

*Answers to Questions and Comments
Raised by Austria
on the
National Report of the Czech Republic*



prepared for the purposes of the
First Review Meeting of Contracting Parties
to the
Convention on Nuclear Safety
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AUSTRIA 1: Could you specify the current implementation status of Category II and III tasks from IAEA-EBP-WWER-03, "Safety Issues and Their Ranking for WWER-440 Model 213 Nuclear Power Plants" (April 1996) for Dukovany Units 1-4?

NPP Dukovany

The Nuclear Power Plant Dukovany is paying prime attention to safety enhancement, i.e. to the „IAEA Safety Issues“ resolution. The first safety enhancements have been included in the so-called „NPP Dukovany backfitting programme“ specified by the Government Resolution No. 309 of 1986. Still before the IAEA-EBP WWER-03 was put in words, a so-called „Minimum List of Measures to Enhance Nuclear Safety of VVER 440/213 Blocks“ had been brought about within the framework of the VVER 440/213 club. The „IAEA Safety Issues“, arisen thereafter, contain a variety of recommendations from this List. The safety aims of the NPP Dukovany voiced today in the upgrading program under the name of „MORAVA“, have been passed through judgement by the IAEA mission on the basis of the IAEA-EBP-WWER-03 document prepared in 1995.

It can be summarised that all of the „Safety Issues IAEA“, categorised II and III, have been included in the upgrading program by the Nuclear Power Plant Dukovany. The "operational" issues stated in the IAEA-EBP-WWER-03 document (13 uncategorised recommendations) is placed under discussions at the NPP Dukovany on separate basis and its level shall be subject to inspection by the repeated OSART mission in 2001. For an outline of the individual safety issues sorted out or being just prepared see the table below.

It is obvious from the graphic information, that the NPP Dukovany intends to gradually resolute altogether 74 identified Safety Issues (categorised I, II, and III).

Until early 1999, 31 measures have been implemented in total, 16 of them in category II and 1 in III.

Of the total number of 40 measures categorised II, 31 will be accomplished by 2002 and as for the 8 findings of IAEA in the category III, all will be realised by the same year. The remaining actions in the category II go hand in hand with implementation of the activity called „Instrumentation and Control System Modernization“. This year in late March, the ČEZ, a.s. made official announcement to the potential contractors to compete for implementation of the Instrumentation and Control System Modernization project.

Schedule of IAEA Safety Issues resolution

Year	Number of Finding	Count per Year	Total	I	II	III
Cont.	AA1 (II), AA2 (I), AA3 (II), AA10 (I)	4	4	2	2	-
by 1998	G3 (II), CI1 (II), CI2 (III), CI4 (II), CI5 (II), CI6 (I), S6 (II), S7 (II), S8 (I), IaC8 (II), EI1 (I), C3 (II), C4 (II), C5 (I), IH1 (II), IH5 (I), AA4 (I), AA7 (II), AA12 (I), AA13 (I), AA14 (I), AA15 (I), IH8 (I), EH3 (III)	24	28	11	11	2
1998	G1 (II), S15 (II), IH3 (II)	3	31	-	2	-

1999	AA5 (I), AA8 (II), G2 (III), EH1 (III)	4	35	1	1	2
2000	S12 (I), EI5 (II), IH4 (II), AA11 (I), S1 (II), S4 (II), S5 (III), S13 (III), C2 (II), IH2 (III)	10	45	2	5	3
2001	S11 (I), S16 (II), RC1(II)	3	48	1	2	-
2002	S3 (II), S9 (II), S10 (II), S17 (II), IaC11 (I), EI2 (I), EI3 (I), EI4 (I), AA6 (II), IH7 (III)	10	58	4	5	1
2003	IaC10 (II), IaC6 (I), IaC7 (II),	3	61	1	2	-
2004	CI3 (II)	1	62	-	1	-
2006	S14 (II)	1	63	-	1	-
2007	S2 (II), IaC1 (II), IaC2 (I), IaC3 (II), IaC4 (II), IaC5 (II), C1 (II)	7	70	1	5	-
2009	IaC9 (II)	1	71	-	1	-
2010	AA9 (I)	1	72	1	-	-
not planned	IH6 (I), EH2 (I),	2	74	2	-	-

AUSTRIA 2: Could you specify the current implementation status of Category II and III tasks from IAEA-EBP-WWER-05, "Safety Issues and Their Ranking for WWER 1000 Model 320 Nuclear Power Plants" (March 1996) for Temelín Units 1 & 2?

The extent to which the recommendations from the IAEA-EBP-WWER-05 Report had been implemented was assessed by the IAEA expert mission in March 1996. In summary, it can be stated that most of these recommendations had been fulfilled at that time already or were then in an advanced stage of realisation. This is being documented in the Summary Report from this IAEA mission "Reviews of WWER-1000 Safety Issues Resolution at Temelín NPP, WWER-SC-171".

Issue Number	Issue Designation	Note
GENERAL		
G1	Component classification	Is being addressed
G2	Equipment qualification	Is being addressed
G3	Reliability analysis of the safety system class 1 and 2	addressed
REACTOR CORE		
RC1	Prevention inadvertent of boron dilution	addressed
RC2	Control rods insertion reliability /fuel elements deformation	addressed
RC3	Sub-critical status monitoring during reactor shutdown	addressed
COMPONENT INTEGRITY		
CI1	RPV embattlement and its monitoring	addressed
CI2	Non-destructive tests	addressed
CI3	Primary pipeline whipping restrain	Is being addressed
CI4	Steam generator collector integrity	addressed
CI5	Stem generator tube integrity	addressed
CI6	Steam and feedwater piping integrity	Is being addressed
SYSTEMS		
S01	Primary circuit cold overpressure protection	addressed
S02	Mitigation of a steam generator primary collector break	addressed
S03	Reactor coolant pump seal cooling system	addressed
S04	Pressuriser safety and relief valves qualification for water flow	addressed
S05	ECCS sump screen blocking	addressed
S06	ECCS water storage tank and suction line integrity	addressed
S07	Heat exchanger integrity	addressed
S08	Power operated valves on the ECCS injection lines	addressed
S09	Steam generator safety and relief valves qualification for water flow	addressed
S10	Steam generator safety valve's performance at low pressure	addressed
S11	Stem generator level control valves	addressed
S12	Emergency feedwater makeup procedures	addressed
S13	Cold emergency feedwater supply into steam generators	addressed
S14	Main control room ventilation system	addressed
S15	Hydrogen removal system	addressed

Number of Issue	Issue Designation	Class of Issue
MEASUREMENT AND CONTROL		
I&C01	I&C reliability	addressed
I&C02	Safety system actuation design	addressed
I&C03	Automatic reactor protection for power distribution and DNB	addressed
I&C04	Human engineering of control rods	addressed
I&C05	Control and monitoring of power distributions in load follow mode	addressed
I&C06	Condition monitoring for the mechanical equipment	addressed
I&C07	Primary circuit diagnostic systems	addressed
I&C08	Reactor vessel head leak monitoring system	addressed
I&C09	Accident monitoring instrumentation	addressed
I&C10	Technical support center	addressed
I&C11	Water chemistry control and monitoring equipment (primary and secondary)	addressed
I&C12	Automatic reactor protection for power and DNB	addressed
I&C13	Power distribution monitoring inside the active zone in load follow operation	addressed
I&C14	Power supply to the plant process computer and I&C systems	addressed
ELECTRIC POWER SUPPLY		
E12	Reliability of diesel-generators	addressed
E13	Protection signals for emergency diesel-generator	addressed
E14	On-site power supply for incident and accident management	addressed
E11	Off-site power via start-up transformers	addressed
E16	Ground faults in DC circuits	addressed
E15	Emergency battery discharge time	addressed
CONTAINMENT		
Cont. 1	Containment by-pass	addressed
INTERNAL RISKS		
IH1	Systematic fire hazard analysis	addressed
IH2	Fire prevention	addressed
IH3	Fire detection and extinguishing	addressed
IH4	Mitigation of fire effects	addressed
IH5	Systematic analysis to floods	addressed
IH6	Flood protection of the emergency electric switchgear	addressed
IH7	Protection against the dynamic effects of main steam and feedwater line.	Is being addressed
IH8	Polar crane interlocking	addressed
Issue Number	Issue Designation	Issue Class
EXTERNAL RISKS		
EH 1	Seismic designs	addressed
EH 2	Analysis to plant specific natural external conditions	addressed
EH 3	Man induced external events	addressed

ACCIDENT ANALYSIS		
AA01	Scope and methodology of accident analysis	addressed
AA02	QA of plant data used in accident analysis	addressed
AA03	Computer code and plant model validation	addressed
AA04	Availability of accident analysis results for supporting plant operation	addressed
AA05	Main steam line break analysis	addressed
AA06	Overcooling transients related to pressurized thermal shock	addressed
AA07	Steam generator collector rupture analysis	addressed
AA08	Accidents under low power and shutdown (LPS) conditions	addressed
AA09	Severe accident	addressed
AA10	Probabilistic safety assessment (PSA)	addressed
AA11	Boron dilution accidents	addressed
AA12	Spent fuel cask drop accidents	addressed
AA13	Anticipated transients without scram (ATWS)	addressed
AA14	Total loss of electric power	addressed
AA15	Total loss of heat sink	addressed
OPERATION		
OP1	Procedures for normal operation	addressed
OP2	Emergency Operating Procedures	addressed
OP3	Limits and Conditions	addressed
Man1	Need for Safety Culture	addressed
Man2	Experience feedback	addressed
Man3	Quality Assurance Program	addressed
Man4	Data and document management	addressed
PO1	Philosophy on use of procedures	addressed
PO2	Surveillance programme	addressed
PO3	System of communications	addressed
RP1	Radiation protection and monitoring	addressed
Tr1	Training programs	addressed
EP1	Emergency centre	addressed

In order to evaluate the state of fulfillment of the recommendations under IAEA-EBP-WWER-05, the NPP Temelín has entered a contract with an engineering/consulting company. The purpose is the detailed analysis of the works done so far, with the goal to timely identify any potential drawbacks in the existing solution.

In general

In the Annex to the National Report, the Summary Reports of the IAEA missions, the ones that have evaluated the „Safety Issues“ implementation in NPP Dukovany and NPP Temelín, are referred to. They can be made available through Mr. Šváb, „liaison officer“ of SÚJB.

AUSTRIA 3: How was the function of bubbler condensers assessed in the past and what are future plans?

A multitude of analyses has been focused on the bubble condenser structure strength proving methods. At first, they were the ones carried out by the Polish organisations, then those by the Ukrainian Energoprojekt, Kiev. The strength-targeted calculations have been performed on the bubble condenser metal structure by Russian specialists and placed under considerations during the course of the meeting of the IAEA consultants held within the „Extrabudgetary VVER Power Plants Safety Program“.

Some partial (mainly small scale) tests have also been done on the system.

The meeting of the IAEA consultants held in 1996 in the NPP Dukovany followed these intentions:

- To consider the technical approach included in the Power Plant documentation;
- To review the as-built state of the system;
- To estimate the usefulness of the proposed improvements, considering also acceptability of the bubble condenser design.

As a result of the meeting, the NPP Dukovany was advised to analyse selected parts of the bubble condenser structure. In particular, to elaborate the new thermohydraulic analyses and mainly (in case of the power plant in operation) to carry out more comprehensive calculations of the thin-wall structure with use of some less conservative criteria and methods (plastic deformations ought to be deemed acceptable in the structures).

The NPP Dukovany contracted analyses of the thermohydraulic behaviour of the bubble condenser. The structure has been subdued to the strain calculations under the LOCA conditions (with use of the finite element method) and the thermohydraulic calculations have been applied for a LOCA accident in its first phase of development.

In parallel, the largest project of the „Nuclear Safety“ series have been initiated and commenced, associating the means with use of PHARE and TACIS project PH 2.13/95 „Bubble Condenser Experimental Qualification“. Beside the Czech Republic, the other countries such as Slovakia, Hungary, and also Russia and Ukraine are beneficiaries of the project. The goal of the project is to test the VVER bubble condenser for functionality on the large scale model, to work out the thermohydraulic analyses for a maximum accident, and to carry out the mechanical calculations of the structure under more precise terms. Western companies with use of the IAEA standards are accomplishing the project. The early results give evidence of a more resistant metal structure of the bubble condenser than specified in the initial assessment achieved within the limits of the IAEA Extrabudgetary Program.

Conclusions:

- It is obvious from the calculations results, that the condenser structure integrity will be preserved in all postulated circumstances;
- Maximum overpressure on the structure does not reach beyond permissible limits;

- The studies performed so far do not place in doubts the functionality of the NPP Dukovany bubble condenser.

What concerns the functionality of the bubble condenser system, the NPP Dukovany shall make use of the PHARE-TACIS PH2.13/95 project results in their decision-making processes. Regarding these results and recommendations, the NPP Dukovany will, if necessary, tackle accomplishment of the measures.

AUSTRIA 4: Has the improvement in safety resulting from backfitting been quantified for the Czech nuclear power plants (Dukovany & Temelín)? If so, please report the results of the quantification.

NPP Dukovany

The safety measures included in the MORAVA upgrading program have been proposed on the basis of extensive analyses and assessments done in the period from 1992 to 1997, both with use of their own strength and under support of local companies, and by the international evaluating missions. As for the main actions of evaluation, they are the following:

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|---|---|
| 1. Internal and external audit and the associated IAEA mission for elaboration of the conclusions of the IAEA extrabudgetary program called „Safety Issues“ (IAEA-EBP-WWER-03): | ◆ 40 measures in category II
◆ 8 measures in category III |
| 2. Analyses done within the Emergency Operating Procedure development: | ◆ 17 modifications proposed in addition (other safety measures proposed are comprised under 1) through 3) |
| 3. Analyses done within the PSA 1, 2 (probabilistic safety analyses): | ◆ 5 modifications proposed in addition (other safety measures proposed are comprised under 1) through 3) |
| 4. Review of NPP Dukovany safety after ten years in operation(so-called „Operational" Safety Analyses Report): | ◆ Proposed safety measures are comprised under 1) through 3) |
| 5. Nuclear safety related requirements of the Regulatory Body: | ◆ Required safety measures are comprised under 1) through 3) |

The safety improving updated quantification carried out in early 1998 and the resulting CDF value is $9.93 \cdot 10^{-5}$ per reactor & year. With the modernization programme finished, the value of $1 \cdot 10^{-5}$ per reactor & year should be reached.

NPP Temelín

As the question relates to quantification of the plant safety improvements resulting from the plant back-fitting, it has to be noted that there is only one way how to estimate the plant safety quantitatively. This is to develop and quantify the PSA models in consequential terms, specific for a given plant. The primary results are delineation of the likely Core Damage Frequency (CDF) from the events which occur when the plant is operating at power or loss-of-cooling frequency (decay heat removal capability) for a number of shutdown plant operating states. The Core Damage Frequency is determined by considering in detail the actual plant design and its response to occurrence of events both internal and external to the plant, thus the final results directly reflect and delineate the actual state of the plant design, including design safety improvements.

Within the framework of Temelín NPP PSA Project the PSA models have been developed, covering Level 1 both at power and shutdown states of operation, external events and the Level 2 analyses. The hierarchical structure established for the performance of the Temelín PSA was determined from the outset by the requirement to produce a „Living PSA“ capable of being used for both the plant design/operation in-depth analysis as well as on-line use in real time, including necessary technological transfer to the Temelín NPP.

One of the key elements of the QA program for the Temelín Living PSA was an independent review of the work at various stages during the course of the project, which has been performed at three levels. The final level of review was the review conducted by two IAEA organised IPERS reviews. International experts reviewed the Level 1, 2, and external event analysis. The small number of minor concerns and errors uncovered during each of the reviews were dealt with prior to completion of the current analysis. The only major concern of the review teams was that the model should be updated when the final design and equipment installation becomes available.

As the plant is currently under construction with many safety improvements being implemented into design, the information required for the PSA have been in a state of transition throughout the performance of the analysis and the results are based on a number of conservative assumptions concerning the ultimate design and future operation in some areas. These have all been carefully documented so that they could be confirmed, corrected or highlighted, as the final plant information becomes available prior to commissioning. In order to overcome this conservatism embodied in the current PSA, the Temelín NPP plans to update all the models during 1999-2000, striving to ensure that each information and assumption in the PSA reflects the ultimate design (including all safety improvements) and construction of the plant at the time of its commissioning, providing risk model that is suitable for both applications and use in licensing-related work

The Temelín PSA results reflecting a certain stage of the plant design (as mentioned above) are comparable with the results of the other plants. These interim results will be presented in more details at the IAEA International Conference on Strengthening of Nuclear Safety in Eastern Europe, to be held in Vienna in June 1999.

From the outset there were two clear aims for the performance of the Temelín PSA. The first was to ensure that the Temelín personnel were fully trained in the PSA methodology so that a full in-house capability would be developed for future use of the PSA. The second was to produce a “live“ plant model, which could be used now, and in the future, to provide important information on plant safety and operation.

The Temelín PSA has already been used for some plant-specific applications associated primarily with following areas:

- Providing risk insights for evaluation of selected safety system permissible outage times within Technical Specification restrains;
- Risk impact evaluation of selected IAEA Safety Issues associated with physical and functional separation and diversity of WWER 1000;
- Development of a real-time risk calculation PSA model for Temelín Safety Monitor.

The model is expected to be used extensively in the future for various applications designed to assess the impact on safety of design changes, procedural changes, changes in the technical specifications, and changes in test and maintenance procedures and strategies based on risk

minimisation. Also, it is expected that the model will be used by the plant training personnel to attain a better understanding of certain accident sequences and thus enhance the training given to plant personnel. Other areas of PSA application at the plant are evaluation of accident events, outage risk management or providing historical risk profiles associated with the plant operation through the real-time risk monitoring tool Temelín Safety Monitor.

AUSTRIA 5: A Regulation on Liability for Nuclear Damage (Third Party Liability) is now being prepared (National Report, Point 2.1.2). How will this Regulation implement, supplement or amend the provisions contained in section five of the Act N° 18/1997 Coll., on the Peaceful utilisation of Nuclear Energy and Ionising Radiation (the Atomic Act)?

The Atomic Act implementing regulation, now being prepared and mentioned in the National Report under 2.1.2, pertains to implementation of the provision of § 35, point 3 of the Atomic Act. Consistent with this, the executive regulation will define the limits in concentration and quantity of nuclear materials beyond the effect of the provision about the nuclear damages as under article I, point 2 of the Vienna Convention on the Civil Liability for Nuclear Damage. According to that Article an Installation State may, if the small extent of the risk involved warrants so, exclude any small quantities of nuclear material from the effect of this Convention provided that maximum limits for the exclusion of such quantities have been established by the Board of Governors of IAEA and any exclusion by an Installation State is within such established limits". The limits established in the Draft version of this above regulation comply with those set forth by the Board of Atomic Energy on Sep. 14, 1977. (Resolution of the Board of Governors concerning the establishment of maximum limits for the exclusion of small quantities of nuclear material from the application of the Vienna Convention on Civil Liability for Nuclear Damage).

AUSTRIA 6: Has a Czech licensee a right of recourse against his employees (in particular those in operational control) if they cause a nuclear damage either by their negligent behaviour or with the intent to cause such damage? If this case is this right of recourse granted on the basis of the labour contracts entered into between the license holder and its employees or otherwise?

Consistent with the Atomic Act, implementing under its head 5 the Vienna Convention on Civil Liability for Nuclear Damage into the Czech Legal Code, the licensee has the right to impose legal action (subject to explicit stipulation in the agreement reached in writing or if the nuclear event has resulted from action or negligence done with intention to cause a damage) against the individuals who acted or neglected to act with such intention (Article X of the Vienna Convention).

AUSTRIA 7: Is it planned to increase the amount of the license holder's liability for nuclear damages?

In 1998, the Czech Republic has signed the "Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage". Due to the amount of the existing licensee's liability, as it is defined in the Atomic Act (CZK 6 billions) and with regard to the „phasing-in mechanism“, the Protocol could have been ratified already. Nevertheless, the Czech Republic intend to prepare an amendment of the Atomic Act within the horizon of 2-3 years in order that this amount could be raised gradually to a higher value assumed in the above Protocol (SDR 300 millions).

AUSTRIA 8: Has the Czech Republic introduced a criminal responsibility of the licensee or of its employees, which would have to be established by independent tribunals? If this is the case, what are the sanctions that can be imposed against the licensee or these employees? For what kind of offences?

It is not clear from the question, for what the criminal responsibility of the licensee or of its employees should be established.

For violation of any legal liability defined in the Atomic Act, the SÚJB has the right to impose a penalty in the amount as follows:

- a) Up to CZK 100 millions on the one who has broken the nuclear energy exploitation ban for other purposes than peaceful ones as under § 4 or the ban in line with § 5, para 1,
- b) Up to CZK 50 millions on the one who is doing unlawfully the activities under § 9, para 1,
- c) Up to CZK 10 millions on a licensee for the failure to observe the liability under § 17 through 20,
- d) Up to CZK 10 millions on the entity for having breached the radioactive waste material import and deposition ban under § 5, para 2, for the failure to meet the compulsory deposits to the nuclear account as under § 27, or the obligation to dump the radioactive waste materials by the person only authorised to do so in line with § 26 and § 48, para 1,
- e) Up to CZK 200 thousands to the individual persons of the statutory authorities, and up to CZK 100 thousands to the staff members of the body followed up, for distortion or concealing of any facts vital to supervision, or for failure to provide co-operation on inspection,
- f) Up to CZK 200 thousands for a failure to perform other responsibilities imposed by this Act.

Upon determining the penalty amount, the seriousness, consequences, and duration of acting unlawfully must be considered as well as the extent of the consequences caused, timeliness and effective co-operation in the damage repairing procedures. When the remedy is taken just after the a breach was discovered and the SÚJB has been provided with an efficient co-operation, and provided that there are no damages suffered by persons or to environment, the SÚJB may resign on its right to impose the penalty.

The penalties flow into the state revenue as one of its incomes.

AUSTRIA 9: Does the Czech Republic intend to become a party to the Convention on the Protection of Environment through Criminal Law (European Treaty Series/172), opened for signature in Strasbourg on 4 November 1998, which deals, in particular, with intentional and negligent offences committed by means of nuclear substances or installations?

Czech republic is planning to become a party to the Convention on the Protection of Environment through Criminal Law (European Treaty Series/172) in the near future. However, it is not included in the plan for 1999.

AUSTRIA 10: Are the prices for electricity produced at Dukovany plant set up in a way to account also for necessary safety upgrades?

The prices for electricity are in the Czech Republic still regulated by the state. This status should remain till 2002. The price for which the ČEZ is selling electricity to distribution companies has been set forth as the maximum price for the entire company irrespective of where the electricity came from. This price has been calculated as an average of all energetic installations (nuclear power plant, coal-burning and hydro-electric power plants), **among others taking into account** the expected reconstruction and upgrading costs including event the costs incurred in connection with improvement of nuclear safety in the Dukovany NPP. Thus, there is no electricity price calculated especially for output **from** the Dukovany NPP. Like anywhere in the world, it is neither necessary here nor even possible with regard to optimal allocation of **financial** resources to **held** any internal funds (**banking accounts**) available to the ČEZ, a.s. in the moment the upgrade is embarked on, the funds that would satisfy the needs. **Except it**, the internal resources can be **completed by loan** capital (**bills, bonds, banking loans**).

AUSTRIA 11: When will a full-scope simulator be available at the nuclear power plant Dukovany?

Currently, the ČEZ, a.s. is training its operations personnel of NPP Dukovany on the VVER 440 full-scope simulator with use of the VÚJE Trnava Training Centre. This training has a form of a basic course (part of the basic preparation of the new employees before the authorisation of SÚJB is awarded to them), periodic course (for the staff members active as control operators managers), and re-qualification course (being a part of education on transition between the individual posts within the operative control staff). The obligation to take this training is rooted in the applicable Czech legislation (SÚJB Regulation 146/1997 Coll.).

The preliminary works prior to onset of the training on the VVER 440 multifunctional simulator developed for NPP Dukovany within the limits of the PHARE programme have now reached their culminating point. This preparation comprises fulfilment of all legislative conditions necessary for accomplishment of the specialised training of selected staff (see the Law 18/1997 Coll. and SÚJB Regulation 146/1997 Coll.), including elaboration of the necessary training materials and training documentation (training programmes, task scenarios, etc.). Once the training is begun on the VVER 440 multifunctional simulator (in the 2nd half of 1999), a part of the basic training (within the scope of 2 weeks) shall be transferred to this VVER 440 machine.

Construction of the VVER 440 full-scope simulator of the type „main control room replica“ is assumed to finish in 4th quarter of 2000 when it ought to be taken over by the NPP Dukovany. Just after acceptance, the trial operation will follow connected with simulator testing and practical training of instructors scheduled to make training on the simulator. With the legislative conditions as in the case of the VVER 440 multifunctional simulator fulfilled (training programmes, scenarios of tasks, system of rating, the training itself can be assumed to start on the simulator typed „main control room replica“ in the 3rd quarter of 2001. The basic periodic and re-qualification course shall then be accomplished to its full extent on these VVER 440 full-scope simulators in the areas of the NPP Dukovany.

AUSTRIA 12: Has a comprehensive safety culture policy been established at the nuclear power plants Dukovany (and Temelín)? Does such a policy consider requirements for a periodic review and, if necessary, improvement of the plants' safety cultures?

Implementation of Legislative Principles and those Determined in the ČEZ, a.s. Internal Documents

For details of all of these issues raised see the National Report. Here, in the reply, the key items only are summarised:

- In the proclaimed ČEZ Strategy of Nuclear Activities, an obligation is rooted to ensure the safety and culture of safety;
- The obligation to secure the nuclear safety and radiation protection with preference has been voiced by only one licensee authorised to operate (construct) the nuclear power installations in the Czech Republic - the company of ČEZ, a.s. - which has proclaimed its Strategy of Safety in Nuclear Activities in June 1995 [5-1]- hereinafter the National Report references are indicated. The Strategy contains a safety-related commitment of the company, defining the safety priorities associated with construction and operation of the nuclear energetic installations. In its concept, the document complies with major safety principles as they are stated in the IAEA document of „Safety Culture“ [5-2]. The Strategy has been issued as a company's control document in the form of the Board's resolution.
- The Strategy of the ČEZ, a.s. company, on its declaration, is closely linked with safety strategy of the Dukovany NPP [5-4], being an appendix to the internal control document called Nuclear Safety Rules [5-5]. It is directly stated in the proclamation that the management of the NPP Dukovany is fully aware and respectful of its responsibility for safety of a nuclear installation in operation and undertakes to ensure the peak results in all of its activities vital for nuclear safety. The nuclear safety is of the top priority and the safety-related requirements override those of the production. In order that all of the above declared principles were fulfilled, a comprehensive mechanism has been elaborated at the Dukovany NPP, including the control documentation at various levels, the system of assessment on regular basis, and the one of inspections. In their activities, the staff members are obliged to keep the rules, so that a probability of non-standard events would be minimised. One of the tools for continuous monitoring of the nuclear safety level is available in the nuclear safety indicators. A set of indicators is what matters here, characterising development of the level of nuclear safety and radiation protection at the Nuclear Power Plant Dukovany, for the last month (year). A Technical Safety Group has been set up to solve the vital issues connected with safety of operation in the Dukovany NPP. At its meetings, the Technical Safety Group is reviewing the crucial safety issues and proposes how they could be sorted out in concept. During the sessions of the Group, moreover, the outcomes of individual assessments are placed under judgement, as well as the aforementioned safety indicators.
- All information on the nuclear safety affecting activities is provided to the supervisory authority - SÚJB. The strategy also includes openness of the Nuclear Power Plant Dukovany, in providing information on the operational safety level both face-to-face with wide public and towards the foreign parties.
- In order that a level of nuclear safety could be performed and increased in a controlled manner, an proper care, attention, and financial resources are aimed at this goal, both at the level of the company and both of the nuclear power plants (see Chapter 7 of the National Report).

AUSTRIA 13: How does the communication policy established at the units provide for the immediate information exchange on safety concerns between plant staff and management so that these concerns can be promptly addressed?

Good communications and quick exchange and conveyance of information upon approaching the safety problems of the nuclear power plants in the Czech Republic belong to the prime tenets of the Operator.

The communication between the operating personnel and management is detailed in the specific operating manuals and quality assurance documentation in the field of NPP operations control, such as „Management of the Non-stop Shift Operation“ or working procedure of „Issuance, acceptance, and Execution of Commands“ and the like.

As an underlying documentation, for example, the standard of INPO 87-018 „Operational Communications Verbal“ Revision 02, Institute of Nuclear Power Operations, has been used.

Further reporting obligations of the shift personal to the management and/or neighbourhood of the NPP are detailed in the emergency documentation system giving account to how the emergencies could be sorted out at the NPP.

Concerning the units in operation, the reporting obligation of the persons who have found a deviation from a normal state of operation, through the NPP Dukovany shift engineer and Shift Emergency Staff at the SÚJB and the District Offices in the zone of emergency planning are detailed in the approved NPP Dukovany Internal Emergency Plan updated on Jul. 1, 1998, including the related technical communications. As well as the method and periodicity these technical devices (pagers, telephones, and fax machines) are stated here. For detailed clarification of how to convey information on origin and course of an emergency between the individual operations of NPP Dukovany (including the Emergency Staff and management) NPP Dukovany headquarters, and external organisation (including the District Offices and SÚJB) see the Operational Instruction 118/98.

AUSTRIA 14: Has a systematic control room design review, including environmental aspects, been performed at the units according to international standards, and what are the results?

NPP Dukovany

Yes, the Main Control Room design was analysed comprehensively in past years.

The company of NCC Ltd, Knutsford, England analysed MCR design within the limits of the PHARE EC/ENE/15 project called „Replacement of Instrumentation and Control Systems for VVER 440/213 Nuclear Power Plant Dukovany in 1994. In May 1996, the ENAC Consortium within the PHARE 92 project No. 4.2.9/92 called „VVER 440-213 Engineering Safety Evaluation (Dukovany and Bohunice)“ again reviewed the MCR and ECR design.

The summarised results from both of these projects are available in the relevant Reports (see the National Report Appendix 4). The recommendations resulting from these analyses serve as an underlying documentation for preparation and implementation of the modernization programs (such as Realised Adjustment of Air Handling Systems to Protect the MCR against Fume Flood during a Fire in Cable area, or the T706 construction - strengthening of the MCR capability to be manned).

The analyses to potential influences of adjacent environment are, of course, subject of evaluation in the Safety Analysis Report (revision was prepared recently, after ten year of operation NPP Dukovany units).

NPP Temelín

Currently, the systematic activities are carried out at the NPP Temelín with the goal to verify and validate the designs of main and emergency control rooms. This activity as a whole can be split into six basic stages in line with the joint „Procedure for Verification and Validation of the MCR and EMR designs.

The individual stages are as follows:

- I. Normal operation of the unit - verification and validation by means of an on-display simulator
- II. Interpretation of the requirements derived from the analyses carried out for the EOP (Symptom Oriented Regulations)
- III. Abnormal state of the unit - verification and validation on the full-scope simulator.
Emergency state of the unit - verification and validation on the full-scope simulator.
- IV. Incapability of the MCR to be manned - verification and validation on the full-scope simulator.
- V. Malfunctions of the Automatic Control Systems
- VI. Verification and Validation of the MCR and ECR designs according to the NEREG 0700 rev. 1 - for analysis of the engineering psychology criteria.

Each of these individual stages is brought to life in compliance with the partial procedure and as such is also documented. A goal is defined in these documents, as well as the progress of fulfilment, and actual results reached. The progress is further subdivided into two phases: preparatory one and evaluation. Within the preparatory phase the activities are defined, such as work on underlying documentation, on evaluation team which must be organised, and time schedule of practical evaluation. The phase of evaluation comprises the activities of evaluation itself. At the end of each stage, a phase of evaluation comes, saying whether or not the particular goals have been reached.

Let us take the stage VI for example: The Control Room Design comes under evaluation according to NUREG 007, rev. 1 which treat partially the working points proposed for the operative personnel (temperature and humidity, ventilation, lighting, acoustic conditions, lockers for personal property, surrounding area, and comfort).

The process as a whole has been drafted in order that it could finish prior to commencement of the 1st unit physical start-up. At present the evaluation of the Control Room Design has been finished for normal operation of the unit (start-up, load operation, shutdown, and cooling down of the unit). The results give evidence, that the goals of this stage have been achieved. Now the task-oriented analyses are being evaluated for the Symptom Oriented Regulations (EOP), scenarios prepared for assessment of abnormal and emergency states on the full-scope simulator, and the Control Room Design matched against the criteria under NUREG 0700. rev. 1.

The entire „Procedure“ has been set up in accordance with the following documents:

- ČSN-IEC 1771 „Nuclear Power Plants - Main Control Room - Verification and Validation of the Proposal“, final design
- ČSN-IEC 964 „How to Design the Nuclear Power Plant Control Rooms“
- ČSN-IEC 965 „Auxiliary Control Points Making it Possible to Shut Down a Reactor otherwise than from the Main Control Room which Might Have Become Inaccessible“

AUSTRIA 15: In which way were quality control audits in the nuclear power plants performed up until now, and was there information feed-back from those audits into the present system?

New system of quality audits (as the quality verification tools) have been implemented by ČEZ, a.s. since 1995, when this element of quality systems of NPP Dukovany and NPP Temelín power plants were updated. Before that time, both quality control and quality audits were organised in accordance with nuclear specific "Individual Quality Assurance Programmes", developed by the operator, reps. vendor, for each task or delivery under the valid QA regulations (Decree No. 5/1979, replaced by Regulation 436/1990).

The internal audits are used both to verify the serviceability of the company's quality system as a whole (within competence of the Safety and Quality Section of the ČEZ, a.s. headquarters) and to verify the serviceability of the quality system of each power plant on separate basis (within competence of their local Quality sections).

The external audits are applied where it is necessary to select, screen, and evaluate a potential contractor and its aptness to assure adequate quality for the purpose of ČEZ, a.s. contracts.

The quality audits are performed in compliance with the approved procedures and plans of audits.

At the output from an external quality audit is a record, which must contain the findings in the areas under review. In response to such an audit some preventive or remedial measures must be set forth on the side of the screened entity management together with the deadlines of their fulfilment.

At the end of such an external quality audit with affirmative results, a potential contractor is either included in the List of Screened Contractors or left therein as the one satisfying the requirements of ČEZ, a.s. anchored in its quality system, being at the same time assigned with the status of a contractor apt to meet the specified supply obligations to ČEZ, a.s. in the given branch (nuclear/non nuclear) and over limited period of time (not more than 3 years). In the event of negative audit results the above aptness is rejected to the contractor or taken away from him.

The QA is of highest concern of licensee and the regulator from very beginning of the project. See the National Report and attached legislation for details. For example, the construction of the Dukovany Nuclear Power Plant has been entrusted to the investment company of Energoinvest. During the course of manufacturing and installation works, this company stood behind all investment activities, including the quality inspections of key components while being manufactured at individual contractors and manufacturers, and then also performed the on-site acceptance inspections, providing also for a specialised supervision over installation of technologies.

The results were officially recorded and any possible findings discussed with the manufacturer with the goal to remove causes of inconsistency.

Entire course of manufacturing, installation, and commissioning works at the Dukovany Nuclear Power Plant was supervised by the regulatory authorities in the field of technical and nuclear safety.

All knowledge and experience attained during the quality inspection of manufacturing and installation works were then projected into the Program of Pre-operational and Operational Inspections. In this manner the feedback is being applied on continuous basis, even within the existing system of customer-oriented, acceptance, and operational inspections.

AUSTRIA 16: In the Mochovce nuclear power plant certain upgrades were installed in order to assure proper functioning of the bubbler condenser. Were comparable upgrades implemented also in the Dukovany nuclear power plants? Are there plans for future upgrades?

The measures taken at the Mochovce NPP are well known to us. The Dukovany NPP co-operates closely with Mochovce, making use of their experience from a variety of Safety Issues. The entire problem is watched constantly (see our reply to the question raised by Austria in relation to bubbler condenser functionality). Dukovany NPP is actively involved in PHARE Bubbler Condenser Qualification project. Any possible measures will be tackled here after termination of the PHARE-TACIS - PH2.13/95 project which also includes the experimental verification of the structural elements. This is why the Dukovany NPP has yet not done any measures on bubble condenser system similar to those carried out at Mochovce.

AUSTRIA 17: Does the risk monitor take into account experience from re-evaluation of risk associated with past precursor type of events? Is operational experience used to check that appropriate information is provided by the risk monitor (SAS)?

- a) The experience attained from estimation of the risks of operational events are used in overhaul and test planning so that the instantaneous risk would not go up uselessly. Base on this experience is a simple table where the permissible combinations being simultaneously out of service are listed together with corresponding risk rates. The table is designed to be used by those who are not experts in PSA for planning of overhauls and tests with respect to risk during the overhauls and tests in operation of the unit, which must be kept at its minimum.
- b) The operational events are used for periodic evaluation of the parameters entering the PSA-1 (mainly the frequency of initiating events is in question and unavailability of components, analyses of human mistakes, etc.). The „update“ of this knowledge under control by the „Living PSA“ project. After this PSA „update“ only, a so-called „risk monitor“ can be updated. Currently, complete SW of the risk monitor is being replaced in co-operation with the American company of SCIENTECH/NUS and the Czech company of NRI Řež. Testing and validation of this risk monitor is also included due to the PSA Study.

With use of this risk monitor, the permissible time of equipment unavailability can be determined from the probabilistic safety criteria. These unavailability times determined as above were matched against the values stated in the Limits and Conditions for NPP Dukovany. After agreement between NPP Dukovany and SÚJB the permissible times of unavailability were modified for some equipment and some now components were incorporated into Limits and Conditions and some Limits and Conditions were modified.

AUSTRIA 18: Have the DBA requirements for the Dukovany nuclear power plant been changed because of the plant upgrading measures?

According to the current legislation, it is necessary prior to each modification affecting the nuclear safety to submit to the Supervisory Authority (SÚJB) the documentation of this change. Within this documentation, the safety analysis and description of changes must also be submitted in an applicable Safety Analysis Report (SAR).

In 1995 – 97 the new Safety Analysis Reports was prepared for the each of NPP Dukovany units after ten years in operation. In these SARs the DBA requirements are anchored. For elaboration of these SARs, the SÚJB has imposed some new requirements based mainly on the IAEA recommendations and on up-to-date standards. The DBA definition remains unchanged, being standard as for any other PWRs.

AUSTRIA 19: What is the frequency of periodic safety reviews of the units? Are there any specific requirements for re-licensing?

Periodic safety re-assessment was implemented in Czech Republic in two phases:

- The first complete reassessment of nuclear safety (documented by innovated Safety Analysis Report) for the Dukovany units was performed after 10 years of operation using advanced state-of-the-art tools and taking into account operational experience and plant modifications. It was prepared by the utility to fulfil one of the conditions of the State Regulatory Body (SÚJB) from its decision No. 154 (1991), which established conditions for the 1st unit license for continued operation after 10 years. On the basis of this innovated Operational Safety Analysis Report, the State Regulatory Body by its decision No. 197 (in August 1995) has issued 2 year license for the continued operation of Dukovany 1st unit subject to fulfilment some requirements (conditions). One of the conditions requires continually updating ("Living") Operational Safety Analysis Report
- Periodically updated ("Living") Operational Safety Report for Dukovany plant is now in effect. It documents the state of nuclear safety assurance of the NPP Dukovany units. This report consists of constant unchangeable part (the same for all 4 NPP Dukovany units) as well as of the parts which are updated regularly once a year, always not later than by the end of the next half-year - at the same time for all units. This safety report is based on the complemented "Operational Safety Report for Nuclear Power Plant Dukovany".

In addition, a license granted by the Office is required for each the restart of a nuclear reactor back to the critical state after refuelling in accordance with Act of 24 January 1997 of Peaceful Utilisation of Nuclear Energy and Ionising Radiation (the Atomic Law (see Chapter III §9 (1) e) "Licenses for Individual Activities").

As a part of license granting for a new reload evaluation of previous fuel cycle is being performed (before and during the outage) including comparison of predicted and actual parameters. The parameters of the new reload pattern of proposed new cycle are being checked, especially from the point of view safety analysis and meeting the safety requirements (fuel design limits). Start up test program, reload program, functional tests are reviewed. Periodic safety reports are submitted to the regulatory body for review consequently they are used as input into the NPP Ageing Management Program. Overall inspection and some specialised ones of preparedness of equipment and personnel for nuclear fuel reloading is performed. The inspection includes machinery systems and components, electrical systems, I&C, compliance with QA program, in-service inspections etc.

Last, but not least, according to provisions of § 17, letters a) and b) of the Atomic Act, a licensee shall verify nuclear safety during all stages of the installation's service life (in the scope appropriate for the particular licenses), asses it in a systematic and comprehensive manner from the aspect of the current level of science and technology, and ensure that the assessment results are put into practice. This verification and/or assessment must be documented.

AUSTRIA 20: What are the actual dose reductions achieved in the Czech Nuclear Power Plants and what are the goals for the future with regard to occupational exposure?

The values of the collective dose equivalent achieved at the Dukovany NPP during the last five years are:

Year	1994	1995	1996	1997	1998
NPP Personnel [Sv]	0,42	0,46	0,39	0,40	0,37
Contractors [Sv]	0,99	1,23	1,06	1,12	0,97
Total [Sv]	1.41	1.69	1.45	1.52	1.34

The CDE value, which is determined to be achieved at the Dukovany NPP in 1999, will not exceed the level of **1.6 Sv**.

AUSTRIA 21: What were actual release values and how did they develop over the past decade?

For the values of actual releases from the Dukovany NPP over the period of the last ten years (including 1998) see the following easy-to-view tables:

Yearly activity values of the radioactive rare gasses (RRG) - Xe133, Xe135, tritium, radioactive aerosols, and radioactive iodine released from the Dukovany NPP into atmosphere:

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
RRG [GBq]	610	100	270	1120	4200	4330	5351	3164	417	1403
Tritium [GBq]	409	447	432	415	325	466	410	412	308	398
Aerosols [MBq]	190	99	101	212	208	148	136	84	244	79
Iodine [MBq]	2100	10	14	65	99	24	15	122	11	108

Yearly activity values of the liquid tritium (H3) and activating and fission product (AFP) into the water resources from the Dukovany NPP:

Year	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Tritium [GBq]	18900	20100	18300	19300	18600	15600	14475	17230	14626	15518
AFP [MBq]	296	183	314	100	411	374	171	95	76	56

AUSTRIA 22: Have appropriate arrangements been made for co-ordinating on-site and off-site emergency preparedness? Is the current level of co-ordination sufficient or is any improvement necessary?

There is an existing appropriate arrangement for co-ordination of the on-site and off-site emergency preparedness.

The nuclear power plant submits to the relevant District Authorities the background documents for elaboration and preparation of the off-site emergency plan.

The SÚJB will approve an on-site emergency plan and its changes on the basis of discussion with the relevant District Authority on interconnection of on-site and off-site emergency plans.

For ensuring the emergency preparedness in the emergency planing zone, the NPP co-operates with a relevant District Authority and participates at its own expenses:

- in enabling the activities of the National Radiation Monitoring Network,
- providing the public with antidotes,
- running a press and information campaign aimed at ensuring that the public is prepared for radiation accidents,
- providing a system for notification of relevant bodies in the extent and manner established by the on-site emergency plan,
- providing a warning system for the public.

The extent of the NPP's expenses in ensuring these activities is established by government ordinance No.11/1999 on emergency planing zone.

Next improvement in the field of on-site and off-site emergency preparedness co-operation is supposed after approval of the new act on emergency management and integrated rescue system (emergency act). At present this Act is in the final stage of preparations and is scheduled to attain its legal force on January 1, 2000.

AUSTRIA 23: What is the status of emergency preparedness planning at Temelín nuclear power plant? How has the experience gained through the operation of the Dukovany nuclear power plant been used for the development of the emergency preparedness plan for the Temelín nuclear power plant?

Upon approaching the issues of emergency preparedness and during the work on the on-site and off-site emergency plan, the Temelín NPP is taking as its basis the requirements of the applicable Czech legislation, recommendation of the PRE-OSART accomplished at the Temelín nuclear power plant, operational experience from other NPPs in the Czech Republic (Dukovany) and in the Slovak Republic (Jaslovské Bohunice and Mochovce) and the requirements of the State Office for Nuclear Safety.

The requirement related to the Temelín NPP on-site emergency plan and to its off-site emergency plan is rooted in the Law No. 18/1997 Coll. (Atomic Act). For the details of how to provide for the Temelín NPP emergency preparedness have been specified in the SÚJB Regulation No. 219/1997 Coll. and in the Governmental Directive 11/1999.

The general outline on the basis of which the emergency documentation is being prepared for the Temelín NPP is similar to that used for the Dukovany NPP on-site emergency plan. During their meetings held on regular basis, the ČEZ staff members being in charge of the emergency preparedness can exchange their experience and practical knowledge, put under their judgement the experience gained during operation of the Dukovany plant, and apply this experience and knowledge to the conditions prevalent in the Temelín NPP. The staff members of the Temelín NPP emergency preparedness unit are taking their part in the exercised held in the Dukovany NPP.

In its initial draft, the on-site emergency plan has been prepared for the Temelín NPP and its content has passed through the judgement by the experts from the EDF France. In its material aspects, it has been discussed with the SÚJB representatives. Currently, the received objections and comments are being implemented into a new version of this on-site emergency plan.

Upon work on the program supporting the emergency preparedness at the Temelín NPP, the technical and normative documentation of the US NRC (Nuclear Regulatory Commission) NUREG 0654, 0659, and 0737 has been taken as a basis together with the recommendations stated in the IAEA publications of the Safety Series No. 50-SG-G6, No. 50-SGO6, No. 55, No. 72, No. 73, No. 86 and the IAEA recommendation of the series TECDOC-953 and 955.

AUSTRIA 24: Have state-of-the-art seismic analyses been performed for the Temelín and Dukovany nuclear power plant sites (e.g., probabilistic seismic hazard analyses, seismic margin analyses, seismic PSA)? Did any upgrading result from these analyses? If the analyses are planned, what is the schedule for their completion?

NPP Dukovany

Due to the newly accumulated knowledge and the more precise requirements on the NPP localities, the geological and tectonic conditions have been re-evaluated in the locality of NPP, Dukovany [Haško J., Šimůnek P., Tucauerová D.: Seismic and Tectonic Study, Underlying the Pre-operational Safety Analysis Report of NPP Dukovany. Energoprojekt, Praha, 1990, Barták V.: Macroseismics, Accelerograms and Response Spectrums, Underlying Documentation for the Pre-operational Safety Analysis Report of NPP Dukovany.]. For the NPP Dukovany, the works were carried out by EGP Prague (Architect Designer organization) to be used as underlying material for the novelised Pre-operational Safety Analysis Report.

In its Rev. 1, the Pre-operational Safety Analysis Report contains a brief account of the NPP Dukovany subject area, including the tectonic elements therein and a brief summary of local hydrogeology. In this sub-chapter (and in compliance with the IAEA 50-SG-S1 recommendation of 1991), the subject area is to be understood as the territory delimited by a circle with its centre in the Dukovany NPP and radius of 200 km.

The subject area is well-known in its geology and geophysics, surveyed thoroughly on its surface and in depth. It is well mapped in all geological, gravimetric, magnetometric, and radiometric aspects, containing several national and international profiles of in-depth seismic probing, and its shallower structure is in its basin parts investigated by a multitude of the explosive seismic profiles and by thousands of deep wells. In considerable details the subject territory has been surveyed in its geo-thermal and geo-morphological features and it has been subject to a levelling carried out here repeatedly for decades. In the region of Carpathian Mountains, on more significant zones of fraction, the horizontal moves of the earth were monitored by means of three polygons guarded geologically for over 15 years [Procházková D., Roth Z.: Complex Investigation of Earthquake Origin in Central Europe. In: Environmental Monitoring and Adjacent Problems].

The Dukovany NPP has also a systematic approach to a probabilistic evaluation.

On occasion of the equipment qualification a Methodology for Evaluation of the NPP Dukovany Seismic Resistance had been applied to the seismic area. The method of SMA (Seismic Margin Assessment) was employed here, developed in EPRI.

Moreover, the special procedures of SQUG-GIP (Seismic Qualification Utility Group - Generic Implementation Procedure) were committed, used mainly where the seismic resistance of the active, safety-significant components of the NPP facilities must be assessed, being well compatible with SMA methodology.

The organisations responsible for evaluation of the NPP Dukovany seismic resistance have carried out the above activities according to their own QA programs, being generally in compliance with the IAEA 50-SG-QA6 a ISO 9001 instructions.

List of the main documents used:

ČSKAE Decree No. 2/1978

ČSKAE Regulation No. 436/1990

IAEA Safety Guide 50-SG-S1

IAEA Safety Guide 50-SG-D15

RG 1.29 Seismic Design Classification (NRC 1978)

The results of the above evaluation have unambiguously shown the possibility of safe shutdown in the NPP, Dukovany in the case of a seismic event.

NPP Temelín

The original Russian design did not consider seismic aspects due to very low seismicity in the region. The NPP Temelín is now performing a structures and equipment re-assessment for an SSE of 0.1 g with use of various Czech, Russian, and IAEA, USNRC, ASCE, ASME, IEEE and German standards.

For Temelín NPP a Seismic PSA was performed and completed within the Temelín PSA external event analysis. This analysis has been conducted by NUS, plant PSA staff, David Consulting and EQE International with the idea of estimating the range of contribution of seismic events to the total core damage frequency. The approach used for the analysis is described in NUREG/CR-2300 and Probabilistic Seismic Safety Study Of an Existing Nuclear Power Plant Kennedy, R.P. et. al. The seismic hazard analysis performed by David consulting indicates that the annual frequency of exceeding a PGA of 0.1 g is about $1E-6$. The fragility curves were developed by EQE international, with HCLPF capacities found generally larger than 0.15g. The constructed seismic event trees were quantified using the code SEISMIC. No significant contribution was generated, as the contribution to the CDF was found below $1E-10$ /yr, even using conservatively the 95th percentile hazard curve. The conclusion of the seismic PSA is that the seismic contribution to risk to the public from operation of the Temelín plant is very low, primarily because of the extremely low hazard and component and structural fragility that are following seismic re-qualification for SSE value 0.1 g more than adequate for the hazard level at the site. As a result, no other design modifications for the seismic risk were recommended based on the PSA insights.

AUSTRIA 25: Which verification processes and monitoring programmes are in place for ensuring that relevant new external hazards information is brought to the attention of the regulatory body and the nuclear power plant operators on a timely basis?

NPP Dukovany

At the NPP Dukovany the Operational Safety Analysis Report is subject to regular reassessments. This updating also includes monitoring and assessment of any potential new external risks. The data acquisition system for this monitoring and evaluation is based on co-operation with the relevant District Offices, local mayors, and industrial enterprises, being a minimum of them in this prevailing agricultural region. At least once a year this Report is regularly submitted to SÚJB for their evaluation.

NPP Temelín

Problems of off-site risks from the Temelín NPP geographic position viewpoint has been approached within the limits of the Addendum to the Preliminary Safety Analysis Report prepared by EGP Praha in 1995 (in volumes 2 and 3). In evaluation of the background behind these problems in the field of seismic engineering, in the field of analyses into specific natural conditions (meteorology, hydrology), and in the area of external events of human origin (threats from the industrial facilities, transport, gas lines), the IAEA mission accomplished at the Temelín NPP in 3/96 was active too. In the Final Report of „Review of WWER-1000 Safety Issues Resolution at Temelín Nuclear Power Plant“ a fact is appreciated that the analyses into the external risks have been supported by a variety of supplementary studies prepared by Czech research organisations, mainly on the basis of IAEA Guides and international recommendations.

Currently, the solution of these problems is being updated within the works on the Pre-operational Safety Analysis Report where the analyses connected mainly with the extreme climatic conditions in the locality of NPP Temelín will be added.

AUSTRIA 26: Which national standards does the regulatory body apply and to which extent do these standards comply with international standards with regard to the design of nuclear installations against external hazards?

The new Regulation No. 215/1997 Coll. includes regulatory requirements for siting of nuclear facilities (for full text see the Appendix II of the National Report or SUJB www site. Regulation on general design criteria for nuclear facilities, which is under revision just now, includes all the standard requirements for external events (natural events such as climatic conditions, flood, fire, earthquake, and man induced ones such as explosions, missiles, aircraft crash, toxic gas.). This new Regulation is following the format and content of 10.CFR.50 Appendix B "General Design Criteria" (similarly to the previous Decree No.2/1978 Coll.). Both Regulations are in compliance with IAEA Safety Series 50 – SG - S, resp. 50-SG-D.

AUSTRIA 27: What are the aircraft crash design criteria for the nuclear power plant and the interim spent fuel storage facility for the Dukovany site? Which analyses "have also shown that the spatially isolated back-up core cooling systems, together with civil construction, ensure that even an aircraft crash will not affect function of the reactor emergency shutdown and cooling" (p.90)? Have any reinforcement measures been implemented against the impact of aircraft crashes at the Dukovany nuclear power plant?

Problems connected with a military or civil plane, which might potentially crash down on NPP Dukovany, were considered in the study prepared by the company of Stevenson and Associates (Report rep 25-97.EDU: Analysis of the Necessity to Consider a Plane Fall on the NPP Dukovany Sites according to the IAEA Instructions). In line with the IAEA methodology [Safety Series No. 50-SG-S5 "External Man-Induced Events in Relation to Nuclear Power Plant Siting". IAEA, Vienna, 1981] it has been demonstrated that the likelihood of a fall of a normal civil or military plane on the NPP Dukovany HVB is very low, being under the level $SPL = 10^{-7}$ ($SPL =$ Screening Probability Level) which is taken, in accordance with the above stated IAEA document, as threshold. Thus, given the locality of NPP Dukovany, such situation -- plane crash -- does not need to be considered here.

In the Pre-operational Safety Analysis Report for NPP Dukovany the impact resistance of ceiling structures was calculated against clashed flying objects. Structure strength was assessed for the projectiles varying in parameters. For the one No. 5 having 2 m in diameter, weight of 2 tons, and impact velocity of 100 m/s, the safe thickness values were determined as follows:

concrete: 0.27 m for penetration
 0.53 m for crumbling out
while the actual thickness of the HVB ceilings is either 1.5 or 1.0 m.

reactor steel lid having 3.7 m in diameter a minimum impact thickness is 0.052 m while the actual lid thickness is 0.160 m.

It has been proved that the power plant reactor building ceilings are resistant enough against the impact of small objects (thus also of the aircraft, their engines, projectiles, etc.) up to 10 tons in weight what, even with a high level of conservatism, covers small aircraft currently operated mainly by the air clubs or other similar organisations, or also the small planes of private companies, etc., further the engines and jets of military aircraft and the like.

In addition to the above summarised facts, the NPP Dukovany site is moreover protected by a prohibited area under current designation of LK P9 FL55/GND, being a cylinder of 2 km in diameter and 1850 m FL/GND height, with central point co-ordinates $49^{\circ}05'10''$ $16^{\circ}08'51''$ E. Under the agreement reached between NPP Dukovany and airfield of Náměšť nad Oslavou the air traffic is monitored in the neighbourhood of NPP Dukovany.

AUSTRIA 28: How have the safety analyses been changed to reflect the ongoing process of design changes and facility upgrading measures?

NPP Dukovany

According to the legislation in force, every modification with impact on nuclear safety must be duly documented to a supervisory authority (SÚJB). In the documentation to be submitted, a safety analysis must be included, as well as a description of changes in the applicable Safety Analysis Report. Once the modification is implemented, the corresponding changes must be incorporated into the "Operational" Safety Analysis Report (OSAR).

Some of the modifications can substantially affect the safety analyses. In recent years, for example, an enhanced Russian fuel has been used and all of the safety analyses had to be recalculated consequently in the OSAR.

NPP Temelín

Major project changes (control system replaced, nuclear fuel replaced, system of radiation monitoring replaced, diagnostic system replaced) have been accounted and analysed in the Addendum to the Preliminary Safety Analysis Report (AdPSR) prepared after the agreement reached with the SÚJB with respect to the US requirements of the RG 1.70 Instruction of „Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants“ and in compliance with the recommendations of the International Inspection Missions accomplished at the Temelín Power Plant. The safety analyses themselves, i.e. part 15 of the AdPSR, have been ordered quite anew, and the prevailing part of the analyses, covering fully the WELCO contract and accounting for the partial changes done within the project by both WELCO and others involved in the project, has been worked out by the WELCO company. EGP, Praha has then accomplished the associated analyses, making use of the methods comparable with those from the West, and completed the entire AdPSR (Nov. 1995).

Under the US Instruction of RG 1.70, even the Pre-operational Safety Analysis Report (PSAR) is just being prepared. For the ČEZ NPP Temelín, this vital licence document is being elaborated by the Architect Engineer ŠKODA Praha. ŠKODA Praha is taking part in the modification procedures within the Temelín PP Project and has established its own system of how to implement the nuclear safety related changes into the NPP Temelín Safety Documentation. Thus, the changes and measures designed to improve the equipment and systems used in the NPP Temelín are accounted in the NPP Temelín Design and Safety Documentation. Within the limits of PSAR, the company of WELCO and Czech organisations is updating the safety analyses.

AUSTRIA 29: Have the codes used for these new analyses also been modified?

The procedure of calculation code amendment and updating is run continuously, following closely the development in computer technology and research, as well as changes in the nuclear legislation (in particular in the field of radiation safety).

Regarding the broad spectrum, difficulty, and comprehensives of the problems dealing with safety of nuclear equipment, the state supervisor (SÚJB) is evaluating the quality and suitability of these calculation codes for the safety documentation to be elaborated, including the programs received from abroad. When evaluating the codes, the SÚJB is making use of the VDS 030 Directive called „Guidelines for Evaluation of the Calculating Programs Designed to Assess Nuclear Safety“ which bring to life 7 specialised Boards of Evaluation (Neutron-related Physical Calculations, Thermohydraulic Analyses, Nuclear Fuel Behaviour, Analyses of the Non-credible Accidents, Strength-related calculations of components and systems, calculation of how the RA (radioactive) products can spread themselves, PSA analyses).

The computer programs, for example, used for the NPP Temelín new analyses have been modified by WELCO to allow for the engineering differences between the WWER and PWR for which they had been developed. Currently, the above specialised Boards subject the programs to evaluation, and the results will then be used for Temelín in the Final Safety Analyses Report (FSAR).

AUSTRIA 30: Which measures or modifications is in place, under construction or under consideration that would improve retention capabilities?

NPP Dukovany

a) Major modifications and measures already taken:

- PORV,
- 17 passive recombiners installed, burning hydrogen in hermetic areas, measuring moreover the concentration levels in the hermetic zone, as well as ambient temperature,
- Protection called „Main Steam Collector Outburst“ reconstructed,
- Temperature measurement at the active zone output extended in scale,
- Emergency feedwater pumps replaced by the more powerful ones,
- Electricity supply switchboards upgraded,
- SW and automatic systems designed to accomplish the „Isle Mode“ of NPP Dukovany operation implemented and tested,
- „Cool Resource Station“ reconstructed completely,
- Selected pumps and motors replaced in the case of vital systems within the primary circuit
- Pressure setting modified in the hydro-accumulators on the basis of analyses.

b) Major modifications and measures currently in run:

- Sieve replacement on the suction side of the emergency pumps in the hermetic section,
- Level measurement in the hermetic compartments (measurement diversity to be implemented),
- Pressure measurement in the hermetic compartments (measurement diversity to be implemented),
- The "Super Accident" Feedwater Refilling Collector from steam generator is moved to less exposed areas,
- Protection against Reactor Vessel Cool Pressurisation is added,
- Implementation of a new symptomatic EOPS,
- Establishment of a so-called „Safety Engineer“ as a new management post within shift mainly with regard to prevention and elimination of emergencies.

c) The following measures and modifications, for example, are anticipated to take place in the future:

- ESFAS will be modified and extended,
- Instrumentation and Control System will be upgraded in its parts and some automatic systems will be extended,
- A so-called „Technical Supporting Centre“ will be created
- The SAMG will be elaborated to comply with the world trend.

NPP Temelín

The NPP Temelín project comprises the elements enhancing the nuclear power plant's capability to minimise the design breeches, forming a so-called „defence in depth“ within a design (fuel matrix - fuel rods coverage - primary circuit threshold in pressure - containment).

The following is included in among these elements:

- Implementation of a highly automated control system with a higher priority of technology control than the one assigned to the operating personnel response.
- Burners of hydrogen accumulated in containment,
- TSC accomplishment to support the operating personnel in dealing with accidents,
- Hierarchic structure implementation in the field of Instrumentation and Control System (Limitation System, Primary System of Protections, Diverse System of Protections with one of the main missions to make sure that the first credible barriers are not disrupted in case of a control system failure (fuel and coverage)

With respect to nuclear safety the Instrumentation and Control Systems can be broken down into:

- Major protection systems,
- Major control systems,
- Minor protection and control systems

The major protection and control systems must be serviceable during normal and abnormal operation, as well as in emergency conditions. They must have a high level of service reliability, and multiplicity and independence of individual divisions must be implemented in them. They are composed of three independent sections, backed up mutually. This approach to I&C is closely related to the same approach applied to another technology. In this way, the vital functions closely related to the nuclear safety are provided by three separate, adequately isolated, and independent entities - sections, and each of them, regardless of the other two, can ensure the requires activities.

The minor protection and control systems are those I&C system used to accomplish control in the systems closely related to nuclear safety but where nuclear safety does not play any major role. Nuclear safety of the NPP remains fully ensured even with these systems out of service. Under normal operation, these systems provide a necessary background to the field facilities, preventing occurrence of any abnormal operation and accidents. In the event of an abnormal operation or emergency condition, the most important systems may provide supporting functions, which will reduce some, related adverse effects. In their design, the minor systems have no impact on the nuclear safety. Seen from the nuclear safety point of view and with regard to containment of some abnormal operation adverse effects, they are also highly reliable in service. The selected sections have been designed with such level of multiplicity and independence that neither of the faults on one component can result in any abnormal operation or emergency condition. Like the major SCS sections, those minor ones are also composed of three separate sections backing up each other. This approach to SCS is closely related to the same one used in another technology. In this way, the functions for the redundant part of the technology are performed by three independent, adequately isolated, and independent circuits, each of which, regardless to the other two, is able to perform the required activities.

AUSTRIA 31: How has the scope of the safety analyses been expanded to address certain severe accidents?

NPP Dukovany

The safety analyses in "Operational" SAR have been prepared for the range of postulated Design Basis Accident (DBA). The severe accidents have been analysed within separate activities. In considerable numbers the severe accidents have been analysed within the limits of the state funded project of „NPP Safety“ finished in 1992. As well as the project of PHARE 4.2.7a „Beyond DBA Analysis“ finished in 1998 was focused on these serious accidents.

Within the grant of the US government the Probabilistic Safety Assessment Level 2 study has been elaborated in a limited scope, being an analogy to the Internal Plant Evaluation which had been prepared for the American NPPs. This study was prepared by the American Company of SAIC and NRI Řež as its subcontractor. The study of PSA-2 has been finished in the last year (see 9.1.2 of the National Report.).

In the last year, this study of PSA-2, limited in scope, has been updated in order to be in compliance with the up-to-date study of PSA-1. At first, the results of PSA-2 and conclusions of PHARE 4.2.7a will be taken as a basis to support SAMG and the proposal of other preventive and mitigating measures to be prepared.

NPP Temelín

In the area of heavy accidents by the NPP Temelín, the necessary support is provided by the NRI (Nuclear research institute) Řež. The analyses are carried out by means of the MELCOR code (standardised in line with the SÚJB methodology). Based on the PSA-1 and 2 results, the most urgent scripts have been figured out for development of serious accidents, with use of the following criteria:

- Probability of occurrence sufficiently high,
- Serious radiological impacts on the NPP environment

Until now the following analyses have been prepared and their results used as building material for the base of knowledge on which the Severe Accident Management Guidelines have been prepared:

- Phenomenological analyses of severe accidents
 - Immediate rise of in-containment temperature
 - Steam explosions,
 - Hydrogen fires and explosions.
- Analyses of the serious accident scripts figured out:
 - Medium-scaled loss of coolant accident (LOCA) with simultaneous loss of emergency refilling (low-pressure script),
 - „Station Blackout“ without restored supply of electricity (high-pressure script),

- Seal failure of the SG primary collector - by-pass containment (medium-pressure script),
 - Large-scaled LOCA with „accident management“ considered.
- Analyses of selected processes in the course of serious accidents and proposed preventive measures, slowing down the progress and reduction of serious accident consequences.
 - Primary circuit disintegration due to a thermal creep,
 - Containment started melting at its bottom after the reactor pressurised vessel failure,
 - Cooling of the wrecked active zone in the reactor shaft,
 - Course of the in-containment parameters during serious accidents,
 - Sensitiveness study of how the high-pressure emergency refilling is restored after LOCA stills before the core starts melting.

AUSTRIA 32: By which procedures is it ensured that following a modification or design change all documents, operation procedures and drawings are updated accordingly?

In the ČEZ nuclear power plants, a compliance of the individual documents with the others and with actual state of equipment is being ensured on permanent basis (configuration management procedure, which is a part of QA system has to be followed). This applies not only to the period of construction and start-up, but to normal operation as well. When implementing a modification on the equipment or after every change in the design documentation, the person in charge is obliged to announce the fact to the individual officers responsible for relevant documentation, and specify the scope. The latter must integrate the reported changes in the documentation, make also the other staff member familiar with them, and arrange distribution of the updated documents. The procedure has been documented in the internal regulations.

In this area the procedure follows the usual routine known internationally and is fully based on the recommendations of the International Agency for Atomic Energy, Vienna, included in the codes and safety instructions of the NUSS program. At the same time it adheres strictly to the requirements imposed here by the Czech Republic legal code.

The procedures to ensure the compliance of the individual documents with the others and with actual state of equipment are included in the file of control documents. For the period of construction, both at NPP Temelín and individual contractors too, the quality assurance programs are applicable along with the related procedures, which describe the processes how to keep all documentation in its up-to-date state. These procedures are incorporated even into the contractual relationships with the individual contractors.

Whenever a modification is submitted for approval, the following impacts must be assessed prior to any decision:

- On original project specifications;
- On related parts of the power plant projects in time and place (the goal is to keep project integrity);
- On safety documentation (of finished safety analyses and assessments);
- On quality documentation (list of selected equipment, individual quality assurance programs);
- On start-up procedure (starting documentation);
- Modes of operation (Operating Regulations).

In addition to the related cost and profit assessment, all of this is aimed at the impacts on the installation procedures, etc. The decision about acceptance of the required modification and thus also about its integration into the design documentation can be taken only after all of the above impacts have been considered.

As the project is being prepared, the above impacts are brought into ever more specific form, and the related documentation is extended or modified accordingly. As soon as the project output is available, the project itself can be scrutinised and reviewed independently. The necessary compliance between the as-built state of equipment, design documentation, and safety assessment documentation prescribing also the way of how to start, operate, and inspect

the equipment with focus on its quality is followed up and validated mainly at the stage when the functional tests are about to be started on the individual systems, and henceforth in the course of the power plant start and operation. For the after-start period, there are the control documents prepared in the NPP Temelín, describing how to keep all documentation in its current state and in compliance with the actual state of equipment.

To provide the related processes designed to maintain the compliance between the documentation and equipment (configuration management) with proper administrative and technical support, the Information System is being committed in the NPP Temelín, with the PassPort SW package in its core, backed by the File Net optical display unit. In 1999, this implementation came to its culminating point at the NPP Temelín with its individual modules being set in trial operation. For the above purposes, the Document Control and Engineering Change Control modules are employed.

There is also another key component making the above process extremely effective - highly qualified engineering staff participated in the changes while they are prepared and implemented.

AUSTRIA 33: Are PSA insights used for enhancements of plant design and operational practices (including safety upgrading for nuclear power plant Temelín)? Is there sufficient expertise available at nuclear sites to maintain PSA ("living" PSA)?

A fairly considerable space in the Czech Republic National Report has been devoted to the ways that the nuclear safety is being constantly enhanced. In the following text this information is summarised on separate basis for both existing nuclear energetic installations.

NPP Dukovany

The PSA results are used for evaluation of the scheduled modifications to increase the nuclear safety, mainly for assigning priorities to these measures. PSA is also used where operation must be supported - amendments of operating guidelines, equipment tests, etc. In 1995, the Limits and Conditions were partially modified by means of PSA-1 and in co-operation with the American Company of SAIC. As well as in scheduling the in-operation overhauls on the NPP Dukovany unit, the PSA criterion is used to minimise risks (Risk Monitor).

At the Dukovany NPP a so-called Living-PSA has been established at the same time.

For NPP Dukovany, the PSA has been prepared by an independent company of NRI Řež to which a highly competent team is available, able to solve these problems. There at the Dukovany NPP, 2 staff members are responsible for this PSA program, submitting the necessary underlying materials to the manufacturing company, and accumulating the modelling data. The key staff members have attended the seminars and training courses held in the topic of PSA by IAEA, DOE, and WANO.

For further details to the PSA utilisation at the Dukovany NPP see 9.1.2 of the National Report.

NPP Temelín

Within the framework of Temelín NPP PSA Project the PSA models have been developed covering Level 1 both at power and shutdown states of operation, external events and the Level 2 analyses. The hierarchical structure established for the performance of the Temelín PSA was determined from the outset by the requirement to prepare a living PSA capable of being used for both in-depth analysis of plant design and operation as well as on-line use in real time, including necessary technological transfer. The structure had to provide a clear and traceable link between the plant design documentation and operational information and the risk evaluation, both for performance of the PSA and its continuing use.

The increasing level of plant design and operational details making it is possible to include in the PSA and the ability to relate this directly to the individual model unit has lead to the realisation that the PSA can be used in the day-to-day operation and decision making processes at the plant in the areas like e.g.:

- Assessment of modifications (design, operation, testing, procedures, etc.)
- Tech specs issues (LCOs, AOTs, STIs)

- Operating and maintenance strategies based on risk minimisation
- Outage Risk Management
- Precursor Analysis
- Risk Profiles

These issues are primarily associated with calculating risk for a given plant configuration or its change. For it to change the risk it must eventually either change the value of the individual elements (basic events) in the PSA or the logic structure in which those elements are arranged. As calculating the risk of a new plant configuration using PSA risk model requires roughly person days, performing a risk assessment sometimes for hundreds of equipment outages, tests, and alignments required for some applications is thus beyond reach.

From that reason and in addition to completion of Temelín LPSA model, the decision has been made to extend the PSA Project and to implement a real-time risk calculation tool analysing both real and scheduled plant conditions for determining the impact of plant configurations and on-line maintenance on operational risk level - Safety Monitor™ 2.0

The major purpose of the Safety Monitor at Temelín is to provide an on-line measure of risk based on the current plant configuration and testing status so enabling the plant staff to plan and perform maintenance activities in such a way that safety is maximised, and at the same time unnecessary plant shutdown is avoided. It is clear that simply no plant would prefer to be uninformed about the risk associated with an upcoming change in plant configuration. The process of obtaining that information using PSA is so arduous that to evaluate every change would be virtually impossible and such evaluation would be only retrospective in nature. Prior to the Safety Monitor, calculating the risk of a new plant configuration using PSA would have required roughly person days. This level of effort made performing a risk assessment for each of hundreds of equipment outages, tests, and re-alignments using PSA beyond reach. Now the performance of such a calculation is performed in about 4 person minutes, so allowing the hundreds of calculations to be performed. As the model in the Safety Monitor is the same as the PSA model, in fact it contains more information on components than the PSA model, each calculation gives the exact PSA solution appropriate to the particular plant alignment..

It is expected that the Safety Monitor will be used extensively by the maintenance division in scheduling preventive maintenance activities, both at power and during refuelling. The planner can enter specified equipment outages several weeks in advance and if the calculated risk for these hypothetical configurations is high, then equipment outages can be rearranged within the schedule until the risk is sufficiently low. Similarly for operator personnel would definitely be an advantage to be informed about a risk associated with an upcoming plant configuration prior to such configuration is entered, including recommended limiting time to be allowed for such configuration or to provide risk reduction advise for such configuration. The intended use of Safety Monitor following the plant commissioning, in general form, is briefly summarised below:

- Provide an easy-to-use tool for operator/maintainer plant staff to obtain insights from the PSA without detailed knowledge of PRA techniques and terminology
- Provide a PSA-oriented tool for active influence on risk level of plant operation
- Provide a means to optimise safety within Technical Specifications constraints
 - Identify requirements that are too restrictive given their risk significance or
 - Identify Tech Specs required testing that might be adverse to the plant safety
- Provide a means to optimise planed maintenance activities through:

- Import of maintenance schedule into the Safety Monitor
- Risk profile calculation over the entire maintenance schedule
- Schedule adjustment/editing from acceptable risk level point of view
- Optimised schedule export back into the plant maintenance scheduler
- Provide history of plant configuration changes and component outages with associated risk levels.

AUSTRIA 34: Has a system been established to assure an efficient feedback of operational experience of nuclear power plants in other countries, especially WWER reactors?

As stated under paragraph 14.1.6. of the National Report, the operational feedback in the form of experience attained from operation of the nuclear power plants abroad has been used on systematic basis since 1991. The system of exchange and utilisation of these operational events has been broken down into five programs as it is stated under „External Events“ of the above mentioned chapter. The system has undergone its internal revisions and updates in 1994 and 1998. On these occasions, the updated documentation of the system has also been prepared. In 1997 and 1998 the system has been reviewed within the „WANO Peer Review“ and PHARE 1.01/95 project. These assessments came to the conclusion that, at present, the system of the external operational experience utilisation complies with all of the WANO criteria and represents an effective share on increases of safety and reliability in the Dukovany NPP.

The programs of WANO and IAEA serve here as chief information resources. They are under constant and systematic monitoring by the feedback teams for external operational experience. Information on operational events at foreign power plants are under registration, being conclusively interpreted with regard to their applicability in operation of the Dukovany NPP. Should this interpretation result in some proposed remedial measures for the domestic power plants, the system will follow their actual accomplishment.

In addition to the above international organisations, even an immediate exchange and co-operation between the power plants is utilised. For more effective utilisation of experience from operation of the VVER units the direct agreements have been reached with the Slovak power plants of Bohunice and Mochovce within which all fault reporting forms and technical approaches are exchanged regularly on monthly basis. A similar contract has also been made with the Russian Kola Power Plant. There is also very close direct co-operation with the power plants of Paks (Hungary) and Loviisa (Finland).

Within the limits of WANO, there is a Club of VVER-440/V213 Units Operator, founded in 1991. This Club organises its regular meetings (at least once a year) and the purpose is to exchange the operational experience and co-ordinate the procedures within the modification and upgrading programs, as well as those in the field of the IAEA safety-related findings for which the actual measures have to be taken and carried out.

AUSTRIA 35. Art 19: Is there a formal process of (a) deterministic, and (b) probabilistic analysis of operational events?

There is the only operated nuclear energetic installation here in the Czech Republic in the Dukovany Nuclear Power Plant with the following systems available:

a/ deterministic one,

b/ probabilistic one designed to analyse the in-operation events.

ad a/ To analyse the causes of these in-operation events, the methodologies of ASSET (Assessment Safety Significant Event Team) and HPES (Human Performance Enhancement System) are available to the NPP Dukovany with the goal to establish the direct and root causes of the events and propose the remedial measures preventing analogous events from repetitive occurrence. Utilisation rationale of the ASSET methodology has been validated by two ASSET missions performed at the Dukovany NPP. These have acknowledged the serviceability of this system. Concerning the HPES methodology, we have been made familiar with it by training held in 1998 within the PHARE project.

The most vital safety problems are being analysed according to the principles of these methods.

ad b/ On monthly basis the cases of equipment unavailability of the NPP Dukovany individual units were analysed with use of the Risk Monitor and contributions of the individual out-of-service facilities to this risk assessed. Yearly, the most vital cases of the equipment outages have been evaluated with regard to accumulated risk as well as the contributors to this total accumulated risk of the entire NPP. With respect to these assessments, the corrective measures have been proposed to improve this situation (reduce the risk) during scheduled maintenance and equipment tests. Observance of these proposals is under constant monitoring and evaluation.