the reactors were detected during SÚJB inspections. The VR-1P teaching reactor is used extensively for education purposes and fulfils its important role also beyond the sector under the responsibility of the Ministry of Education. Based on results of inspection activities and with regard to the steadily good operation and nuclear safety parameters, the SÚJB renewed the reactor's operation licence for another 10 years.

The LR-0 reactor at the Nuclear Research Institute serves specific purposes due to which the degree of its use is very low now. Negotiations with a foreign customer are under way with a view to extending the application of this facility.

LVR-15 reactor at Nuclear Research Institute in Øež
(Photo: NRI archives)

VR-1P teaching reactor at the Faculty of Nuclear Science and Physical Engieering, Czech Technical University in Prague
(Photo: Faculty archives)

OTHER NUCLEAR FACILITIES

The new Atomic Act extended the scope of facilities falling under the category of nuclear facilities. The term “nuclear facilities” covers facilities for the production, processing, storage, and disposal of nuclear materials. The institutions involved include the Uranium Concentrate Storage Facilities within the National Material Reserves and the Uranium Concentrate Storage Facilities of the DIAMO company and its GEAM subsidiary.

The above nuclear facilities are undergoing a process of harmonization with the new legislation, which may be scheduled to 5 years under the Atomic Act.

SPENT FUEL MANAGEMENT

Spent fuel is currently stored at 3 nuclear facilities, viz. in the spent fuel storage pools of the Dukovany NPP, the High Level Radioactive Waste Storage Facility of the Nuclear Research Institute in Øež, and the spent fuel interim storage facility at the Dukovany site.

Interim Spent Fuel Storage Facility at the Dukovany site

Following trial operation which proceeded longer than a year, the licensing process for the Interim Spent Fuel Storage Facility was finalized in January 1997. Based on evaluation of the trial operation and on its own inspection results, the SÚJB granted a permanent operating licence. Additional 12 CASTOR-440/84 casks containing spent fuel from the Dukovany plant were transferred to this facility in 1997. The total as of 31 December 1997 was 23 casks of this type.

Selected physical quantities such as the surface temperature, pressure between the primary and secondary lids of the casks (leaktightness testing), and the radiation situation inside the storage facility and in its surrounding have been monitored. The values did not exceed the limits specified by the SÚJB in the Limits and Conditions for Permanent Operation. No violation of the Limits and Conditions occurred in 1997. SÚJB inspections in January and July were concentrated on the preparedness of the facility for permanent operation start-up and on compliance with the Limits and Conditions. No shortcomings were identified.

The SÚJB Decision No. 29/97, whereby the permanent operation of the facility was licensed, ordered the Dukovany nuclear power plant management to submit application for augmenting the Limits and Conditions for Permanent Operation with the requirement that venting air inlet into the storage facility hall should be ensured.

For the SÚJB to be able to take an unbiassed decision regarding the use of the CASTOR-440/84 casks for transport after the storage period has elapsed, the Decision No. 29/97 also includes a clause ordering the plant management to submit a conception of a card documenting that the quality of the cask is being maintained throughout the entire service period.

In October 1997, transports back to the Czech Republic of spent fuel produced by the Dukovany plant and temporarily stored in the Slovak interim storage facility at Jaslovské Bohunice were completed; by the end of the year, all spent fuel from the Dukovany plant was stored in the plant's interim storage facility.

Interim spent fuel storage facility at the Dukovany site
(Photo: ÈEZ, a.s. – Dukovany NPP archives)

Since the condition which limited the maximum storage capacity of the interim storage facility to 600 tons had been lifted by a governmental decision, ÈEZ started preparatory activities to extend the facility's storage capacity. The first negotiations between the SÚJB and ÈEZ specialists concerning the contents of the "Safety Reports for the Spent Fuel Storage Facility at the Dukovany Site" were initiated at the end of 1997.

NUCLEAR MATERIALS TRANSPORT

Five international transports of spent nuclear fuel from the Jaslovské Bohunice nuclear power plant in Slovakia to the Dukovany storage facility, three spent fuel transfers within the Dukovany area, forty spent fuel transfers within the area of the Nuclear Research Institute in Øež and one inland transport of irradiated fuel between the Nuclear Research Institute in Øež and the Faculty of Nuclear Science and Physical Engineering in Prague were accomplished in 1997.

As far as fresh nuclear fuel is concerned, four international transports of such fuel from Russia to the Dukovany plant and two transfers within the Dukovany premises took place in 1997. Furthermore, four international transports were accomplished from the United States to the Temelín plant. Two fuel pins which had been transported to Temelín by mistake in dummy fuel assemblies were sent back to the USA. The Nuclear Research Institute imported 118 fresh fuel assemblies for its research reactors from Germany by four international road transports.

Handling a CASTOR-440/84 transporting and storage cask
(Photo: SÚJB)

Uranium concentrate was also subject to international transports: five transports from DIAMO company to the United Kingdom, two transports to France, and one transport to Russia. In addition, there were accomplished four inland transports of natural uranium from the ŠKODA-ÚJP Praha a.s. company (Nuclear Fuel Institute) to glass works, four uranium concentrate transfers within the premises of the DIAMO GEAM plant in Dolní Rožínka , and one inland transport of waste uranium concentrate from the DIAMO VZUP Kamenná plant to the DIAMO GEAM Dolní Rožínka plant.

In addition, the SÚJB granted licences for two transports of high level radioactive radionuclide emitters.

The SÚJB accomplished 8 inspections of nuclear material transports and concluded that the nuclear safety and radiation protection requirements were met.

The SÚJB made examination and granted licences for the use of a spent nuclear fuel transport cask and (first review of an existing licence), for the use of a spent fuel storage cask (also as the first review of an existing licence), and three licences for the use of transport casks whose previous licences had expired. In addition, the SÚJB validated six transport casks which had been certified abroad.

STATE SYSTEM OF NUCLEAR MATERIALS ACCOUNTANCY AND CONTROL

The SÚJB performed 70 nuclear material inspections in 1997, in this 47 jointly with IAEA inspectors. All of them were made in accordance with the Agreement between the Czech Republic and the IAEA for the application of safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons and with the requirements of the state system of nuclear materials accountancy and control. The objectives of the inspections were invariably met.

Two unplanned inspection visits to the Temelín nuclear power plant were stimulated by the special situation which arose when two genuine fuel pins were found in fuel assembly dummies. The fuel pins had been placed in the dummies by the dummy manufacturer by mistake. Subsequently, the dummies were returned to the foreign supplier.

Overview of nuclear material possession licences granted/withdrawn by the SÚJB in 1997

licences	granted	withdrawn/expired		
number	51	14	1	11
reason	organization's request	organization's request (no nuclear materials in posssession)	non-compliance with reporting obligations	licence expired

Within its authority in control regimes to strengthen the Treaty on the Non-Proliferation of Nuclear Weapons, the SÚJB granted 79 nuclear item importing licences and 19 nuclear item exporting licences. In 5 cases, the SÚJB issued approval for nuclear item user change within the Czech Republic.

Overview of inspection activities in 1997

MBA code	Number of IAEA inspections	Number of SÚJB inspections	IAEA inspection efforts[1] (man-days)
CZ-A	1	1	2 (1)
CZ-B	4	4	7 (6)
CZ-C	1	1	2 (4)
CZ-D	1	1	2 (2)
CZ-E	1	1	1 (2)
CZ-F	1	2	1 (2)
CZ-G	2	2	3 (2)
CZ-J	10	10	18 (20)
CZ-K	11	11	21 (20)
CZ-L	12	12	13 (2)
CZ-T	2	3	3 (2)
CZ-V	1	1	2 (2)
CZ-W	0	1	0
CZ-X	0	1	0
CZ-Y	0	1	0
CZ-Z	0	18	0 (2)
T O T A L	47	70	75 (61)

[1] Inspection efforts permitted by the relevant facility supplement in 1997
[2] Inspection efforts not yet determined

Overview of material balance areas (MBA) in 1997

MBA code	MBA name	Type of nuclear material inventory[1]	Amount after PIT[2] (SQ[3])
CZ-B	LVR-15 research reactor, NRI[4] Øež	HEU, LEU, N	2.3
CZ-C	LR-0, research reactor, NRI Øež	LEU, N, D	4.2
CZ-D	Research laboratories, NRI Øež	all types	0.8
CZ-E	Škoda Nuclear Machinery, Plzeò	HEU, LEU, N, D, P	0.1
CZ-F	ŠKODA-ÚJP, Praha (Nuclear Fuel Institute)	LEU, N, D	1.0
CZ-G	HLRW storage facility, NRI Øež	HEU, LEU	0.6
CZ-J	Dukovany –1 reactor unit, ÈEZ, a. s.	LEU, D, P	264.6
CZ-K	Dukovany –2 reactor unit, ÈEZ, a. s.	LEU, D, P	249.4
CZ-L	Dukovany ISFSF[4], ÈEZ, a.s.	LEU, P	249.2
CZ-T	Temelín NPP, ÈEZ, a. s.	LEU, D	20.8
CZ-V	VR-1P teaching reactor, FNSPI[4] Prague	HEU, LEU	0.2
CZ-W	DIAMO s.p., NMR[4] storage facilities	N	([5])
CZ-X	DIAMO s.p., Stráž pod Ralskem	N	([5])
CZ-Y	DIAMO s.p., GEAM plant Dolní Rožínka	N	([5])
CZ-Z	Total: 243 organisations	all types	0.7
Material exempt from inventory-keeping due to non-nuclear uses			1.5
Total: 250 organizations			ca 795.4

[1] HEU – highly enriched U, LEU – low enriched U, P - plutonium, D -depleted U, N - natural U
[2] PIT – Physical inventory taking.
[3] SQ - Safeguards significant quantity, for plutonium, 1 SQ = 8 kg (with respect to the total weight of the element), pro HEU, 1 SQ = 25 kg total weight of the ^{235}U isotope, for LEU, N, and D, 1 SQ = 75 kg total weight of the ^{235}U isotope, and for thorium, 1 SQ = 20 t total weight of the element..
[4] NRI = Nuclear Research Institute; ISFSF = Interim Spent Fuel Storage Facility; FNSPI = Faculty of Nuclear Science and Physical Engineering, Czech Technical University; NMR = National Material Reserves.
[4] Confidential data.

Aerosol bulk sampling facility at the National Radiation Protection Institute in Prague (Photo: NRPI archives)

STATE SUPERVISION OF RADIATION PROTECTION

OVERVIEW OF IONIZING RADIATION SOURCES AND WORKPLACES HANDLING IONIZING RADIATION SOURCES

A survey of ionizing radiation sources and workplaces handling them, except for very significant ionizing radiation sources, is given in the table below:

Application field	radiation generators		facilities with sealed radionuclide sources			workplaces handling unsealed ionizing radiation sources		
	simple	signif.	minor	simple	signif.	minor	simple	signif.
medical	5884	2265	141848	6	100	45	120	59
industry	280	198		4339	513	7	40	2
others	102	11		305	113		153	16
total	**6266**	**2474**	**141848**	**4650**	**726**	**52**	**313**	**77**

Workplaces with very significant ionizing radiation sources include:

- *institutions operating nuclear reactors and related technological facilities (as described in detail in Part 1 of this Report), i.e. the 4 reactor units of the Dukovany NPP, 2 research reactors at the Nuclear Research Institute in Øež and 1 teaching reactor at the Faculty of Nuclear Science and Physical Engineering in Prague;*
- *workplaces operating major industrial irradiation facilities, in particular facilities for irradiation of foods (especially spices) owned by the Artim Praha s.r.o. company and facility for radiation sterilization of medical materials owned by the Bioster Veverská Bitýška a.s. company;*
- *facilities handling major quantities of radioactive substances (very significant unsealed sources) which are operated, in particular, by the Nuclear Research Institute at Øež and by the companies Sorad Praha s.r.o., Cesio Praha s.r.o., and Isotrend Praha s.r.o.*

EMERGENCIES ASSOCIATED WITH IONIZING RADIATION SOURCES

Seventeen emergencies associated with ionizing radiation sources were reported in 1997. The following were potentially most significant from the radiation protection aspect:

- Radioiodine release above the investigation level (see Part 1 hereof) which occurred at the Nuclear Research Institute in Øež on 2 July 1997.
- Eight workplaces handling radiation sources (largely sealed radionuclide sources) in the North-Moravian region were flooded during the floods in July 1997. Inspection visits by authorized persons and by the Ostrava Regional Centre gave evidence that no radioactivity source loss or damage had taken place.
- On 19 September 1997, the German customs inspectors at the Rozvadov border crossing retained a truck owned by the OMEGA TRANS Plzeò carrier company for suspicion that an ionizing radiation source was being transported (a measuring instrument was reported in the customs declaration). The Regional Centres in Plzeò and Ústí nad Labem found that the truck had carried a thickness gauge which involved an Am-241 source at 0.925 GBq (maximum activity rate on the cover surface was 100 μGy/h). This was the property of TESLA Raspenava company, which was under winding-up. The source was retained and disposed of as radioactive waste. No human health harm or environmental damage occurred.

- On 2 December and 15 December, radiation sources were illegally transported in railway wagons containing metal scrap owned by the metallurgical works in Ostrava. The wagons were retained, and thickness gauges containing Sr-90 (about 3 GBq) were found in them. The sources were handed over to ISOTREND s.r.o. for identification, and the SÚJB is currently making investigation into from where the sources have got lost.

The majority – 9 of the recorded 17 emergencies – was associated with contamination of steel or steel products.

In addition to the above, the following cases were involved:

- *During the February – March period, the Regional Centres dealt with the problem of contaminated heats at the Hrádek Iron Works. Heats which contained Co-60 at activities above 30 kBq/kg were handed over to the NYCOM Praha a.s. company which transported them to the Richard repository, for the less contaminated heats the manufacturer is seeking application under conditions approved by the SÚJB.*
- *Based on a request by the Health Officer General of the Slovak Republic dated 21 May 1997, investigation was made into the contamination by Co-60 of agricultural machinery parts exported by the Czech Republic to Slovakia. The investigation revealed that the parts had been manufactured by the Roudnice Machine and Metallurgy Works using contaminated steel, product of the Hrádek u Rokycan Iron Works. Based on a SÚJB Decision, the manufacturer took the contaminated parts back on 19 December 1997 and made provisions for their safe storage and isolation from the environment.*
- *On 30 May 1997, the Prague Regional Centre examined aluminium scrap suspected of contamination. The scrap had been imported by the ALMAX TRADE a.s. company. No dose rates in excess of the natural background variation were detected.*
- *An iron scrap delivery from the LIGMET Pøíbram company which exhibited an elevated dose equivalent rate (0.6 – 0.8 μGy/h) was examined on 4 June 1997. The scrap metal was returned to the supplier who was ordered to identify the origin of the metal and to make provisions to prevent it from further use.*
- *A cultivator, some parts of which were contaminated by Co-60, was retained on the Zlatá Hora border crossing to Poland on 2 July 1997. The Ostrava Regional Centre performed on-site examination and, in cooperation with the Head of the Jeseník District Administration, made provisions for interim storage of the machine and eventual replacement of the contaminated parts. Based on a SÚJB Decision, the supplier, Roudnice Machine and Metallurgy Works, shall replace the parts with non-contaminated ones and shall take provisions to safely isolate the contaminated parts from the environment.*

The problem of metal contamination is a long-term one and requires that the level of radiation be consistently measured by the scrap users as well as by the metallurgical works and, in particular, that the licensees be forced to handle sources by procedures stipulated by the law. Indirectly, this issue is linked with the unsatisfactory situation in institutional radioactive waste disposal: the Atomic Act assigns the coordinating and guarantor responsibility in this field to the newly established Radioactive Waste Repositories Administration, which should be funded by the institutional radioactive waste producers.

REGULATORY AND INSPECTION ACTIVITIES

The execution of state supervision of radiation protection was mainly concentrated in radioactivity source handling licensing procedures and in the inspection of workplaces where such activities are practised. The administrative agenda also involved assessment of exposure to natural sources, radon in particular.

Licensing of activities resulting in exposure. Type licensing of ionizing radiation sources

Licensing procedures for activities associated with exposure to ionizing radiation resulted in 1187 decisions issued by the SÚJB Regional Centres and 346 decisions issued by the SÚJB Headquarters. Due to the legislative change, the structure of the licensing process was altered in 1997. While in the first half of the year the licences mostly covered the use of ionizing radiation sources, their acquisition and imports as specified by the legislation then valid, in the second half of the year the licences were largely related to Article 9 Para 1 of Act No. 18/1997, and 135 ionizing radiation source type licences under Article 23 were granted.

Inspection activities

Two types of inspection in the field of radiation protection were gradually introduced in 1997:

Inspection visits performed by the Regional Centres, mostly regarding simple and significant ionizing radiation sources, except for significant unsealed radionuclide sources. Such inspection visits were carried out based on monthly plans prepared by the Heads of the Regional Centres.

Special inspection visits, i.e.:

- inspection visits performed by special teams, appointed by the Deputy for Radiation Protection and consisting of inspectors from various regions, for specific kinds of ionizing radiation sources and worplaces handling such sources;
- inspection visits performed by *ad hoc* teams, particularly at workplaces handling very significant ionizing radiation sources.

The following licensee rating scheme was adopted in the second half of 1997: I – source handling is fully compliant with the requirements of the law; II – formal deficiencies without impact on the radiation protection level; III – deficiencies requiring remedial provisions and/or limitation to or suspension of the licensee's activity; and N – serious deficiencies, licence is withdrawn.

One institution was identified within the inspection activities where significant ionizing radiation sources were operated without authorization; penalty was imposed on the institution and remedial action was taken (see later).

Inspection visits performed by the Regional Centres

An overview of the inspection visits is given in the table below:

Ionizing radioation source application field	**ionizing radiation source class**	**number of inspections broken down by rating**				
		I	**II**	**III**	**N**	**total**
industry	simple	63	73	13	1	150
	significant and very significant	31	132	2		165
human and veterinary medicine	simple	300	266	18		584
	significant and very significant	183	235	12		430
others	simple	9	1			10
	significant and very significant	64	98	2		164
Total		**650**	**805**	**47**	**1**	**1503**

Based on the review, the following common denominators can be identified:

a) The vast majority (over 90 percent) of the inspected workplaces handling ionizing radiation sources was rated as level I and II, the remaining fraction (below 10 percent), as level III; one institution was rated as level N.

b) In the area of natural ionizing radiation sources, all the inspected building material producers were rated as level I or II; however, two-thirds of water suppliers for the water mains were rated as level III, as were one-third of workplaces with the risk of natural ionizing radiation sources.

c) So far, Quality Assurance programmes as stipulated by the new legislation have not been developed by the institutions handling artificial ionizing radiation sources, and the preparation of such programmes poses a problem to the licensees. Therefore, guidelines were developed at the end of 1997 for long-term stability tests and for operational stability tests in dental diagnosis, and for other radiodiagnosis departments such guidelines will be issued during the 1st quarter of 1998.

d) Generally, deficiencies were identified in the institutions' monitoring schemes; occasionally, problems were also found in personnel monitoring (for some users, hiring the personnel dosimetry service was a financial problem).

e) In medical X-ray diagnosis, obsolete ionizing radiation sources are often used; Quality Assurance schemes as required by the new legislation fail to be developed (according to this legislation, only type-licensed ionizing radiation sources may be used, certain acceptance tests and stability tests should be carried out, ...); document maintenance is unsatisfactory (stability test protocols, operating guidelines, technical documentation – type licence, ...); and medical personnel as well as patients sometimes fail to use the prescribed personal protective devices.

f) The statute of persons ensuring a consistent supervision is not duly respected by the licensees; this will have to be rectified in accordance with the new legislation.

g) Deficiencies were found in the identification and security of ionizing radiation sources (minor sources in particular) due to privatization, winding-up of the former licensees, personal changes, etc.

h) Responses to information on the new legislation and to requests for material sheets from building material producers and water suppliers are slow, reluctant or negative and require an extensive reminder agenda. The directory is difficult to update and complete because the national company directories are incomplete and obsolete.

i) The inspectors provided many consulting services (often non-recorded) to state administration and local government officials as well as to people living in homes with a high (or low) radon risk; this activity is of importance not only with respect to the state administration's cooperation but also with respect to public anxiety of radiation.

Special inspection visits

Besides the existing special department for inspection activities in the uranium industry, radiation protection inspector teams specialized in the fields of radionuclide release into the environment and radioactive wastes, in Category II and III workplaces handling unsealed sources, and in radiation protection at nuclear facilities, commenced their work. Special inspection visits also included inspections in the area of natural ionizing radiation sources.

Expert inspector teams whose main task was to prepare unified inspection sheets in compliance with the new legislation were set up in 1997 for the remaining types of ionizing radiation sources used in the industry (non-destructive testing, logging, ...), for medical x-raying departments, for therapeutic accelerators, and for sources serving to measure various quantities (thickness gauges, level gauges, ...). The inspection sheets were tested throughout

the 2nd half of 1997. During the next stage, such inspections will be carried out by the Regional Centres, supported by experts of the special and expert teams where necessary.

Uranium industry

The special inspection team accomplished in 1997:

- *70 radiation protection inspection visits concentrating on compliance with radiation protection requirements during uranium ore mining and milling and during remedial actions at abandoned uranium mining and milling sites.*
- *9 unplanned inspection visits: 6 visits concentrating on monitoring programmes and personnel dosimetry at DIAMO s.p. plants, and 3 visits in relaion to emergencies (break of a technological sludge pipeline, radioactivity release into the environment during waste processing at the ECOINVEST Bytíz mine, and mine water seepage at an abandoned site in the Litomìøice area).*

The following conclusions can be drawn:

a) In 36 cases no non-compliances were found, the licensees' provisions during ionizing radiation source handling complied with applicable legislation (rating I).

b) Formal deficiencies with no impact on radiation protection provisions were found in 29 cases (rating II).

c) Deficiencies affecting radiation protection were found and corrective actions imposed in 14 cases (rating III).

d) Problems were most frequently detected in personnel monitoring in controlled zones, in radionuclide releases into the environment, and in the development of monitoring programmes.

e) Ensuring continuity in meeting radiation protection requirements is a special problem in organizations undergoing ownership changes.

Release of radionuclides into the environment. Radioactive wastes

The special inspection team for radionuclide releases into the environment and for radioactive wastes accomplished inspection visits concentrating also on the fulfillment of requirements laid down by previously issued decisions and on:

- *compliance with the Limits and Conditions for the radioactive waste storage facility at the Dukovany site (rating II);*
- *compliance with requirements for radioactive waste handling equipment at the Temelín NPP (rating II);*
- *radioactive waste handling by the Nuclear Research Institute at Øež (rating II);*
- *compliance with the requirements for void space filling in the Alcazar-Hostim repository (rating I);*
- *radioactive waste handling by the Isotrend Praha s.r.o. company during radioactive waste sorting, storage and accounting (rating II).*

Although no serious deficiencies in the field of radiation protection were detected, the visits showed that more attention should be paid to radioactive waste record-keeping during any radioactive waste handling process, to radioactive waste transport from the producer to the processing entity to the final storage and disposal, and to the installation of equipment for radioactive waste handling at the Temelín nuclear power plant.

Nuclear medicine departments and Category II and III workplaces handling unsealed radioactivity sources

The special team for nuclear medicine departments and Category II and III workplaces handling unsealed radioactivity sources accomplished 28 inspection visits in 1997, out of them 25 at nuclear medicine departments. The conclusions are as follows:

a) Documentation is largely maintained as required, some departments failed to develop a written monitoring programme and Quality Assurance programme. Records of unsealed sources in use and of spent sources were maintained at each of the department visited. Personnel monitoring records, decontamination guidelines and internal emergency plans were available. At some departments the workplace monitoring records were unsatisfactory. Workplace monitoring equipment is at various standards, some instruments are very obsolete.

b) The extent of Quality Control varies from department to department. Apart from departments licensed for ionizing radiation source handling under the new legislation, the Quality Assurance programmes have not been authorized by the SÚJB as yet; this fact was mentioned in the inspection visit reports along with deadlines for submitting the documentation for authorization.

c) Solid radioactive waste arising from the work of the nuclear departments are sorted with respect to the kind of radionuclide and stored for a period corresponding to 10 times their half-life; then they are measured and disposed of provided that they meet the requirements of the Decree No. 184/1997 as hospital waste. In one case, Article 5 of the Decree was applied and the storage period was reduced. The volume of liquid wastes arising from routine diagnostic work at nuclear medicine departments is small; the majority of the wastes is diluted and, as specified by Decree No. 184/1997, either drained into the sewerage or stored in a dying-out facility and then disposed of as normal waste. Six departments have retention sumps at their disposal.

d) In the 28 inspection visits, 26 departments/workplaces were classified as II, two as I.

Radiation protection at nuclear facilities

The team members carried out 26 inspection visits at nuclear facilities in 1997, either independently or together with nuclear safety inspectors.

The visits concentrated on radiation protection provisions at nuclear facilities and workplaces handling very significant ionizing radiation sources. Special attention was paid to licensees' compliance with the new legislation.

The following facts were found:

a) The radiation protection standard at the Dukovany NPP is high, deficiencies detected are more formal than inherent.

b) More attention should be devoted to the activity authorization process at the Nuclear Research Institute in Øež. Although existing in some form, the required documents (monitoring plans, emergency plans) do not always meet the requirements specified by the new legislation.

Natural ionizing radiation sources

To satisfy the new requirements laid down by Act No. 18/1997, the inspection activities were also extended in the field of natural ionizing radiation sources, particularly so that more attention was paid to the natural radionuclide contents of building materials and supplied water because Act No. 18/1997 transferred the onus of proof to the producers and suppliers. The following activities were implemented within preparation for this regulatory responsibility:

- *the entities to be supervised (identified based on available directories) were sent information concerning their obligation to submit measurement results to the SÚJB;*
- *record sheets were requested from those entities;*
- *preparatory work was commenced on databases (regional and communicating central databases) for keeping records of the obliged entities and results.*

The number of building material manufacturers in the Czech Republic is estimated to over 1100 and the number of waster suppliers to the public system, to more than 2000; the record sheets were sent by less than 30 percent of those called upon to do so. Updating and completing the directory is also a very difficult task because national commercial directories fail to be up-to-date and complete.

Overview and evaluation of inspection activities in the fields of natural ionizing radiation sources

Entities whose activities pose a potential hazard of increased exposure to natural ionizing radiation sources	***number of inspections broken down by classification results***				
	I	***II***	***III***	***N***	***total***
building material manufacturers	*25*	*43*			*68*
water suppliers	*33*	*47*	*160*		*240*
bottled water suppliers	*3*			*1*	*4*
others (particularly workplaces with elevated radon risk)	*29*	*5*	*20*	*5*	*59*
Total	***90***	***93***	***180***	***6***	***371***

Inspectors offer their consulting services to state administration and local government personnel and to the public, particularly to people living or working in homes with a high radon risk; this is of importance to mitigate public anxiety.

Inspections carried out by *ad hoc* inspection teams

Four inspection were accomplished by *ad hoc* teams in 1997; visits were made to the successor organizations replacing the former Institute for Research, Production and Application of Radioisotopes (ÚVVVR), to BIOSTER a.s. in Veverská Bitýška, to the Nuclear Research Institute at Øež and to the St. Anne Hospital in Brno. The visits to the successor organizations of the former ÚVVVR showed that if organizations of this type disintegrate, the standard of the radiation protection system declines. Generally, problems are identified in the field of ionizing radiation source disposal, particularly where high-activity long-lived sealed alpha emitters are involved. Visit to the St. Anne Hospital in Brno confirmed the suspicion that significant ionizing radiation sources were used there without

SÚJB authorization. Also, a linear accelerator was found to be operated by the Radiation Oncology Department without authorization. In-depth investigation revealed that not only was the accelerator operation suffered from process deficiencies but, moreover, the results arrived at by independent expert teams which had assessed the conditions of the future clinical use of the accelerator and their recommendations had been disregarded. It is thus conceivable that some patients have been exposed to doses which were not entirely consistent with the planned values. Therefore, the SÚJB imposed on the hospital a penalty of Kè 250 000. The hospital paid the sum and implemented corrective actions immediately after the inspection visit.

CONTROLLING AND LIMITING PROFESSIONAL EXPOSURE

Personnel exposure at workplaces handling ionizing radiation sources was monitored by the five existing dosimetric service organizations: the National Personnel Dosimetry Service company, the dosimetric service departments of the Dukovany and Temelín nuclear power plants and of the Nuclear Research Institute at Øež, and the dosimetric service of the uranium industry (DIAMO s.p.). Together the service institution maintain records of nearly 23 thousand persons working with ionizing radiation sources.

The following conclusions were drawn from a preliminary evaluation of personnel exposure in 1997:

field	number of personnel under supervision (incl. external personnel)	total collective dose /Sv/	average annual eff. dose /mSv/	highest indiv. effective dose /mSv/
Dukovany NPP	2339	1,52	0,65	20,4
uranium industry	1323	8,25	16,95	45,5
health care	over 8000		1,6	120
others	nearly 5000		1-3	

SÚJB inspection investigated 13 cases where dosimetric services reported personnel dosemeter exposure in excess of 20 mSv (range: 20 – 120 mSv). In 4 instances the doses were found to be non-personal, being due to improper dosemeter handling (the gown with the dosemeter was left near a ionizing radiation source, the dosemeter was improperly attached to the gown during source handling, ...); in 9 instances the doses were evaluated as personal or potentially personal (in one case a higher dose on a finger dosemeter was examined). Eight of the 13 cases were related to the health sector, 5 to the industry.

Personal doses in the health sector arise mostly cardiologists' and radiologists' exposure during invasive interventions, whose numbers exhibit increasing trends. The highest dose, 120 mSv, was detected for a cardiologist and, after investigation, classed as potentially personal. This trend was observed in 1996 also, and it has been concluded that although the interventions are justified, radiological protection is not always optimized and increased attention should be paid to this issue.

CONTROLLING AND LIMITING PUBLIC EXPOSURE

In the field of radiation burden of the public, efforts were centered on reducing the exposure to radon in buildings because this is where the overwhelming fraction of public exposure in the Czech Republic takes place. Medical irradiation is the next important component of public exposure on which SÚJB's attention concentrated. This is radiation to which individuals are exposed as patients undergoing medical examination using ionizing radiation sources, particularly X-raying instrumentation.

Medical exposure

An enquiry action using questionnaires was organized in cooperation with the National Radiation Protection Institute. The results allowed activities of the radiopharmaceuticals applied to be assigned to the frequencies of the various types of examination in nuclear medicine, which made it possible to calculate the effective doses per examination and to establish the collective doses and their distribution with respect to the type of examination and to the patient age and sex. Based on evaluation of this action and in cooperation with the Czech Nuclear Medicine Society, a table of limiting applied radioactivity values was developed for the various types of nuclear medicine examination and was incorporated into the new radiation protection legislation.

Radiodiagnosis examination parameters are being established within a scientific research project which was launched in 1997.

Exposure to natural radiation sources

In cooperation with the National Radiation Protection Institute and the District Administrations, the SÚJB continued radon screening to identify houses with an inadequately high risk. Within a screening programme concentrating on areas with increased radon risk of the subsoil and on risk construction characteristics, 11 000 houses were measured for radon, and additional 1900 houses with an equivalent volume radon activity in excess of the limiting value of 200 Bq/m^3 (corresponding to an annual effective dose of approximately 4 mSv) as laid down by the SÚJB Decree No. 184/1997 were examined. Thereby, the number of measured target houses increased roughly to 100 thousand and the number of identified houses with an elevated radon risk to approximately 16 thousand. The house owners are informed about the results of measurement and where an increased risk level is identified, they are also informed that they can apply for allowance to cover part of the antiradon remedial provisions from the national budget.

A program for creating a database of the screening results was finalized, owing to which it is possible, in addition to the routine procedures, to perform a map processing down to the level of the towns and villages, allowing the radon risk level to be predicted within the communes.

The SÚJB also met its additional obligations within the Radon Programme of the Czech Republic under the Ordinance of the Government of the Czech Republic No. 709/1993. Repeated negotiations were held concerning the new scheme of a more efficient participation of the central and local state administration bodies in the implementation of the Radon Programme.

A European Conference on Radon Protection in Homes and at Workplaces was organized in June in Prague under the auspices of the Ministry of Environment, SÚJB and the National Radiation Protection Institute. The 6th Czech Radon Programme Conference was held in Jihlava.

MEDICAL ASPECTS OF RADIATION PROTECTION

A total of 108 suspect cases of occupational disease were examined by the SÚJB in 1997. These included:

- 93 lung cancers and 9 other diseases in uranium mine workers. For 46 of the lung cancers the probability of a causal nexus between the disease and underground work in the uranium mine was evaluated as predominating under the Governmental Decree No. 290/1995 specifying an Occupational Disease List. In the remaining cases the probability of a causal nexus was not found predominating and the disease was not granted the Occupational Disease statute.
- In workers other than uranium miners: 4 lung cancers in persons working in the underground of the Pøíbram Ore Mines, one chronic myeloid leukemia and one cancer of the thyroid in workers operating technological or diagnostic X-ray instrumentation In four cases the causality between the risk work and the disease was evaluated as predominating

(3 lung cancers and 1 thyroid cancer), and in the case of the thyroid and two cases of the lung cancer the disease was given the Occupational Disease statute under the above governmental decree.

The SÚJB issued a recommendation for the Deputy Health Officer General responsible for the uranium industry to improve the follow-up preventive medical examination of former uranium mine workers.

In cooperation with the National Radiation Protection Institute, Institute for Expert Reviews and Emergency Management, Uranium Industry Health Care facility and the Charles University Medical Faculty Hospital, the methodological guidelines for assessment of the occupational nature of lung cancers were amended and submitted for joint publication in the Official Bulletin of the Ministry of Health of the Czech Republic.

The SÚJB was asked 29 times for assessment of fetal doses received due to radiodiagnostic or nuclear medicine examination of the mother. In none of the cases examined a hazard of unfavourable impact on the fetus was identified.

CENTRAL REGISTRIES AND DATABASES IN THE RADIATION PROTECTION SECTOR

Development of central registries of professional exposures and ionizing radiation sources continued in 1997 in line with the requirements of the new legislation. The registries will include records of issued licences and licensees, so that eventually a complete system of national record files containing all information necessary for efficient national radiation protection administration will emerge. The Central Registry of Workplaces, which will be used jointly by all the databases created, was set up in the first half of 1997.

The Professional Exposure Registry has been mostly fed with up-to-date data (checking and refining some data is currently under way) and now it enables data of personnel handling ionizing radiation sources to be retrieved and statistical surveys of dose distributions to be created for defined professional groups. The final version of the source registry under ORACLE is at the stage of finalized data analysis; nevertheless, a provisional application tool has made it possible to obtain surveys from a simple database program provided by the IAEA.

RADIOACTIVE WASTE HANDLING

Dukovany nuclear power plant

Following inspection of nuclear facility PS-48 – Radioactive Waste Solidification – and assessment of readiness of this facility for start-up of permanent operation, and after review of the documentation submitted, the SÚJB issued, under Act No. 28/1984 and Decrees No. 67/1987 and 59/1972, a permanent operating licence as a basic document for subsequent procedures before the Construction Authority.

The compliance with the Limits and Conditions was inspected for the Dukovany Regional Radioactive Waste Repository as laid down by Act No. 18/1997 and implementing regulations No. 1984/1997. Based on inspection of the operation records and results of measurement accomplished by an accredited laboratory it was found that the limits and conditions had not been exceeded.

Temelín nuclear power plant

In response to the operator's application and following review of the corresponding part of the Preliminary Safety Report Supplement and of the design documentation concerning construction changes, the SÚJB granted a licence for construction change in the area of radioactive waste processing. This licence forms a basis for construction change procedures before the Construction Authority.

Inspection was carried out of the radioactive waste processing facility installation, including the technical documentation and physical inspection of the facility in the auxiliary active processes building.

The requirements of the Decree No. 184/1997 regarding safe radioactive waste management, including waste collection, processing and treatment were found to be met.

Nuclear Research Institute at Øež

Floor finishing at the Fragmentation and Decontamination Centre as required by the SÚJB was finalized. However, the solid radioactive waste arising from the floor reconstruction and from a part of the building failed to be processed, duly labelled and transported for disposal. Based on that finding and in compliance with the requirements of the Decree No. 184/1997, Art. 28, Para 2, the SÚJB ordered the Nuclear Research Institute to to take corrective steps and treat the radioactive waste so that the acceptance criteria for the Richard repository be met.

Inspection of the situation in the remediation of old environmental burdens showed that the fact that risk analyses for such burdens have not been finalized as yet is a hindrance to the implementation of provisions in this field. The final, amended version of the Risk Analysis Report has not yet been submitted to the SÚJB for review.

"Richard" radioactive waste repository

Based on application submitted by ARAO a.s. company and following review of the "Conditions for Radioactive Waste Acceptance for Transport To and Storage At the Richard Repository", the SÚJB granted a licence for establishing a workplace handling ionizing radiation sources at the Richard facility, permitted the collection and use of ionizing radiation sources by that facility, and licensed radioactive waste storage within the Richard repository.

Based on a request by ARAO, a.s., the SÚJB permitted storage of 110 tonnes of iron material contaminated by Co-60 in the Richard repository provided that provisions are made to prevent the material from coming in contact with mine water.

Other repositories

Based on authority granted to it by the Atomic Act, the SÚJB granted its approval to the project "Final Disposition of the Hostim Radioactive Waste Repository".

Compliance of the filling work in the empty compartments of the Alcazar-Hostim repository with the licensed project was checked by inspection visits, which were started in September 1997. No non-compliances were identified. The work had been finalized, empty compartments filled, and the construction site cleared by 27 October 1997, as laid down by the schedule.

SÚJB inspection visits performed in cooperation with the National Mining Administration identified no deficiencies in radiation protection at the "Bratrství" central radioactive waste repository in Jáchymov. The operator was invited to submit documentation approval application as required by Act No. 18/1997 and Decree No. 184/1997.

Other entities

Inspection visits were accomplished at the departments of Artim, s.r.o., Praha company. The inspection centered on compliance with the requirements of the new Decree No. 184/1997 regarding radioactive waste collection, sorting, storage and record-keeping.

It was found that spent Co-60 radionuclide emitters were used by Isotrend s.r.o. company for setting up new irradiator sources or else sent back to the supplier, so that no radioactive wastes accumulate at Artim.

Isotrend, s.r.o., company was a next entity inspected. The company submitted records of spent sealed sources accepted in 1997 and letters of conveyance for radioactive wastes containing sealed radioactive sources which were received for storage at the Richard repository.

Physical inspection was performed of the space allocated for on-site storage of spent sealed sources and of the conditions of storage of liquid radioactive wastes arising from sealed source leaktightness tests and from decontamination work.

No serious deficiencies in radioactive waste collection, sorting or storage were identified.

RADIOACTIVITY RELEASES INTO THE ENVIRONMENT

Dukovany nuclear power plant

Inspection activities included checks of radioactivity of waste waters released from the plant into the environment and of the status and completeness of documentation. The results of the inspection activities shpwed that the data measured by the plant were in a good agreement with those obtained by the SÚJB Regional Centre in Brno.

Decommissioning of nuclear facilities

Based on a request submitted by the Škoda – Nuclear Engineering company and following review of the corresponding Safety Report, the SÚJB granted a starting decommissioning licence for the ŠR-0 research reactor in Plzeò-Vochov. Having obtained the final dismantling and decommissioning report and based on a favourable review of the documentation, the SÚJB regards the research reactor as decommissioned as of 30 June 1997 and the workplace with ionizing radiation sources as dissolved and applicable to any other purpose without limitation.

Remedial actions at abandoned uranium industry sites

Due to the gradual flooding of abandoned mines, water management and the associated natural radionuclide release into the environment are becoming the most important radiation protection issues in the uranium industry. Fourteen controlled decontamination stations and 26 other controlled releases are currently under operation. A total of 15.8 million m^3 of purified mine waters, 1.05 million m^3 of lagoon and drainage waters, and 0.78 million m^3 of seepage water from spoil banks are released into the environment annually. Such ever-

increasing volumes of water to be decontaminated may be sources of hazard. The volume activities of the radionuclides in the releases are subject to regulation by water management authorities and are monitored based on approved monitoring programmes.

A control measuring network exists in regions affected by the mining activities. Periodically measured are the dose equivalent rate, equivalent volume activity of radon in air, and the uranium and radium-226 contents of fallout. Natural uranium and radium 226 are quantitated at sampling sites attached to the decontamination station release points. The data obtained in 1997 were not beyond the expected ranges and required no corrective actions.

Testing the resistance of a field dose rate monitoring facility
(Photo: NRPI archives)

NATIONAL RADIATION MONITORING NETWORK

The national Radiation Monitoring Network (RMN) is coordinated by the SÚJB which acts as the RMN Headquarters, backed up by the National Radiation Protection Institute. The monitoring results are included in the Annual Reports on Radiation Situation in the Czech Republic, which is submitted to the Governmental Emergency Commission on Radiation Accidents and to the public through district administration bodies, health stations and libraries.

The Radiation Monitoring Network operates in two regimes: the normal regime, aimed at monitoring the actual radiation situation and at an early detection of radiation accidents, and the emergency regime aimed at evaluating the consequences of such radiation accidents. The normal regime is implemented by permanent bodies engaged in the Network, the emergency regime includes, in addition, emergency bodies. The normal monitoring regime involves several sub-systems, encompassing selected or all permanent RMN bodies. The subsystems are as follows:

- **Early warning network**, which comprises 44 measuring points with automatic transmission of observed data. The measuring points are operated by the Czech Hydrometeorological Institute (27), SÚJB Regional Centres (8), Headquarters of the Civil Protection of the Czech Republic (7), National Radiation Protection Institute (1), and Institute for Expert Reviews and Emergency Management in Pøíbram (1).
- **Territorial network of 206 measuring points** equipped with thermoluminescent dosemeters (TLD). This **TLD-network** is operated by the SÚJB Regional Centres in cooperation with the National Radiation Protection Institute; the Institute for Expert Reviews and Emergency Management is also involved.
- **Local TLD networks with 78 measuring points in the surroundings of the Dukovany and Temelín nuclear power plants,** operated by the Environmental Radiation Monitoring Laboratories of the two nuclear power plants and by the SÚJB Regional Centre in Brno.
- **Territorial network of 12 air contamination measuring points** operated by the National Radiation Protection Institute, SÚJB Regional Centres, and the Environmental Radiation Monitoring Laboratories.
- **Network of 9 laboratories** (6 laboratories of the SÚJB Regional Centres, 2 Environmental Radiation Monitoring Laboratories of NPPs, and 1 laboratory of the National Radiation Protection Institute) equipped with gamma-spectrometric and radiochemical analytical instrumentation to quantitate radionuclides in environmental samples (aerosols, fallout, foods, drinking water, animal food, ...).

No extraordinary radionuclide release into the environment occurred in 1997, nor has any of the investigation levels been exceeded. Variations in the dose rate values were due to natural background fluctuations.

Participation in international exercise actions gave evidence that the RMN as a whole is at the European standard, both with respect to the equipment and to the measuring site density. There exist countries with considerably denser networks similar to the Czech Early Warning Network (Germany, Austria, Spain) but this is due more to the historical development and political decisions following the Chernobyl accident than to actual needs. Many highly developed countries such as the Nordic countries, France and Switzerland operate automatic systems which have roughly the same density as the Czech system. As far as the laboratory capabilities are concerned, the Czech standard matches well the EU. The equipment of all RMN components is sufficient to meet the basic requirements for monitoring and radiation situation data transmission as enshrined in EU legislation.

ARTIFICIAL RADIONUCLIDE MONITORING IN THE ENVIRONMENT

The monitoring programme is aimed at examining the time and spatial distribution of radionuclide activities and ionizing radiation doses within the Czech Republic in order to derive the long-term trends and detect any deviation from them at an early stage. From among the artificial radionuclides, the following are measurable and are monitored by the RMN:

- in air: ^{137}Cs, ^{90}Sr, $^{239+240}$Pu, ^{85}Kr;
- in foods: ^{137}Cs, ^{90}Sr, ^{3}H;
- in human body: ^{137}Cs.

Air contamination

As in the previous years, no major deviations in the artificial radionuclide content of air occurred in 1997. The volume activities of ^{137}Cs due to the transport of this radionuclide from higher layers of the atmosphere and resuspension of the initial fallout from the soil surface were in the order of units to tens of $\mu Bq/m^3$.

A fraction of the ^{137}Cs activity in air arises from global fallout which is due to earlier atmospheric nuclear weapon tests. In addition to ^{137}Cs, the aerosols contain ^{7}B, which is cosmogenic, and ^{210}Pb, which is a decay product of ^{222}Rn. Those radionuclides are determined by semiconductor gamma spectrometry. By way of example, the plots below show the time behaviour of volume activities of the three radionuclides in airborne aerosol and of their specific activities in fallout, as determined by the Air Contamination Measuring Points which are operated by the National Radiation Protection Institute in Prague. The plots exhibit a long-term decreasing trend of the volume activity of ^{137}Cs and variations in the ^{7}Be and ^{210}Pb contents throughout the year.

Volume activity of radionuclides in airborne aerosol as measured by the Air Contamination Measuring Points of the National Radiation Protection Institute in Prague

Specific activity of radionuclides in fallout on surface water level as measured by the Air Contamination Measuring Points of the National Radiation Protection Institute in Prague

Volume activity of ^{85}Kr in air in Prague

In 1996, ^{85}Kr was included among radionuclides monitored by the RMN with a view to eventually encompassing all artificial radionuclides detectable in the environment (before, the ^{85}Kr measurements were performed by the Nuclear Physics Institute, Czechoslovak Academy of Sciences). Krypton 85 is a fission product and is also present in minor quantities in effluents released from nuclear power plants. The main sources of this radionuclide, however, include nuclear reprocessing plants; nuclear weapon tests contributed in the past as well.

Contamination of foods

Radionuclide contamination of foods has been monitored on a long-term basis following the relevant monitoring plan. This plan has been set up for the various commodities with particular respect to the significance of their consumption. Since no event bringing about increase in the amount of radionuclides in the environment occurred in 1996, no increase in food contamination levels was observed either.

The volume activities of ^{137}Cs in some basic foods, i.e. milk, beef, and pork, are in the order of tenths of Bq/kg. The values for ^{137}Cs and ^{90}Sr in drinking water are very low, viz. tenths to units of mBq/l or even below the limit of detection. The tritium content of drinking water has also been nearly constant at units of Bq/l.

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

Internal contamination of humans

Monitoring of internal contamination by ^{137}Cs using the whole-body counter at the National Radiation Protection Institute continued in 1997 in a reference group of 34 persons (19 females, 15 males), largely Prague citizens 22 to 74 years age. In view of the very low ^{137}Cs content in the population, such measurements are performed once a year only, applying long measuring times to reach the lowest detection limits reasonably attainable. The average ^{137}Cs activity in the body of an individual so obtained was 83 Bq. A similar internal contamination value was obtained by measuring the ^{137}Cs volume activity in the urine of a selected group of population.

As to the development of internal contamination by ^{137}Cs in 1997, the changes were very small, as before, in a long time after the atmospheric nuclear weapon tests.

Development of the ^{137}Cs content in Czech population after the Chernobyl accident

Calibrating a whole-body counter for measurements of transuranium elements in human body (Phantom of the US Transuranium Registry)
(Photo: NRPI archives)

External exposure monitoring

As proved by its several years' performance, the territorial TLD network is capable of detecting any significant deviation from the steady state at the site under surveillance. The results obtained by the local TLD networks in 1997 will be detailed in the Annual Report on Radiation Situation in the Czech Republic.

Continuous dose equivalent rate measurement is performed by the Early Warning Network, the average values are recorded in 10 min periods. In 24 h intervals the data are transmitted to the central RMN database at the National Radiation Protection Institute: from the measuring points at the SÚJB Regional Centres, Institute for Expert Reviews and Emergency Management, and the National Radiation Protection Institute through modems via telephone lines; from the measuring points of the Czech Hydrometeorological Institute (ÈHMÚ) through the ÈHMÚ communication network to the central ÈHMÚ computer and further on by a dedicated telephone line. The data transmission periods can be shortened if necessary. The data obtained corresponded to the natural background variations at the sites concerned. The time dependence can be plotted in a diagrammatic form for any site of the Early Warning Network, and the actual values as of a certain time point can be displayed in a map. The data serve as a basis for assessment of the instantaneous radiological situation in the territory of the Czech Republic.

Quarterly averages of the photon dose rate equivalent H_x (nSv/h), as determined by the territorial TLD network in the Czech Republic

Region	**Prague**	**Central Bohemia**	**South Bohemia**	**West Bohemia**
Operated by	**NRPI**	**NRPI**	**NRPI/ È. Budìjovice RC**	**NRPI/ Plzeò RC**
No. of measuring points	**13**	**25**	**30**	**25**
	$H_X \pm s$	**$H_X \pm s$**	**$H_X \pm s$**	**$H_X \pm s$**
I/97	128.6±17.3	143.3±44.6	147.3±24.8	126.2±32.1
II/97	114.1±22.0	122.2±40.8	158.2±29.9	129.0±22.5
III/97	119.2±13.3	129.6±40.3	143.2±23.6	128.4±23.4
IV/97	127.2±17.1	142.5±44.2	158.1±27.6	130.8±18.2
Region	**North Bohemia**	**East Bohemia**	**South Moravia**	**North Moravia**
Operated by	**NRPI/ Ústí nad Lab. RC**	**NRPI/ Hr. Králové RC**	**Brno RC**	**Ostrava RC**
No. of measuring points	**23**	**21**	**26**	**21**
	$H_X \pm s$	**$H_X \pm s$**	**$H_X \pm s$**	**$H_X \pm s$**
I/97	129.6±27.0	116.9±22.0	145.7±23.0	104.2±15.3
II/97	124.0±25.1	111.5±16.9	139.3±22.4	103.8±14.4
III/97	127.1±27.8	117.3±18.8	156.4±26.4	104.4±13.0
IV/97	129.4±25.8	129.1±18.3	157.5±25.9	104.3±15.3

NRPI = National Radiation Protection Institute, RC = SÚJB Regional Centre
H_X = average value, s = standard deviation
NRPI/ ... RC means that the National Radiation Protection Institute performs the measurements and data processing, whereas the SÚJB Regional Centre distributes and collects the dosemeters

MONITORING OF NUCLEAR POWER PLANT EFFLUENTS AND SURROUNDINGS

The total radionuclide releases from the Dukovany nuclear power plant continued to be very low in 1997. No extraordinary leak was detected. According to the quarterly and monthly reports “Radiation Situation in the Surroundings of the Dukovany NPP”, the total releases into the air were below 1% of the derived annual limits and the releases into the surface waters were below 3% for corrosion and fission products and below 70% for tritium.

The dose rate in the surroundings of the Dukovany nuclear power plant is monitored continuously by the TLD system operated by the plant. In addition, at least one monitoring point of the national Early Warning Network is located near each power plant. The dose equivalents arising from external irradiation in the surroundings of nuclear power plants are monitored by the local TLD networks operated by the Environmental Radiation Monitoring Laboratories of the plants and independently also by the appropriate SÚJB Regional Centres. The investigation levels were never exceeded in 1997.

Both the Environmental Radiation Monitoring Laboratories of the nuclear power plants and the appropriate SÚJB Regional Centres take samples of the components of the environment near the plants and measure the radionuclide activities in regular intervals. As in the previous years, no differences in the radionuclide contents were found between the NPP surroundings and the remaining parts of the country.

Radioactivity releases from the Dukovany NPP (in rare gases, aerosols, iodine, liquid tritium, and fission products) expressed as fractions of the respective annual release limits

EMERGENCY PREPAREDNESS

EMERGENCY RESPONSE CENTRE

Preparation and operation of the Emergency Response Centre

During 1997, the Emergency Response Centre within the SÚJB was equipped with hardware necessary to install software tools for assessment of the technology status and radiation situation in the event of emergency at the Dukovany NPP and for assessment of the radiation situation within the Czech Republic.

The problem of on-line transmission of selected technological, radiological and meteorological data in the event of emergency at the Dukovany plant was addressed in cooperation with the Headquarters of the ÈEZ a.s. utility. The transmission was to be finalized in February 1998, followed by trial operation.

The basic sets of procedures, tasks and assignments to be accomplished by the responsible SÚJB personnel during emergency were developed in cooperation with experts from the United Kingdom.

An EU mission took place within the PHARE-RAMG programme in August 1997. This mission reviewed the status of equipment of the Emergency Response Centre and its capabilities with respect to the requirements laid down by Act No. 18/1997 in the event of a radiation accident.

Based on international treaties and conventions and bilateral agreements, the responsibilities of the Liaison Point for Emergency Reporting with respect to the operation of nuclear facilities and workplaces handling ionizing radiation sources were satisfied in cooperation with the Headquarters of the Civil Protection of the Czech Republic.

The performance of the Emergency Response Centre was tested by engagement in the international emergency exercise HEXAGARANT-97, organized by armies of the Central European states within the “Partnership for Peace” project on 16 – 20 June 1997. Following up the international exercises which took place in 1996, this exercise tested the coordinating function, connection and transmission of information between the Emergency Response Centre and the bodies and organizations engaged in the emergency preparedness system at both the national and international levels, as well as the preparedness of selected components of the RMN. Within the SÚJB sector the exercise was commanded by the Emergency Staff, which employed the technical facilities of the Emergency Response Centre and the National Radiation Protection Institute for fulfilling its own tasks and tasks of the RMN Headquarters. The exercise gave evidence that the Emergency Response Centre needs further development, both in the programming and technical equipment fields.

SUPERVISORY ACTIVITIES AT NUCLEAR FACILITIES

Dukovany nuclear power plant

Major SÚJB's attention was centered on a further quality improvement of the public information and warning system within the Dukovany emergency planning zone. The SÚJB reviewed the new public warning system for the emergency zone which uses the national integrated system of warning and information operated by the Ministry of Defence within the civil defence sector. Based on application submitted by the Dukovany plant and a favourable

statement of the Tøebíè District Administration, the SÚJB approved abandoning of the current HADOS information system. The approval is conditional on obtaining documentation which addresses the organization of the informing process and on concluding agreements with the District Administration bodies involved.

Considerable attention was paid to the Dukovany NPP emergency plan. In relation to the new legislation, i.e. Act No. 18/1997 and Decrees No. 219/1997 and 184/1997, the SÚJB held discussions with the Dukovany management and the Headquarters of the ÈEZ a.s. utility dealing with the ways to meet the legislative requirements in the field of emergency preparedness. Also, discussions were held with representatives of the Ministry of the Interior and of the Tøebíè District Administration regarding the interconnection of the internal and external emergency plans.

Based on the above facts, the Dukovany plant management submitted to the SÚJB its amended internal emergency plan for approval. The SÚJB commenced the administrative procedure and internal emergency plan review on 18 November 1997, including negotiations with the involved District Administration bodies regarding the linking to the external emergency plan. The administrative procedure was to be finalized in January 1998.

Temelín nuclear power plant

In 1997, the SÚJB concentrated on the definition of the Temelín emergency planning zone.

Following up the SÚJB Decisions, requirements specified, and results of negotiations, the Temelín plant management submitted supplements to the analysis of potential serious (beyond the design basis) accidents and their radiological consequences. After reviewing the documentation, the SÚJB discussed the proposed specification of the emergency planning zone with the Èeské Budìjovice District Administration, which is the coordinating body for the Temelín emergency planning zone. Subsequently, the SÚJB as the authority under Act No. 18/1997 defined the Temelín emergency planning zone as follows:

1. *With respect to provisions to inform the authorities, bodies and organization and to warn the population, and to provisions for sheltering, iodine prophylaxis and control of movement of people: territory determined by the area of a circle 13 km radius whose centre coincides with the containment of Temelín reactor unit 1 plus the territory of towns and villages lying on the boundary of the circle (external part of the zone).*
2. *With respect to the provisions for preparation and execution of population evacuation: territory determined by a circle 5 km radius whose centre coincides with the containment of the Temelín reactor unit 1 plus the territory lying on the boundary of the circle (internal part of the zone).*

The decision is supplement with an annex containing a map 1 : 50 000 showing the boundaries of the external and internal parts of the emergency planning zone.

Attention was also paid to the preparation of the internal emergency plan for the Temelín plant. The SÚJB reviewed the draft internal emergency plan submitted by the plant management. The internal emergency planning involved a traumatological plan, including conception of the health care provisions.

Miscellaneous

With regard to the new legislation, the Faculty of Nuclear Science and Physical Engineering of the Czech Technical University submitted an amended emergency plan for the VR-1P teaching reactor. The SÚJB reviewed this new version and informed the Faculty about its comments. The Faculty revised the amendment taking the comments into account, and submitted the plan for approval again in December 1997.

OTHER ACTIVITIES OF THE STATE OFFICE FOR NUCLEAR SAFETY

PERSONNEL QUALIFICATION AND TRAINING

After all requirements had been satisfied and inspection carried out, the SÚJB licensed the Practical Training Department of the Training Centre at the Temelín NPP for practical training of selected personnel of the Temelín nuclear power plant.

Based on application submitted and after reviewing the documentation, the SÚJB approved the syllabuses and method of training selected personnel of the Dukovany and Temelín nuclear power plants.

Four scheduled inspection visits examining the personnel preparedness were accomplished at the Dukovany plant before start-up of the reactor units after refuelling. No shortcomings were identified in the documentation or in the staffing.

The State Commission for Examining Special Professional Competency of Selected Personnel of Nuclear Facilities met 13 times during 1997.

Those who passed examination before this Commission were granted selected personnel licences for work at nuclear facilities within the Czech Republic (48 new licences were granted, 26 licences were renewed). >From among the 75 candidates, one failed in the oral examination.

Radiation protection

The SÚJB examining boards examined 306 persons with respect to knowledge of radiation protection issues for granting the special professional competency licence. The licences were granted to 286 persons, while 20 individuals failed.

Two SÚJB licences permitting professional training of selected personnel of workplaces handling ionizing radiation sources were granted, viz. to the Institute of Postgraduate Education in the Health Sector in Prague and to the AZIN Praha s.r.o. company. Discussions were commenced with two additional candidates, viz. the House of Technology in Ostrava and ÈEZ a.s.

LEGISLATIVE ACTIVITIES

Activities in the field of legislation were affected significantly by the fact that Act No. 18/1997 on Peaceful Uses of Nuclear Energy and Ionizing Radiation and on the Amendment of Some Acts (Atomic Act) had been promulgated. While some clauses of the Atomic Act entered into force on 26 February 1997, for the majority of provisions the term of validity was set to 1 July 1997 in view of the large extent and complexity of the issues concerned. Among major changes effected by the Atomic Act is also the fact that any licensing by the nuclear safety regulatory body is now an administrative procedure under the Administrative Procedure Rules, which implies in practice that objections against any SÚJB decision can be raised by any party involved in the procedure. This has put quite new demands on the activities of the SÚJB.

In parallel to the preparation and discussion of the Atomic Act, work was commenced on 14 implementing regulations relating to the Atomic Act, which the SÚJB is authorized to issue under that

Act. The initial number of 16 regulations was reduced by combining three of them into one. Since the final version of the implementing regulations had to be based on the Atomic Act as promulgated, finalization could only be made after the Act had been passed by the Parliament. The following 10 Decrees were published in the 2nd half of 1997:

1. *Decree of the SÚJB No.* ***142/1997*** *on type approval of packaging assemblies for transport, storage, and disposal of radionuclide sources and nuclear materials, on type approval of ionizing radiation sources, and on type approval of protective devices for work involving ionizing radiation sources and other devices for ionizing radiation source handling (on Type Approval).*
2. *Decree of the SÚJB no.* ***143/1997*** *on transportation and shipment of specified nuclear materials and specified radionuclide sources.*
3. *Decree of the SÚJB no.* ***144/1997*** *on physical protection of nuclear materials and nuclear facilities and their classification.*
4. *Decree of the SÚJB no.* ***145/1997*** *on accounting for and control of nuclear materials and their detailed specification.*
5. *Decree of the SÚJB no.* ***146/1997*** *specifying activities directly affecting nuclear safety and activities especially important from radiation protection viewpoint, requirements on qualification and professional training, on method to be used for verification of special professional competency and for issue authorisations to selected personnel, and the form of documentation to be approved for the licensing of expert training of selected personnel.*
6. *Decree of the SÚJB no.* ***147/1997*** *laying down a list of selected items and dual use items in the nuclear sector.*
7. *Decree of the SÚJB no.* ***184/1997*** *on radiation protection requirements.*
8. *Decree of the SÚJB no.* ***214/1997*** *on quality assurance in activities related to the utilization of nuclear energy and in radiation practices, and laying down criteria for the assignment and categorization of classified equipment into safety classes.*
9. *Decree of the SÚJB no.* ***215/1997*** *on criteria for siting nuclear facilities and very significant ionizing radiation sources.*
10. *Decree of the SÚJB no.* ***219/1997*** *on details of emergency preparedness of nuclear facilities and workplaces with ionizing radiation sources and on requirements on the content of on-site emergency plans and emergency rules.*

Based on documents prepared by the SÚJB, the new Agreement between the Czech Republic and the IAEA on Safeguards Based on the Treaty on the Non-Proliferation of Nuclear Weapons was discussed and passed by the two Houses of Parliament in the 1st half of 1997.

Within efforts to strengthen the international system, the IAEA Board of Governors set up a preparatory committee for developing a Supplementary Protocol to the safeguards agreements. SÚJB personnel participated actively in the work of this committee, which prepared a model text of the protocol. The draft protocol has been submitted by the IAEA to the Czech Republic for signing. The SÚJB in cooperation with the Ministry of Foreign Affairs is preparing its discussion and approval/passing by the Czech Government and Parliament.

Within the process of Czech Republic's preparation for accession to the European Union, the SÚJB participated in activities coordinated by the Ministry of Foreign Affairs, as well as in the structured dialogue with the EC Directors General (DG XI and DG XVII). The SÚJB developed documents for the preparation of the National Programme for Adopting the Acquis and prepared a draft positional document in the field of nuclear safety and radiation protection for negotiations concerning accession of the Czech Republic to the EU.

The positional document concludes that:

a) No factual problems in relation to the Czech Republic's accession to the EU should emerge in the area of assessment of nuclear safety and supervision of nuclear safety of nuclear facilities operated in the territory of the Czech Republic; objections if any might be motivated by the generally negative stance of representatives of some "non-nuclear" countries to nuclear power.

b) In the area of safeguards, the acquis can be adopted without demanding a transition period. After acceding to the EU, the Czech Republic will have to sign a new agreement for the application of safeguards in connection with the Non-Proliferation Treaty, which will encompass the Republic, Euratom, and the IAEA as the parties.

c) In the area of radiation protection, the acquis can also be adopted without the need for a transition period.

In relation to the approximation of the Czech legislation in the fields of radiation protection and safeguards in relation to the Non-Proliferation Treaty, nuclear safety, and state administration personnel training, a one-week visit to the European Commission headquarters in Brussels and to the Euratom headquarters in Luxembourg was organized for a nine-member group of SÚJB personnel. A SÚJB representative attended a meeting of one of the sub-committees of the Accession Committee and informed representatives of the EC and of the EU Member States about the level of radiation protection provisions and execution of state supervision of nuclear safety in the Czech Republic. A study entitled "Analysis of Consequences of Czech Republic's Accession to the EU in the Field of Nuclear Safety and Radiation Protection" was ordered from the French company Electricité de France within PHARE projects. Preliminary results should be available by May 1998.

The SÚJB also engaged itself in some activities related to the Czech Republic's accession to NATO. The SÚJB has its representatives in the Working Committee that coordinates preparation for accession and in the working groups – on legislation, safety investment, and emergency planning.

INTERNATIONAL COOPERATION

The activities of the SÚJB in the field of international cooperation was mainly aimed at maintaining and developing bilateral contacts with regulatory counterparts and coordinating technical cooperation and assistance in the relevant area organized by the IAEA, EU (PHARE), US DOE and OECD/NEA. Cooperation also continued within the Forum (former Association) of Regulatory Bodies of Countries Operating VVER Type Reactors.

Bilateral cooperation

Periodical meetings of the Austrian–Czech expert working group within the intergovernmental agreement on problems of common interest in nuclear safety and radiation safety were organized in January and November 1997 at the Temelín NPP. The Czech party provided the Austrian counterpart with information regarding the status and preparation of the new nuclear legislation, construction of the Temelín plant, fuel cycle back end options in the Czech Republic, results of radiation situation monitoring in this country, and operation of nuclear facilities, the Dukovany NPP in particular.

Important is the cooperation of the SÚJB with the US Nuclear Regulatory Commission (US NRC), especially in the training of experts in the inspection of nuclear facilities. An additional training of SÚJB nuclear safety inspectors in the planning, preparation, implementation, and evaluation of inspections was organized in April 1997. Subsequently, the technical aspects of cooperation till the year 2000 were discussed with US NRC experts during their visit to Prague in November 1997. A new programme of cooperation aimed at providing support to NPP operators and their technical background was launched in cooperation with US DOE experts. Detailed technical

documentation began to be developed in preparation for the start of the first 4 projects approved by the US DOE, included in the list developed by the Czech party.

Very close have also been relations between the SÚJB and the Nuclear Regulatory Authority of the Slovak Republic. The formal aspect of cooperation between the two bodies has been specified by the Programme of Cooperation of the State Office for Nuclear safety of the Czech Republic and the Nuclear Regulatory Authority of the Slovak Republic Till 2000, signed in Prague on 29 May 1997. The Programme details the items of the Agreement Between the Government of the Czech Republic and the Government of the Slovak Republic on Cooperation in State Supervision of Nuclear Safety of Nuclear Facilities and State Supervision of Nuclear Materials.

Contacts of the SÚJB at the bilateral level were also enshrined in an agreement with the Russian Federation, and a similar agreement with Ukraine is under preparation.

Cooperation between the SÚJB and the UK Nuclear Installations Inspectorate (Health and Safety Executive) was aimed at the preparation and signing of the Agreement for the Exchange of Information Between the State Office for Nuclear Safety of the Czech Republic and the Health and Safety Executive of the United Kingdom of Great Britain and Northern Ireland, which formally regulates contacts between the two bodies for the future, and at continuing technical cooperation in emergency planning and development of the SÚJB Emergency Response Centre, coordinated by WS Atkins company. Within the latter group of activities, a workshop on the preparation of information for the media was held in January, and a visits of four SÚJB staff members to the United Kingdom where the participants were made familiar with the British emergency preparedness system and the technical and organizational issues of the development of the Emergency Response Centre were discussed. In May, experts of both parties prepared a draft technical cooperation programme for 1997–1998, dealing particularly with the development of emergency procedures for the individual posts within the Centre.

Based on the agreement between the Czech and German governments on issues of common interest in nuclear safety and radiation protection, meetings were organized of the Commission of Experts and of its technical expert working groups, dealing with the preparation of expert reports on the Temelín and Isar 2 nuclear power plants.

Cooperation within international organizations and technical assistance programmes

As during the previous years, SÚJB's international cooperation activities concentrated on professional cooperation with the International Atomic Energy Agency. SÚJB officials attended IAEA meetings and discussed the programme of technical cooperation between the Czech Republic and the IAEA.

The active role of the Czech delegation during IAEA Governor meetings in 1997 was acknowledged by electing SÚJB Chairman, who is Governor for the Czech Republic, to the position of Vice-chairman of the Board of Governors. In addition to the Board of Governors, the Czech Republic is represented in IAEA advisory bodies such as the Nuclear Safety Standards Advisory Committee (NUSSAC) and Senior Advisory Group for Safeguards Implementation (SAGSI).

As a peak event in the relationships between the Czech Republic and the IAEA, the IAEA Director General Mr. Hans Blix visited the Czech Republic on 11 – 13 May 1997.

Implementation of projects approved by the IAEA Board of Governors within the programme of technical cooperation between the Czech Republic and the IAEA for the 1997 – 1998 period was started in early 1997. The following 5 projects were involved:

- *Assessment of corrosion of Zircaloy cladding in nuclear fuel (continuation of a project for the 1995 – 1996 period; 198 550 US$).*
- *Radioactive waste characterization programme (continuation of a project for the 1995 – 1996 period; 140 020 US$).*
- *Remediation for uranium mine tailings impoundments (99 120 US$).*
- *Quality assurance programmes in radiology and radiotherapy (132 305 US$).*

- *Cyclotron for short-lived medical radioisotopes, a model project (1 658 000 US$),*

  Scheduled for 4 years, the goal of this model project, assisted by the IAEA, is to build up a production capacity and distribution network for diagnosis in cardiology and oncology. Project progress is monitored and evaluated by the Model Project Coordination Commission, appointed ad hoc by SÚJB Chairman.

Active engagement of the Czech Republic in the IAEA technical cooperation programme for 1997 – 1998 proceeds, under SÚJB coordination, also within Regional Projects. Other forms of cooperation with the IAEA were implemented through a number of expert meetings, dealing particularly with the following issues:

- *strengthening the regime of non-proliferation of nuclear weapons and the safeguards system;*
- *nuclear energy safety, including radiation protection, radioactive waste management, and the fuel cycle;*
- *use of nuclear energy beyond the power sector and the international nuclear information system.*

Participation of the Czech Republic in the EC Regional Programme "PHARE – Nuclear safety", which is coordinated by the SÚJB, represents a major proportion of technical assistance in nuclear safety coming from abroad. This assistance is aimed at three key areas of the nuclear programme: support of regulatory bodies (RAMG projects), support of scientific organizations (TSO projects), and support of nuclear power plant operators.

Among programmes of technical assistance to the Czech Republic and other Central and Eastern European countries in the nuclear safety area is also the Japanese government's "Invitation Programme", within which training courses were organized the fifth year, dealing with nuclear power plant operation control and maintenance, seismic aspects of NPP projects, nuclear safety and radiation protection, and radioactive waste management.

The Czech Republic is not only a beneficiary; in fact, this country engages itself in the organization of international events of the IAEA and other bodies. The following events were implemented in 1997 under SÚJB coordination:

- *IAEA international training course for newcoming regulatory inspectors, which was held in Prague. Taking 2 weeks, the training course was attended by 15 participants from countries of the European region. Apart from organizational issues, the Czech party also provided experienced trainers.*
- *IAEA workshop on the evaluation of performance of nuclear power facilities (1 week).*
- *IAEA regional training courses on physical protection of nuclear materials and nuclear facilities for Central and Eastern European countries, which have been organized in the Czech Republic in cooperation with the US DOE since 1995. Extraordinary organizational efforts in relation to those training courses were appraised by the US DOE partners by a Letter of Acknowledgment.*

The SÚJB continued in 1997 in its cooperation with the OECD Nuclear Energy Agency (NEA). SÚJB representatives attended periodical meetings of the OECD-NEA Committee on Nuclear Regulatory Activities (CNRA) and were engaged in activities organized by other NEA standing committees such as the Committee for Radiation Protection and Public Health (CRPPH).

The SÚJB is a founding member of the Forum of Regulatory Bodies of Countries Operating VVER Type Reactors, established in 1993 in support of improvement of the level of nuclear safety and radiation protection through the use of common experience, information exchange, and mutual coordination of efforts to secure nuclear safety. In May 1997, the SÚJB organized a next meeting of one of the working groups dealing with the issues of licensing dry storage facilities for spent nuclear fuel with the objective to develop guidelines for the scope of safety reports and draft criteria for assessment of the operation of such facilities. In August, SÚJB representatives attended a periodical top-level meeting of the Forum, organized by Finland at the end of its one-year chairmanship.

PUBLIC INFORMATION

In March 1997, the SÚJB submitted to the government its "Report on the Results of Activities of the State Office for Nuclear Safety in the Execution of State Supervision of Nuclear Safety of Nuclear Facilities in 1996".

Subsequently, the SÚJB prepared Czech and English versions of the Report for the public and distributed them to relevant institutions. The English version was sent to partner organizations abroad and to the contact points of bilateral agreements on nuclear safety. The content of the annual report for the public was the subject of a dedicated press conference which was held under the chairmanship of the SÚJB Chairman on 24 April 1997.

During the year, the SÚJB continued its contacts and discussions with representatives of civic initiatives, particularly in regard of the Atomic Act and its implementing regulations.

The SÚJB has been keping the Czech Press Agency and other media informed about facts within its responsibility; in particular, the SÚJB responded to news which aroused public attention.

The SÚJB also meets its information role towards the professional and general public by issuing the bi-monthly journal "Bezpeènost jaderné energie" (Nuclear Energy Safety) and the non-periodical series "Bezpeènost jaderných zaøízení" (Safety of Nuclear Facilities), publishing general information regarding nuclear safety and detailed requirements and guidelines in support of nuclear safety.

ABBREVIATIONS

EC	European Commission
ECCS	Emergency Core Cooling System
EU	European Union
HEU	Highly Enriched Uranium
HO	Reactor Protection System (Havarijní ochrana)
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
INES	International Nuclear Event Scale
L&C	Limits and Conditions
LEU	Low Enriched Uranium
MBA	Material Balance Area
MCP	Main Circulation Pump
NEA/OECD	OECD Nuclear Energy Agency
NPP	Nuclear Power Plant
NPT	Treaty on the Non-Proliferation of Nuclear Weapons (Non-Proliferation Treaty)
NRI	Nuclear Research Institute at Řež (Ústav jaderného výzkumu Řež, a.s.)
NRPI	National Radiation Protection Institute (Státní ústav radiační ochrany)
RMN	Radiation Monitoring Network
SALP	Systematic Assessment of Licensee Performance
SÚJB	State Office for Nuclear Safety of the Czech Republic (Státní úřad pro jadernou bezpečnost České republiky)
TLD	Thermoluminescent dosemeter(s)
US DOE	US Department of Energy
US NRC	US Nuclear Regulatory Commission
WEC	Westinghouse Electric Corporation