# IMPLEMENTATION OF THE OBLIGATIONS OF THE CONVENTION ON NUCLEAR SAFETY IN LITHUANIA

## THE SECOND LITHUANIAN REPORT IN ACCORDANCE WITH ARTICLE 5 OF THE CONVENTION

2001

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# Article 6: EXISTING NUCLEAR INSTALLATIONS

*Each Contracting Party shall take appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.*

### 6.1. List of existing Nuclear Installations as defined in Article 2

Reported in Annex to 6.1

### 6.2. List of existing Nuclear Installations where significant corrective actions are found necessary by assessment, as relevant, under Articles 10 through 19

The same as in 6.1. Reported in Annex to 6.1

### 6.3. Overview of Safety Assessments performed for INPP during 1998 – 2001 and the major results of those assessments

#### *6.3.1. Historical and Regulatory Framework*

In the previous report the main activities of State enterprise Ignalina Nuclear Power Plant (below refer to as INPP) in 1993 – 1997 for safety assessment and improvement were considered.

INPP activity for safety improvement is based upon priorities to meet the modern requirements of national and international safety standards, upon results of the analysis, carried out in SAR-1, RSR scope, and includes additional calculations, fulfilment of VATESI guidelines, modifications, which improve the system reliability, thus providing the INPP safety.

Managerially this activity is fulfilled within the framework of Safety Improvement Program SIP-1 (1993-1996) and SIP-2 (1997-2005).

The first safety improvement program (SIP-1) was prepared by INPP in 1993-1996. It was the short-term program. It was financed by INPP resources, EBRD/NSA grants and western countries grants, mainly Sweden through Swedish International Project on Nuclear Safety (SiP).

The most essential INPP activity regarding safety improvement was the preparation of a Safety Analysis Report (SAR), performed by Western and Eastern research institutes. In addition to the SAR production, this particular project included the independent review of the safety analysis report (RSR) jointly by independent experts. Unit 1 of INPP was the subject of this assessment. However, since no significant differences were identified between Units 1 and 2, the results apply to both units. A complete set of SAR and RSR reports was submitted to VATESI in 1997. A Panel of international nuclear safety experts, Ignalina Safety Panel (ISP), made an assessment of the development process and scope of the INPP SAR/RSR.

Ignalina Safety Panel recommendations were submitted to the Lithuanian Government in written form in 1997. According to the recommendations (such as, to prepare Safety Case for Control and Protection System; Safety Case for Accident Localization System; Safety Case for Primary Circulation Circuit Integrity; Fire Hazard Analysis for all safety systems etc.) the plans were prepared and agreed with VATESI, taking into consideration the scope and schedules of the recommendations fulfilment, the competent organizations of scientific and engineering support were involved, necessary materials were prepared.

In particular SAR, RSR and ISP International Panel recommendations became the basis for a new Safety Improvement Programme (SIP-2) for the period of 1997 – 2005 years, which consisted of 185 activities totally. Additionally SIP-2 included: engineering activity for safety improvement and SIP-1 activities non-completed till the moment of SIP-2 preparation.

As the result of the prime additional safety cases submission, the conclusion was made: there are neither unexplored problems nor non-compliance with modern standards requirements, which could prevent the INPP Unit 1 operation.

On the basis of such extensive arguments the 5-year License was issued for the INPP Unit 1 operation.

Additionally, VATESI formulated the License affirmative conditions, which provide the gradual development of safety improvement issues, such as:

1 The INPP, being an operating organization, shall improve INPP safety, co-ordinate the license activity for nuclear energy facilities and monitor the performance of License affirmative conditions;
2 If any changes of Lithuanian Republic Law or any other legislation acts which regulates the safety of nuclear energy take place after modification or additional safety analysis performance, VATESI has the right to amend the License affirmative conditions;
3 If any changes of Lithuanian Republic Law or any other legislation acts which regulates the safety of nuclear energy take place, INPP is obliged to update the internal documentation in accordance with the amended documents;
4 On request of State Nuclear Power Safety Inspectorate, Health Ministry and Environment Ministry, according to their competence, INPP is obliged to submit all necessary information of INPP activity;
5 The corresponding institutions in accordance with their competence shall be informed and the updated information or new documents, listed in the application for License, in case of documents amendments shall be submitted to them.
6 The Lithuanian State Nuclear Power Safety Inspectorate can change the License conditions, can terminate or cancel the License, if INPP is ascertained like not performing the License affirmative conditions. The License is reinstated or the permission is issued for the Unit start after the appropriate safety justifications is submitted or the drawbacks are eliminated.
7 INPP shall be staffed with trained and qualified personnel in accordance with the regulatory documents requirements. The simulator shall be used for initial and continuous training of the Main Control Room operators.
8 INPP shall prepare, update and affile the safety-related documents in accordance with guides, rules and norms requirements.
9 INPP shall develop the quality assurance and safety culture programs.
10 In accordance with established order, INPP shall inform VATESI about normal operation failures.
11 INPP Unit 1 shall be shutdown if the fuel channels operation is inadmissible from the safety point of view owing to the gap state between channel and graphite stack.
12 INPP shall submit to VATESI the results of operation experience and the problems substantiation within the schedule of the License affirmative conditions. The problems important for INPP safety are: results and analysis of operational monitoring; personnel staffing, training, exams and qualification, use of operational experience, human factor effect; radiation impact to the personnel, public and environment, efficiency of quality assurance system and audit results; abnormal events at INPP; efficiency of INPP safety-related systems and components ageing control; implementation of safety culture improvement activity.
13 INPP shall proceed the safety improvement program SIP-2, in regard to INPP Unit 1. SIP-2 program (and its annual consecutive review) has the agreed schedule for the performance of each activity. Upon the recommendations it was agreed that some activity is less urgent, some needs more time for implementation, that is why not all SIP-2 activities were completed at the date of the License issue for Unit 1 operation. Nevertheless, it is VATESI requirement to keep

the schedule agreed in SIP-2 program.

14 INPP is obliged against time to perform and to develop the special plans and activity programs targeted in long-term perspective.

### *6.3.2. Summary of the Key Safety Cases, performed in 1997 - 2001*

The basic Safety Cases respond to the ISP recommendations, which require:

1 To perform the Safety Case for the structural integrity of the reactor cooling circuit;
2 To perform the Safety Case for the accident localization system;
3 To perform the Safety Case for the reactor control and protection system;
4 To develop and implement the emergency operation procedures and to improve the technical regulation.

Other important safety justifications are:

5 Safety evaluation and stress analysis with the graphite-pressure tube gaps exhausted (gripped pressure tubes) and transient induced by thermal stresses;
6 Seismic assessment of the refuelling machine;
7 Assessment of the problem with channel multiple rupture;
8 Shutdown reactor accidents analysis;
9 Effects evaluation of the net low voltage and frequency for preferred power consumption;
10 Effects evaluation of ageing process on the main safety-related systems.

#### *6.3.2.1. Safety Case for Reactor Cooling System*

The INPP was designed by norms of strength analysis for nuclear power plants, which were valid at that time. These norms were re-issued with additions and amendments in 1987 PNAE G - 7-002-86, confirmed by VATESI and currently they are valid in Lithuania. SAR and RSR recommend to perform the safety justification for reactor cooling circuit integrity to be sure in the system compliance with the modern criteria.

A structural analysis of the components listed below was performed, including a defects analysis during hydro-testing, ultimate design-basis earthquake:

1 Drum separators and their nozzles (down-comer nozzle and feed-water nozzle);
2 Group distribution headers and their nozzles (lower water lines (LWL) and ECCS/GDH connection nozzles);
3 LWL and ECCS/GDH pipes and their nozzles during a water-hammer event;
4 MCC collectors and pipelines with a diameter more than 300 mm (large diameter Dy800 pipelines, down-comers, feed-water pipelines, steam piping systems in the separator area, including the main steam pipes and steam collectors) and the water supply from the ECCS to GDH pipelines Dy150.

Strength analysis of the most components of the INPP reactor cooling system demonstrate their adequate reserve of strength and longevity in the event of hydro-testing and ultimate design-basis earthquake during normal operation.

#### *6.3.2.2. Safety Case for Accident Localization System (ALS)*

The accident localization system is the system of protective confinement, which protects workers, the public, and the environment from the radioactivity release in the event of a main circulation circuit rupture or actuation of a main steam relief valve or in the event of gas-steam mixture release during reactor channels rupture. The ALS also provides water for the emergency core cooling system during accident.

At INPP the main part of coolant circuit with radioactive materials is located in the leak-tight compartments in order to limit the radiation doze for the personnel and the public during normal operation and in case of design-basis accidents (even ultimate design-basis accident) with the rupture of coolant circuit, as well as to prevent the radiation release to the environment.

The ALS is a reinforced concrete building and the equipment set, intended to localize the effects of the design-basis accidents in the result of coolant circuit lines rupture. The ALS consists of: leak-tight compartments (reinforced blocks and lower coolant piping compartments), accident localization towers for released steam localization and heat exchanger and pump system.

It should be noted that INPP design is one of the most recent of the RBMK type reactors. This, together with purposeful safety improvement programmes, provides a better level of safety than that of other RBMK reactor plants.

ALS safety analysis caused an interest before outcomes issue of the INPP, financed by EBRD. An assessment analysis of INPP ALS compliance with the current rules requirements was carried out in 1996.

In compliance with the recommendations of the SAR, RSR and the International Panel Safety Panel a complex safety analysis was performed, including:

1 an assessment of system operation;
2 an assessment of operational experience;
3 an analysis of design-basis and beyond design-basis routs of the accident expansion;
4 monitoring of walls and slabs to confirm the quality of reinforcement and concreting ALS walls and slabs during INPP construction;
5 specification of chemical composition and mechanical characteristics of building reinforcement samples taken from ALS concrete structures;
6 investigation of ALS concrete quality during laboratory monitoring;
7 calculation of ALS thermal hydraulic parameters during ultimate design-basis accident (an accident with MCP header rupture with the back valve failure at one of GDH accident reactor half);
8 structural analysis of ALS during the ultimate design-basis accident – analysis of construction structures to sustain the maximum design-basis pressure;
9 methodology analysis of ALS leak-tightness assessment, applied at INPP;
10 the analysis of hydrogen explosion hazard during ultimate design-basis accidents (carried out by NIKIET and VNIPIET within the scope of substantiation of the symptom-oriented emergency procedures);
11 radioactive doses calculation at the border of a sanitary - protective zone (3km radius out of INPP) and their comparison with hygienic norms in force.

To ensure that radioactivity would not be released from the ALS into the environment and exceed the authorized limits, it was necessary to demonstrate that the walls of the ALS compartments could withstand the pressure rise, which occurs during design-basis accidents. The resolution of this problem was one of most important ALS safety case objective.

A non-linear analysis (NEPTUNE) of the structural integrity of the ALS showed that it would not be violated in the case of the ultimate design-basis accident.

For ALS Safety Case INPP involved Swedish and Danish experts, which performed the monitoring of a building structures by non-destructive testing methods. LEI specialists chose the particular monitoring places of reinforced wall and slabs most loaded during accident.

Besides, in the places indicated by the western experts, samples of concrete and reinforcement were taken, their parameters were defined experimentally in specialized laboratories of the Lithuanian Republic and qualified on compliance to standards requirements.

The database was created in the frame of the work, which includes information about the ALS buildings geometrical data and loading on walls and slabs sections, mechanical characteristics of the building structure materials.

The results of non-destructive monitoring allowed to assess the compliance of the actual ALS building structures to the design decisions. The calculation of the ALS structures actual integrity was carried out on the base of such an assessment and with the consideration of derived experimental data.

The calculations performed and the analysis of hydrogen explosion hazard during ultimate design-basis accident demonstrated that the concentration level of hydrogen in ALS during ultimate design-basis accidents would not reach explosion-hazardous values and they are not dangerous for the integrity of ALS building structures and ALS equipment.

The calculation of radiation dozes at the boundary of a sanitary - protective zone under the ultimate design-basis accident demonstrated that the radiation doses for population and staff will not exceed the established limits.

The INPP submitted the Unit 1 ALS safety analysis to VATESI, where the analysis was reviewed and assessed.

The major findings of the ALS safety analysis for Unit 1 are the following:

1 INPP ALS responds to the functional safety requirement and the ALS is expected to perform its function during all design-basis accidents with the high reliability.
2 All active components are tested with an acceptable frequency, according to agreed instructions and process regulation of INPP operation.
3 The inspection is carried out in sufficient scope and with an acceptable frequency.
4 ALS design allows the critical parts and components to be repaired both during shutdown and during normal operation.
5 The reliability values of the critical components demonstrates that the intervals between maintenance and tests are chosen so that reliability of these components is ensured.

Some non-compliance was found as the result of the ALS safety justification, elimination of which is unreasonable from the economical point of view, and the required safety level can be ensured in the presence of such a non-compliance.

The calculation results, non-destructive testing results, concrete and reinforcement experimental investigations have not revealed the considerable deficiencies preventing the further ALS operation of the INPP Unit 1. Therefore VATESI has issued the Licence in 1999 for INPP Unit 1 operation till summer 2004.

The License affirmative conditions were the fulfilment of activities, planned according to the recommendation of TSO and LEI experts.

The activities mentioned above were included into SIP-2 program, which is being gradually implemented at INPP.

Thus, the complex of administrative-technical measures is currently implementing at INPP in order to increase the ALS leak-tightness, that improves the quality of fault detection, maintenance and defects elimination monitoring of the ALS enclosure.

Air-tightness testing of an airtight enclosure is performed after the maintenance or components replacement influencing the air tightness and strength, if this component cannot be monitored locally. Air-tightness testing of the ALS enclosure at reduced pressure is performed annually at the beginning and at the end of maintenance.

In order to improve the ALS air-tightness of Units 1 and 2 by means of defects detection in the areas difficult of access and their further elimination, the Swedish specialists helped to select and obtain new thermovision, acoustic and other equipment. INPP personnel was trained and currently use the equipment successfully during the annual testing for ALS leak-tightness monitoring for Units 1 and 2.

The other activities are also being performed at INPP in order to improve the ALS safety in accordance with the recommendations.

*6.3.2.3. Safety Case for Control and Protection System – CPS/EPPS*

The CPS provides:

1 the automatic protective reduction of reactor power by 5%, without scram;
2 the automatic controlled emergency reactor power reduction to a safe level, in case of a local power increase;
3 the rapid automatic controlled reactor power reduction to a safe level, in case of failures in some equipment;
4 the automatic or manual emergency reactor shutdown;
5 the rapid automatic or manual emergency reactor shutdown.

Emergency Process Protection System (EPPS) provides the process control and monitoring function. The EPPS generates emergency shutdown signals which are transferred to the CPS.

To establish conformity of the CPS/EPPS to the requirements of the basic safety regulations an analysis of these systems was carried out. The highest level document regulating safety issues is "General Regulations for Nuclear Power Plant Safety". In "Nuclear Safety Regulations for NPP Reactor Facilities" the general requirements are established for the design of reactor plant systems, their characteristics and operating conditions are set. The requirements for actuators of control and protection system are presented in "Regulations for design and safety operation of reactivity control mechanisms".

As a result of the analysis a number of deficiencies against the requirements of the basic safety regulations were found. One of the main CPS deficiency is: the CPS performs two functions - reactor power control during normal operation and reactor shutdown during accident. The insufficient segregation of the CPS channels is noted; the CPS is unavailable to perform its protection functions in case of common cause failure, for example: fire in the CPS rooms.

The RSR recommended that a single failure analysis for existing CPS/EPPS should be prepared and submitted to VATESI for approval. Having carried out the analysis it was found that the “K” and “D” modules used in the CPS do not ensure sufficient isolation between the system channels and a single failure can effect on the availability of emergency protection to perform its function.

The proposal was made:

1 design and replace the K and D modules with the improved input of voting logic in order to provide the channels independence;
2 design and implement an additional protection system (DAZ).

It was also recommended that a second fully independent emergency shutdown system should be provided to ensure INPP safety during all design-basis accidents. INPP has accepted the requirement and the project is currently being implemented.

Compensation for the majority of the revealed discrepancies is achieved by implementation of the DAZ system. For elimination of other deficiencies, organizational and technical measures were introduced, for example, an increase of periodicity of the equipment testing.

To improve the safety of the control and protection system, the following measures were taken at INPP: the old K modules have been replaced with modules of new design meeting the single failure criterion.

Thus, one of main recommendations of the Safety Panel has been completed. Additionally, emergency procedures have been prepared for the event of a self-disconnection of the preferred power supply from the external power network, and turbine trip with vacuum loss (loss of main heat sink). The problem relating to the AZ-1 and FASS memory de-blocking (resetting) circuits has resolved and the assessment of the AZRT emergency signal delay at 40 s was performed.

All the recommendations were included into the Safety Improvement Program SIP-2.

Many of them have been completed. The Additional Protection system (DAZ) has been implemented and substantially increases INPP reliability. The following companies were involved: US Department of Energy, Northwest National Laboratory, Scientech, Inc., Science Applications International Corporation, the Foxboro Company, Baltic Industrial Systems, VITY and LEI. The DAZ system will shut down the reactor automatically in case of pressure increase in the drum-separator, MCP flow rate drop, and a temperature increase in the rooms of the CPS equipment, transferring the signal to servo-drive clutch power circuit for reactor shutdown by-passing CPS logic. The Safety Case for the DAZ system has been carried out, including ATWS analysis, single-failure analysis and the engineering assessment of the system. The project was independently reviewed by NNC representatives (UK).

In addition the following additional circuits for automatic reactor shutdown were developed and implemented:

1 low coolant rate through the GDH;
2 reduced operational reactivity margin (ORM);
3 rate of pressure change in the drum-separator ( $\frac{\Delta P}{\Delta \tau}$ ).

In order to monitor the reactor operation and its protection system more effectively, and to ensure the faster presentation and processing of operating information, the ICS "TITAN" data processing system of Unit 1 has been replaced with a new and modernised ICS; companies US Department of Energy, Energy systems Solutions, Western service Corporation and VITI were involved. Currently the ICS “TITAN” is being replaced at the Unit 2.

Thus, the analysis has established that the instrumentation, control and protection system basically meets the requirements of the Lithuanian regulations. The main deficiency is the absence of a second independent reactor shutdown system. The installation issue of such a system for Unit 2 is included in SIP-2, and implementation is planned for 2003. The lack of such a system is currently compensated for by the installation of the DAZ system.

PMU is established at INPP for Unit 2 Diverse Shutdown System (DSS) Project management. The European Commission placed the contract with NNC , UK to manage the Project. The DSS Project is financed by EC. The PMU prepared the Tender Dossier for Main Contractor selection. The Technical Specification is included into the Tender Dossier. Call for Tender is scheduled for September, 2001. The deadline of DSS Project implementation is scheduled for the end of 2003.

*6.3.2.4. Fire Hazard Analysis (FHA)*

The Terms of Reference to examine and assess the fire protection of Unit 1 rooms equipped with the safety system components (totally 531rooms) applied to shutdown the reactor and cool down the core as well as to prevent the excessive radioactive release to environment was issued to complete the Fire Hazard Analysis. Following the consideration of VATESI it was decided to extend FHA by incorporating the results obtained from the second stage of FHA implementation, which was to include

the examination of the rooms equipped with the safety-related and normal operation systems, fire hazardous rooms and etc.,

The experts from VNIPIET (Russia), SYKON (Sweden) and AEA-Technology (UK) were involved to prepare and implement the first stage of FHA.

The basic principles of fire protection specified in the IAEA Guidelines «Fire Protection in Nuclear Power Plants» 50-SG-D2 (Rev.1) was applied to complete the first stage of the Fire. Hazard Analysis.

The first stage was complete in 1998. It was concluded that the systems installed to shutdown the reactor, remove the heat decay and prevent from excessive radioactive release to environment are reliable

It was documented to prove that the fire occurred in any rooms specified in FHA does not effect the safe operation of Reactor 1. The possibility to safely scram, cool down and control the reactor conditions in all the above events applying the safety or normal operation systems remained available is provided.

Based on the results obtained from the implementation of the first stage of FHA it was recommended to improve the fire protection in NPPs. The activities (to be implemented from 2001 to 2004) to improve the fire protection as much as to make the NPP fire protection measures to conform to the applicable standards of Republic of Lithuania and international standards were developed. The activities were specified to be complete until 2004. The activities include replacing the doors of the safety system components with the doors of high fire resistance, replacing absolete equipment and installing the updated fire fighting systems, fire alarming systems, floors and stairway flights made of non-combustible material and laid along the escape routes, installing the fire dampers in the ventilation systems, covering metal structures and electrical cables with fire retardant applications, etc.,

The First Stage Fire Hazard Analysis was one of the documents to be submitted to VATESI to license Unit 1.

The second stage of FHA for INPP Unit 1 (FHA1/2) was implemented to comply with the requirement of INPP Unit 1 Operational License.

The primary task of FHA is to analyse and conclude the available fire protection measures with reference to nuclear safety of INPP and documentary demonstrate that the available fire protection measures based on the data, results and conclusions obtained from the first and second stages of FHA ensure the nuclear safety of INPP Unit 1.

The Fire Hazard Analysis 1/2 for INPP Unit 1 has been implementing since January 2001. The main executor is LEI and the main consultant is SwedPower (Sweden).

The second stage of FHA 1/2 comprises the consideration of the additional protection systems, issue of the total list of the rooms to be included in FHA1/2 (rooms equipped with safety system components, rooms adjacent to the above ones, rooms of high fire load). The data obtained from the analysis of 1100 rooms has been compiled, the data base for 1600 rooms (including the rooms analysed during the first stage of FHA) has been prepared and 531 rooms equipped with safety system components have been subject to preliminary selection to comply with the fire protection requirements.

1) *6.3.2.5. Developing and implementing Emergency Operating Procedures and upgrading technical specifications*

In the event of emergency the INPP operating staff apply to the emergency operating procedures, which specify the instructions on how the staff should act in the emergency conditions (accidents) defined by specific scenarios. The emergency procedure is applied in the event of deviation from the operating limits, namely, when the initial event is identified. The objective of the emergency operating

procedures is to restore the nuclear power plant to the normal operating condition, prevent accidents or mitigate their consequences. The advantage of the emergency operating procedures is that that they contain the initial event symptoms (it is essential to identify the event), which are clearly identified and clear instructions for identifying the initial event and specifying what actions should be taken then.

However, the experience of NPP operation for recent decades has proven that many combinations of potential failures occurred during the emergency condition cause the innumerable potential emergency scenarios for which only mostly general compensating measures can be defined in advance. In the event of accidents the operating staff must clearly identify the initial event and select the specific strategy from the previously prepared ones to control the emergency situation. This appears to be rather difficult. As the operator not always manages to clearly identify the initial event, such procedures are not easy to apply.

In 1994 a group of western experts in the framework of “Lisbon Initiative” (responsible for upgrading of technical documentation, organization and operation of NPP on the basis of experience obtained from the operation of eastern and western nuclear power plants) commenced developing the new symptom-based emergency procedures, which are based not on identifying initial events but on available general parameters of the Unit, i.e. reactor status and Unit in whole. Since it is sometimes difficult to identify the initial event or the wrong action results from its, (failure of the facility or loss of event control), the operating staff is provided with the strategy to control the reactor under any sort of accidents to ensure the specific safety objectives. With reference the initial events reviewed and not reviewed in the design the symptom-based Emergency Operating Procedures are assigned both to design-basis and beyond design-basis accidents. This provision is fit for the requirement specified in the modern international standards. It is evident that both emergency operating and symptom-based emergency operating procedures are required to apply to make the actions of operating staff most effective. The primary actions to be taken in compliance with symptom-based EOPs are to stabilize the reactor within safe operating limits and, after the initial event are clearly identified, to apply the emergency operating procedure. Both these procedures are compatible since the operating staff must maintain the specified critical safety functions by applying the available engineering applications.

To comply with these approved critical safety functions, five symptom-based emergency operating procedures and support procedures have been issued. They appear as follows:

1 Symptom-based EOP-1. Reactor shutdown,
2 Symptom-based EOP-2. Subcriticality.
3 Symptom-based EOP-3. Heat removal,
4 Symptom-based EOP-4. Reactor cavity protection,
5 Symptom-based EOP-5. Localization of coolant leakage.

The current operating staff have been trained and certified to be able to apply the symptom-based EOPs. The scope of procedures required to be known has been specified. This requirement also refers to the staff responsible for engineering support of the Plant.

Additionally, the following activities were originally planned and then completed:

1 The Technical Specifications which are more "friendly" to the plant staff were issued;
2 In compliance with the results obtained from the accident analysis, a minimum number of available ECCS pumps changed and the changed number was included in the Technical Specifications.
3 The safety limits and safe operation conditions were reviewed to comply with SAR;
4 The maximum content of decay products permitted to be present in the coolant was reduced. This will sufficiently minimize radiological effects in the event of coolant loss accidents.

The updated Technical Specifications have been amended to comply with the requirements specified in the applicable standards and has become maximum friendly to the Plant staff.

1) *6.3.2.6. Assessment of Safety, Analysis of Stresses occurred during closure of gap between fuel channel and graphite column and processes caused by thermal stresses*

The fuel channel requirements are specified in the document issued by VATESI "In-Service Inspection Requirements and Safety Case for Fuel Channels, Control and Protection Channels and Graphite Column of INPP RBMK-Reactor" VB-E-07-2000.

The closure of the gap between the fuel tube and graphite column is assessed to comply with the following criteria:

The closure of the gap between the fuel tube and graphite column (further referred to as the process gap), which may occur over any period of the licensed operation is considered impermissible.

The gap closure is an overall contact between the fuel tube, graphite rings and graphite column the length of which is at least 200 mm along the axis of the fuel tube.

Based on the results obtained from the closure gap inspection held during the in-service inspection, INPP should demonstrate that the probability of gap closure in at least one channel will not exceed 0.95 during the next VATESI licensed period of operation of INPP.

The hydro-thermal and structural safety analysis for a small number of channels with closed gaps was carried out in INPP Unit 1.The results obtained from the hydro-thermal analysis showed that the closed gap does not effect the inner surface of the fuel channel wall while the temperature of its outer surface increased by 20-25$^{o}$C. It was demonstrated that under normal operation and in transients, the closed gap between the fuel channel and graphite column does not affect the safety criteria. The probabilistic analysis of gap closure between the graphite column and fuel channel was based on the results obtained from measurements of internal diameters of graphite blocks and diameters of fuel channels taken in INPP Unit 1 in 2000. Based on these measurements LEI estimated that the probability of gap not closure by 2002 would is 0.97. New measurements and consequent analysis of gap closure are scheduled for 2002 outage.

1) *6.3.2.7. Seismic reliability of refuelling machine*

The in-depth seismic assessment of refuelling machine and support structures of crane routes in the Reactor Hall was carried out by the experts of the Central Designer Office of Engineering Industry. The results obtained from the analysis demonstrated that the metal structures of the bridge, trolley, trusses, container and protective cover of the refuelling machine meet the seismic requirements and are capable of withstanding seismic affects without breaking structural integrity. Thus, the dropping of structures of the refuelling machine onto the core is not expected.

*6.3.2.8. Assessment of multiple pressure tube rupture*

In compliance with Unit 1 SAR the assessment of the capability of the design and updated high pressure protection system of the reactor cavity (RC) to withstand the rupture of pressure tubes of RBMK-1500 reactor was complete. It means that the integrity of the reactor cavity must not be disturbed. The High Pressure Protection System (HPPS) removes the steam and gas mixture from the reactor cavity to the Accident Localization System (ALS) where the steam is condensed in the condensate pools while the gas is released into the volumes of ALS. The Safety Analysis implemented in compliance with the Safety Analysis Report (SAR) indicated that the High Pressure Protection System improved in 1996 allows increasing the capacity of the System 2.5 times. This modification ensures releasing the steam into ALS in the event of the rupture of 9±4 pressure tubes in the reactor cavity and 25 ± 12 pressure tubes when the pressure in the Primary Circuit is equal to 4 MPa.

The uncertainties of the results obtained from calculations (≈±50%) are due to uncertainties of deformation of the graphite column following the fuel channel rupture and, consequently, uncertainties concerning the area of the graphite column surface, which will be in contact with the running water as

well as with the accumulated heat, which will evaporate this water. If the deformation of the column remains insignificant (slight), the flow rate of the steam and water mixture will be «isotropic», and the full evaporation of the water (100%). is possible. If the graphite column deformation causes forming vertical channels, the released water will be immediately removed outside and the additional water evaporation (due to accumulated heat) will be minor. Therefore, the range of steam generation in the reactor cavity can be very extended (approximately from 30% to 100%).

The RSR recommended continuing the study to reduce the uncertainty concerning the capability of HPPS in the event of the multiple tube ruptures.

In 1999 NIKIET completed the work recommended by RSR, namely, Analysis of the Reactor Cavity High Pressure Protection System, the objective of which was to reduce the uncertainties obtained from the previous calculations.

Based on the specified calculations made with the state-of-the-art code «VSPLESK», the limits for the capacity of the RBMK-1500 HPPS were amended and approved:

1 $9 \pm 3$ pressure tubes when the Primary Circuit pressure is equal to 7 MPa,
2 $52 \pm 16$ pressure tubes when the Primary Circuit pressure is equal to 2 MPa.

*1) 6.3.2.9. Analysis of Accidents on shutdown reactor*

The primary issues raised to analyse accidents occurred on the shutdown reactor include the problem of possibility to heat-up the fuel elements when the core is subject to empting and the reliability margin of the safety systems is assessed in whole.

While implementing the analysis of accidents on the shutdown reactor the worst failures, rupture places and condition of the reactor cavity before rupture were selected. In compliance with the calculations the additional limits were determined to perform the shutdown reactor activities. All the recommendations were considered in the operating procedures.

*1) 6.3.2.10. Assessment of Consequences Resulted from low voltage and electricity frequency for in-house consumers*

The analysis of performance of in-house facilities in the event of voltage and frequency alteration was complete. The analysis specified the minimum voltage and frequency indications for pumps, fans and valve drives of safety systems. Additionally, the potential scenarios of INPP operation and energy system, potential emergency switching-off of the turbine generators or reactors were reviewed and the events, which may ultimately affect voltage and frequency of the in-house buses were determined.

The demonstration that the safety functions are initiated in all events was provided. However, to ensure more reliable performance of the safety system facilities without any reference to the electricity system conditions, INPP implemented some modifications. The modifications were intended to complete the second stage of the start-up and to connect the diesel generators to uninterruptible power supply facilities in the event of voltage dropping in the outside power supply source and to increase the setponts for start-up frequency and switching-on the diesel generators.

*1) 6.3.2.11. Assessment of ageing and its impact on safety-related systems*

To secure, detect and mitigate the ageing of the equipment components referring to the safety-related systems, foresee or/and identify the time when the components have deteriorated so much that can be hazardous from the point of the required safety margins and the corrective actions are to be taken then, INPP in coordination with VITI and Central Research Institute of Metal Inspection “Prometei” has developed the Programme to control the ageing of components of the safety-related systems.

The Programme includes the conception for the equipment ageing control adapted to the

organizational chart of INPP and specifies the communication ways with the outside organizations dealing with ageing issues.

Based on the results obtained from the analysis of ageing of components of thermal and mechanical equipment of the safety-related systems, the components the ageing of which restrict the lifetime of the plant have not been identified. All selected components are under normal operation and their ageing is controlled and monitored. The selection of the components, which ultimately may raise the potential risk was carried out based on the calculations obtained from the model of PSA of Phase 4 of BARSELINA.

Based on the analysis for ageing of the components of electrical equipment, control and instrumentation equipment it was concluded that the affect of the current component ageing does not have any impact on the safe performance of the electrical and engineering systems as well as the control and instrumentation equipment. All examined components are under normal operation.

To implement the Ageing Programme the following was developed:

*1* Charts to control ageing of the selected components of the safety-related systems;
*2* Recommendations to adjust the monitoring programmes and maintenance programmes;
*3* Programme to study the metal of the Reactor 1 pipelines was developed and the appropriate activities were implemented;
*4* Programme to control the metal degradation caused by intergranular corrosion.

*1) 6.3.2.12. Probabilistic Safety Assessment of INPP*

*PSA, Level 1*

The Probabilistic Safety Assessment Project for INPP Unit 2 commenced in 1991.

The PSA was applied to support and define safety priorities, for instance, to develop two programmes on safety improvement. They were SIP-1 and SIP-2.

The full-scope model of PSA of Level 2 for Unit 1 was first developed in June 1994. The objective was to identify the possible ways for safety improvement. In September1996 the model was updated to comply with the modifications installed in INPP, the modelling methods were improved by applying the additional INPP data. In 1998 the necessity to to comply with the requirements for follow-up improvements of INPP equipment and modelling methods as well as for developing PSA of Level 2 raised.

The INPP PSA Group includes 3 INPP experts and is supported by specialists of Lithuanian Energy Institute (LEI) and experts of Sweden.

The frequency of the core damage identified in 1998 is lower than the results of 1996. It is a result of the installed modifications of the Plant equipment as well as the updated modelling, which allowed reducing the conservatism. In compliance with the results obtained from Phase 5 the core damage frequency is lower that the Lithuanian standard 1E-5 approved for a reactor per a year. The low frequency reached by applying the updated model caused the necessity to assess the consequential risk of the initial events, which earlier had not been included in the scope of study, rate of power and rate of detailing. It was identified that some events, which had not been considered by the model, could become the dominant contributors and, therefore, needed further studying.

The independent group of PSA experts (IPSART Mission) of IAEA carried out the review of Unit 2 PSA in June 2000. The review was complete in close cooperation with the experts of INPP PSA Group and under supervision of VATESI. The recommendations issued by IPSART Mission contributed sufficiently to further development of the PSA model.

The most essential comments provided by the Mission related to the model scope and restrictions. It was responsive to the experience of the PSA Group. It meant that in order to substantiate those low frequencies received 5 it was required to carry out some additional activities.

The last issue of PSA Level 1 Final Report includes the results obtained from the implementation of the IPSART Mission recommendations. The complete work has strongly demonstrated that PSA for INPP is true and useful.

*PSA, Level 2*

The PSA of Level 2 was complete in summer 2001.

The results of the PSA showed that the frequency of severe releases of radionuclides is adequate to the core damage. The reason is that the reliability of ALS functions has never been assessed in PSA of Level 1 in the process of successful core cooling after LOCA. The PSA of Level 2 considered the possibility of rupture of ALS structural integrity and consequential ECCS failures.

The frequencies for all-important scenarios for severe accidents are at the limits of real values, which can be assessed applying the methods of PSA and at level $10^{-7}$, which contributes some uncertainty to the result.

The obtained results have been still demonstrating the efficiency of improvements implemented in INPP, for instance, the newly-installed system DAZ to scram the reactor, the new scram signal and initiation of ECCS in the event of low flow rate through GDH and new, more reliable MSR valves. These improvements have sufficiently reduced the frequency of the core damage that occurs during the early and medium stages of the accident propagation.

The structure of PSA of Level 2 and model were developed and the appropriate calculations were made. This is a basis for considering and putting forward the priorities, which will be applied to in future for further operation improvement of both INPP and PSA model.

The frequency of severe releases is once every 200-500 thousand years. These figures are put at the border of the PSA data truth since the results have been mostly obtained from PSA of Level 1.

The obtained results demonstrate the efficiency of some improvements implemented in the Plant, for instance, reduction of frequency of scenarios for «postulated transients without the reactor shutdown» (ATWS) and accidents caused by loss of flow rate.

Nevertheless, the results received require to make the follow-up efforts. They are as follows:

Implementation of clear emergency procedures for decreasing high pressure in the Primary Circuit and supplying the cooling water at low pressure if the whole long-lasting emergency core cooling system fails to initiate.

The further study of the effects, which can affect the leakage frequency and its volume. This will help to give more realistic interpretation of scenarios of some accidents.

AEA-Technology (Great Britain) carried out the independent review of PSA of Level 2. It was recommended to clarify and improve the substantiation of some results, but the main conclusions were not subject to commenting. The experts of PSA Group accounted for the review comments and the appropriate documents were updated.

The review of IPSART Mission and AEA-T improved sufficiently the content of PSA. The consideration of the comments allowed applying to the PSA to justify the opinions when the plant safety issues are discussed and further solutions are to be taken.

The updated issues of PSA of Level 1 and Level 2 will be reviewed during the next mission of IPSART to be held in October 2001.

The implemented work complies with the VATESI requirements the objective of which is to support and implement at INPP the "living" PSA.

The results of PSA of Level 2 demonstrate that the Accident Localization System (ALS) can cope successfully with consequences of design-basis accidents but cannot be considered as the additional safety barrier for the beyond design-basis accidents that lead to the state "Accident". It means that the probability of severe release is compared to the frequency of the core damage.

The frequency of the core damage is less than1E-5 and this result is similar or even lower than the similar results obtained in many western NPPs. This is justified by the specific peculiarities of the reactor like low specific power, high heat capacity, back-up of engineering safety systems and their independence (separation).

INPP is not equipped with the full-scope containment as most western NPPs. But the reliable safety barriers help preventing from the core damage, which allows keeping the severe releases to 1E-6 per year as the appropriate IAEA standards specify.

1) *6.3.2.13. Preparation of Safety Analysis Report for Unit 2 (SAR-2)*

To comply with the requirements of VATESI INPP shall get the license on continued operation until late 2003. One of the primary documents to obtain the license is the Safety Analysis Report for Unit 2 – SAR-2.

To perform this analysis the Guidelines on preparation of the Safety Analysis Report for INPP Unit 2 was developed and approved. The Safety Analysis Report for Unit 2 of INPP will be carried out with reference to the conditions of the Unit as of the end of 2000 (The Report will include the installation of DAZ in Unit 2, diverse reactor scram systems in the event of low flow rate in one of the GDH, low reactivity margin, depressurisation rate dP/dt in the drum separators, new algorithm for ECCS and the other performed safety improvements).

The objective of the safety analysis to be provided for Unit 2 is to determine to which extend the available safety analysis is valid taking into account the real conditions of the Unit following the implementation of the improvements recommended by the previous analysis.

Thus, the following objectives shall be reached to complete this task:

The results and conclusions of the Safety Analysis Report will be taken by VATESI as primary ones to come to the objective solution on issuing the operation license for INPP Unit 2.

The results and conclusions of the Safety Analysis Report will be primary for the governmental organizations of Lithuania when they have to take the decision on the priority for investing to improve equipment, to maintain and upgrade the safety, to comply with the applicable national and international standard documents.

1) *6.3.2.14. Other programmes*

Additionally, the INPP safety analysis documents include the implementation of the following activities:

1 Analysis of the accidents cause by the equipment failures which were not incorporated in SAR;
2 Analysis of events occurred in the core with the erbium fuel;
3 Safety case for the setpoints of early shut-down and actuation of ECCS (low flow rate in one of GDHs, low reactivity margin and depressurisation rate in drum separators)

4 The additional analysis of the expected transients without actuation the scram function;
5 Long-term analysis of accidents including accidents occurred on the shutdown reactor due to internal and external events;
6 The development of strategy to prevent from stagnation of flow rate in the event of loss coolant accidents and the others.

The above assessments are considered the most important ones and their implementation and recommendations issued to execute the assessments have put forward the additional objectives and tasks for INPP in the field of safety improvements. All important recommendations have been additionally incorporated into SIP-2 Programme and INPP must continue the implementation of the activities of the Safety Improvement Programme SIP-2. The Programme SIP-2 (and its further annual reviews) includes the exact dates fixed to complete every activity approved by VATESI. When the recommendations were issued, it was considered that some activities are less urgent; some need more time to be implemented. In spite of this, VATESI requires from INPP to strictly follow the time schedule specified in SIP-2 Programmes.

### 6.4. Overview of INPP safety improvement programmes

#### *6.4.1. Overall review of INPP Safety Improvement Programmes for a period of 1997-1999 (SIP-2)*

In 1997-1999 the integrated INPP Safety Improvement Programme No.2 (SIP-2/1997), was based on:

1 SIP-1 experience;
2 SAR and RSR recommendations;
3 Recommendations issued by EBRD Safety Commission;
4 Engineering improvements identified by INPP or proposed by the western party;
5 Activities to develop management and organization, which commenced at the time of SIP-1;

As of late 1999, 118 plant activities and 12 activities planned only for Unit 1 of the total 160 activities were complete in their full scope in the framework of INPP Safety Improvement Programme No.2 (SIP-2/1997).

The most important were as follows:

1 The construction of the Spent Fuel Storage for CASTOR and CONSTOR was complete;
2 The computer complex «TITAN – SAIC» was installed in Unit 1;
3 3 batteries were replaced in Unit 1;
4 3 additional protection systems were installed in Unit1:
- GDH Low Flow Rate and Low Reactivity Margin;
- DAZ;
- The system for early shutdown of the reactor and actuation of ECCS in the event of PC and steam pipeline ruptures (DS depressurisation rate signal).

1 The improvement of AFWP system that included the installation of a flow limiter at the inlet of the Unit 1 pumps was complete;
2 The reserve scheme for cooling sealing of Unit 1 ECCS pumps was installed;
3 The Primary Circuit and ALS safety case was implemented;
4 The first stage of INPP Fire Hazard Analysis was complete;
5 The seismic assessment of a number of components of the safety-related systems was implemented;
6 The assessment of consequences for in-house consumers in the event of dropping of voltage and electricity frequency was complete;
7 The assessment of ageing impact on the primary components of safety-related systems was complete;
8 The engineering assessment of the main steam gate was implemented;
9 The analysis of rupture of the emergency feed water pipeline occurred during the start-up of the reactor was complete;

10 The capacity of the drainage system installed in the rooms of drum separators and the others was analysed.

### *6.4.2. Safety Improvement Activities held at INPP in 2000 (SIP-2/2000)*

The INPP Safety Improvement Programme (SIP-2/2000) comprised 70 activities, which were planned to implement within the time from 2000 to 2005 and was based on the following:

2 Activities remained incomplete under the INPP Safety Improvement Programme No.2 (SIP-2/1997);
3 Activities included in the «Plan for Developing and Improving the Safety Case for INPP Emergency Core Cooling System», code ПТОмр-0344-11;
4 Activities included in the «Plan for Implementing Recommendations based on ALS Safety Case for INPP Unit 1»;
5 Activities with reference to «Dropping of Voltage and Frequency Issue»;
6 Activities included in «Programme for Ageing Management and Assessment of Ageing Impact of Electrical Equipment and Elements of Control and Instrumentation Equipment on INPP Safety»;
7 Activities defined in the document «Development of Programme for Control Ageing and Analysis of Ageing Impact of Thermal Equipment and Pipelines of Safety-Related Systems and Amendment of INPP Maintenance Programme;
8 Activities included in the conditions required to be implemented in compliance with the Unit 1 License No.12/99;

1) The following 12 activities of INPP Safety Improvement Programme (SIP-2/2000) were complete in 2000:

1 Replacement of 4 batteries in Unit 1;
2 Development and implementation of activities on protecting the reactor hall from high hydro-testing (pressure testing);
3 Improvement of AFWP System including the installation of flow limiters in the inlets of Unit 2 pumps;
4 Development of the design and installation of the reserve scheme for cooling the sealing of ECCS in Unit 2;
5 Development of the additional computer complex «Prognoz» to support the code for planning the overloading;
6 Development and fabrication of the Typical Replaceable Elements (TRE) of C&P System to replace the available ones;
7 Determination of strength of Steel 08X18H10T to withstand cracking;
8 Determination of strength of Steel 20 and Steel 22K to withstand cracking;
9 Implementation of investigations to identify the crack increase rate caused by IGSCC (Intergranular Stress Corrosion Cracking under Pressure) in the austenite materials;
10 Implementation of calculations for changing in temperature of FC and what consequential loads it causes to the FC walls in the event of spurious ECCS actuation;
11 Development of the control programme for metal degradation caused by the Intergranular Stress Corrosion Cracking;
12 Implementation of the assessment of cross trusses reliability of ALS based on the additional monitoring required when the final conclusions are issued.

The below 4 activities planned under the Safety Improvement Programme were complete. In future the work will be implemented to comply with the procedures applicable at INPP:

1 Implementation of the safety policy and safety culture improvement at all INPP levels (The development of the Programme for improving the safety indicators with the specific measured objectives based on the above policy);

2 Implementation of the planned programme on checking and amending most important documentation on operation and maintenance;
3 Development and implementation of Quality Assurance Programme;
4 Improvement of management of radiation protection by providing regular and overall checking of the current procedures and tasks and by determining new approaches to management, which will allow demonstrating high consideration of this issue.

The following 2 activities were excluded from SIP-2 2000 ÷ 2005 since:

1 The implementation of the activity «Application of fire resistant material on metal structures in cable risers» - is included in «Fire protection consolidated activities for 2001 – 2004 to be implemented at INPP»;
2 «Implementation of analysis of accidents when MSRV long fails to close. Implementation of sensitivity analysis taking into account the additional failures of the cooling system» - are intended to include in «Safety Analysis Report for Unit 2 (SAR-2)».

The following 3 activities are to be implemented under the decommissioning projects for Unit 1:

1 The construction of an intermediate spent fuel storage, modification of transport routes for nuclear fuel to make them fit for the Unit 1 closure arrangements;
2 Extension of capacity of the available Spent Fuel Storage up to 72 storage places;
3 Development of the design, procurement of the equipment and installation of the facility for combustion of solid radioactive waste.

***Table 6.4.2. SIP-2 Financing.***

| | Including: | | | | |
|---|---|---|---|---|---|
| | Own resources | National budget/ privatisation fund | Credit | EBRD | Foreign assistance * |
| **1997** | | | | | |
| 112.555 | 26.333 | - | 31.610 | 46.710 | 7.912 |
| **1998** | | | | | |
| 80.475 | 23.960 | 19.985 | 13.680 | - | 22.850 |
| **1999** | | | | | |
| 36.261 | 1.083 | 16.206 | - | - | 18.972 |
| **2000** | | | | | |
| 69.824 | 35.232 | 3.747 | 12.700 | - | 18.145 |
| **2001** | | | | | |
| 44.649 | 25.216 | - | 16.016 | - | 3.417 |
| 343.764 | Total at 2001-08-01 | | | | |

- - estimated value

### *6.4.3. Planned activities improve safety*

Summary of safety issues of concern identified earlier, and planned future activities to address those issues, including, where appropriate, measures of international co-operation.

In 2001, a new version of the Safety Improvement Program, SIP-2/2001, was issued, from which there were excluded already implemented measures, and also included additional measures – recommendations that appeared after carrying out safety analysis of the INPP systems.

By the end of 2005, the following is planned at INPP:

- Implementation of the second Diverse Shutdown System at Unit 2;
- Establishment of SF Transportation Facility from Unit 1 to Unit 2;

- Design, equipment purchase and installation of Cementation Facility for ion exchange resins and slurry;
- Installation of small leak detection systems in rooms where PC, feed water and live steam lines are located;
- Implementation of a new radioactive waste management system for the 1, 2, 3 waste group;
- Implementation of new maintenance techniques for works with large dose rates.

To complete the Program SIP-2/2001, which is planned to be fulfilled by the end of 2005, it will require about 250 MLt.

### 6.5. Position of Lithuania as to further operation of INPP

#### *6.5.1. Unit 1*

On 5 October 1999 the Seimas of the Republic of Lithuania adopted the National Energy Strategy which states that *"…Unit 1 shall be shut down before 2005 taking into account conditions of the essential and long-term support from the European Union, G7 countries, other countries and international financial institutions"*. Considering the current economic and political situation in Lithuania at that time, on 2 May 2000 the Seimas of the Republic of Lithuania approved the Law on the Decommissioning of Unit 1 at Ignalina NPP, which says that *"the preparatory activities for the decommissioning of Unit 1 at INPP shall be finished before 1 January 2005. The exact date for the final shutdown of Unit 1 at INPP shall be decided by the Government of the Republic of Lithuania having considered the implementation of the Decommissioning Program and Decommissioning Plan and the possibilities of its further financing from the Republic of Lithuania and international financial assistance sources."* The date for the shutdown of Unit 2 had to be decided in 2004.

#### *6.5.2. Unit 2*

*6.5.2.1. History of Safety Assessment*

The INPP is unique among all RBMK type reactors in the scope and comprehensiveness of international studies, which have been conducted to verify its design parameters and analyse its level of risk. Right form the start, when Lithuania assumed control of the INPP (after the demise of the Soviet Union in 1991) the plant, its design and operational data has been completely open and accessible to western experts. Most states having significant nuclear expertise contribute effective assistance for evaluation of safety level of the INPP. As a consequence, the information and conclusions about safety level of the INPP are based on a number of very exhaustive large-scale international studies, which includes the following:

**BARSELINA (1992-present)** – level 1 probabilistic safety assessment of the INPP conducted by Sweden, Lithuania and Russia. At different stage of the project this study has been reviewed by USA (1994) and IAEA (2000) experts.

**SAR (1995-1996)** – first Western-style safety analysis for any Soviet-design NPP. Specialists from the INPP, Russia (main RBMK designer RDIPE), Canada, UK, USA and Sweden contributed. The SAR team supported the INPP management convincing that (1) an adequate safety case for continuing operation of plant had been demonstrated; (2) the safety case would be adequate to the point of first gap closure, which will be the lifetime limiting factor; and (3) the plant's safety standards and practices had been assessed and recommendations for improvement had been made and accepted by INPP. A significant conclusion stated in the SAR is that none of the analysed safety concerns require the immediate shutdown of the plant.

**RSR (1995-1997)** – an independent review of the SAR, which was performed by Western (France, Germany, Italy, UK and USA) and Eastern (Lithuania, Russia) experts. The RSR team agrees with almost all the SAR team's recommendations for improvement and made some additional

recommendations. They, however, were not able to agree that a fully adequate safety case had been demonstrated and gave a set of recommendations both on the additional analyses and safety improvement measures to be implemented. These recommendations formed a basis for the INPP's Second Safety Improvement Program (SIP-2) approved in 1997.

**Safety analyses recommended by SAR, RSR and Ignalina Safety Panel (1997-1999)** - these analyses had been conducted by Lithuanian or Russian experts, but had been independently reviewed by Western experts, mainly by experts from former RSR team.

**Level 2 Probabilistic Safety Assessment of the INPP (2000-present)** – this study had been conducted by joint Lithuanian-Sweden team and reviewed by UK experts. IAEA IPSART mission to review this study is scheduled for October 2001.

The noted studies provide a verified, state of the art knowledge, which makes it possible to assess the present level of plant safety, to compare this level with other plants as well as to plan improvements in the plant hardware and operational procedures, which would enhance the level of safety. SIP-2 program is almost completed, except an implementation of Diverse Shutdown System at Unit 2. Note, that INPP is the only RBMK plant, which not only developed such a comprehensive Safety Improvement Program, but also implemented it.

*6.5.2.2. Gas gap closure safety concern and non-retubing of RBMK-1500 reactors*

In accordance with the Nuclear Safety Account Agreement, Lithuanian authorities agreed that operation of both units at INPP would not be extended beyond the time when the reactor pressure tube have to be replaced. There are two reasons for re-tubing of the RBMK reactors – if gas gap between pressure tubes and graphite bricks are exhausted or pressure tube lifetime is ended. Usually it is assumed that first reason is most limiting and gas gap is exhausted in about 15-20 years of operation. This is completely true for RBMK-1000 reactors. As to RBMK-1500 reactors, the picture could be quite different because of non-linear graphite behaviour and fact that graphite temperatures in RBMK-1000 and RBMK-1500 reactor are significantly different. Having the reason to monitor the process, VATES was established success criteria for gas gap non-closure probability in any channel. This approved success criteria is 0.95. Lithuanian energy institute has conducted in-depth probabilistic and engineering assessment of the gas gap closure for Unit 1. The results of gas gap closure probabilistic modelling for Unit 1 for the period until 2002, taking into account non-linear behaviour of graphite, indicate that gas gap no-closure probability is 0.98. As to Unit 2 similar investigations is under way and would be completed by the end of 2001. However, the preliminary results show, that most probably gas gap closure at Unit 2 would never occur (see Fig. 6.5.2.2. below) as the rate of pressure tube outer diameter expansion at Unit 2 is significantly slower than at Unit 1. The main reason of this is different thermal treatment of pressure tubes used at these units. The pressure tube lifetime is about 30 years. Unit 2 was put into operation in 1987, thus, this plant could be operated safely until 2015-2017.

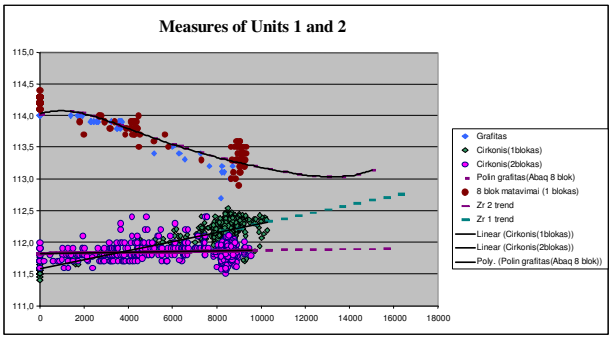



***Fig. 6.5.2.2.***

*6.5.2.3. Development of Diverse Shutdown System for Unit 2*

In scope of the SAR project accident analysis has been performed which include not only analysis of the Design Basis Accidents (DBA), but also analysis of Anticipated Transients Without Scram (ATWS). For RBMK reactors ATWS are not design basis accidents and no previous analyses of such accidents were performed. The ATWS studies in the Ignalina SAR are the first of the kind of for RBMK reactors. These analyses have a different purpose from DBA studies. The purpose of the ATWS studies in this project is to identify the need for possible future design modifications to the shutdown system, to determine the minimum time available for accident mitigation and to make a step towards developing accident management measures and procedures. The SAR analysis shows, that some ATWS scenario can lead to unacceptable consequences. This leads to one high priority recommendation, that a second fast acting, independent and fully diverse reactor shutdown system needs to be installed. The second shutdown system has to be designed to ensure its functionality at conditions prevailing during and after the accident and to provide safe long-term reactor shutdown. However, development and implementation of the second shutdown system (DSS) requires several years. VATESI has required INPP to develop and implement compensatory measures for existing CPS. Such compensatory measures, including CPS Safety Case, additional shutdown system DAZ development and installation, are implemented at both units of INPP. Development of DSS for Unit 2 is in progress and by VATESI requirement should be implemented not later as by the end of 2003.

*6.5.2.4. Confinement issue and PSA level 2 results*

One of the concern of international community that containment of the INPP has a less robust design as compared with Western reactors and consequently, regarding the mitigation of accidents a safety level in comparison with reactors of the same age in Western Europe will be less at INPP. But these are emotions. Results of recently completed Level 2 Probabilistic Safety Assessment of I NPP show, that probability of large early radioactivity release at INPP is comparable with this parameter for Western plants of the same age. This study also showed, that INPP Accident Localization System would successfully cope with radioactivity releases resulted by any design basis accident.

*6.5.2.5. Safety Analysis Report and licensing of Unit 2*

Based on the SAR-RSR activities as well as on the results of SIP-2 program implementation, a 5-year license for operation of Unit 1 was issued by VATESI in July 1999. At present a licensing process of Unit 2 is under way. This process should be completed by the end of 2003. In accordance with VATESI requirement a unit-specific in-depth safety analysis report should be produced and reviewed prior to the granting of license. The process of producing and reviewing of the Safety Analysis Report for INPP Unit 2 is now underway. The review will form the basis for a decision by VATESI to grant a license for continued operation of that Unit.

*6.5.2.6. Possibilities of Unit 2 further operation*

The INPP is unique among all RBMK reactors in the scope and comprehensiveness of safety analyses, which have been conducted to verify its design parameters and analyse its level of risk. The international studies such as BARSELINA, SAR, RSR and follow-up safety analyses provide a verified, state of the art knowledge, which make it possible to asses the present level of plant's safety as well as to make and implement plans on its enhancement. The INPP is the only RBMK plant, which has developed such a comprehensive Safety Improvement Program and also implemented it. Safety analyses have determined that in terms of PSA indexes INPP is comparable with Western reactors. As already mentioned in SAR, the safety level of the INPP is adequate to the point of first gap closure, which will be the lifetime limiting factor. In accordance with the Nuclear Safety Account Agreement, Lithuanian authorities agreed that operation of both units at INPP would not be extended beyond the time when the reactor pressure tube have to be replaced. Reactor re-tubing is required for two reasons only, first of all, if gas gap between pressure tubes and graphite bricks is exhausted, and secondly, if pressure tube lifetime is exhausted. As it is shown above, at Unit 2 gas gap closure would be never

appeared, while the pressure tube lifetime is about 30 years. Unit 2 was put into operation in 1987, thus, this plant could be operated safely until 2015-2017.

# Article 7: LEGISLATIVE AND REGULATORY FRAMEWORK

1. *Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.*
2. *The legislative and regulatory framework shall provide for:*
   - *i. the establishment of applicable national safety requirements and regulations;*
   - *ii. a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a license;*
   - *iii. a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licenses;*
   - *iv. the enforcement of applicable regulations and of the terms of licenses, including suspension, modification or revocation.*

### 7.1. State Regulation of Nuclear Power utilization

Chart of interaction between regulatory bodies and INPP is presented in Annex to 7.1.

### 7.2. Summary of Laws, Regulations, Licensing System and the Inspection, Assessment and Enforcement Process governing the safety of Nuclear Installations

The Republic of Lithuania Law on Nuclear Energy defines that the principal objectives of state regulation of nuclear energy safety is:

1. to establish the conditions and criteria for the safe use of nuclear energy;
2. to control and supervise the procedure of observance of these conditions and criteria;
3. to establish sanctions for persons who violate the requirements for nuclear safety, radiation protection, accounting and control of nuclear materials.

List of the Main Legal Acts Regulating Nuclear Power Safety in the Republic of Lithuania, VD-VP-01-2001, presents 224 legal documents (International Conventions and Treaties, Laws of Parliament, Resolutions of Government, Regulations of different Ministries and other governmental institutions) related with different nuclear power safety issues.

The main national law, which regulates use of nuclear energy, is The Republic of Lithuania Law on Nuclear Energy adopted by Seimas (Parliament) on 14 November 1996. In nuclear energy sector there are also applicable:

1 The Republic of Lithuania Environmental Protection Law
2 The Republic of Lithuania Law on Environmental Monitoring
3 The Republic of Lithuania Law on Waste Management
4 The Republic of Lithuania Civil Protection Law
5 The Republic of Lithuania Law on Energy
6 The Republic of Lithuania Law on Enterprises
7 The Republic of Lithuania Law on the Assessment of the Impact on the Environment of the Planned Economic Activities
8 The Republic of Lithuania Law on the Supervision of Potentially Dangerous Installations
9 The Republic of Lithuania Law on Occupational Health Care
10 The Republic of Lithuania Law on Radiation Protection
11 The Republic of Lithuania Law on Radioactive Waste Management
12 The Republic of Lithuania Law on Construction
13 The Republic of Lithuania Law Concerning Control of Import
14 Transit and Export of Strategic Goods and Technologies
15 The Republic of Lithuania Law on the Decommissioning of Unit 1 at the State Enterprise of Ignalina Nuclear Power Plant
16 other.

The Republic of Lithuania signed international conventions and treaties applicable to nuclear power safety issues:

1 Convention on Nuclear Safety
2 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
3 Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
4 Convention on Environmental Impact Assessment in a Transboundary Context (ESPOO, 1991)
5 Convention on the Protection and Use of Transboundary Watercourses and International Lakes
6 Agreement between the Government of the Republic of Lithuania and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons
7 Protocol Additional to the Agreement between the Government of the Republic of Lithuania and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons
8 Convention on Supplementary Compensation for Nuclear Damage
9 Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage
10 Treaty on the Non-Proliferation of Nuclear Weapons, signed on 1 July 1968 in London, Moscow and Washington
11 Comprehensive Nuclear-Test-Ban Treaty
12 The 1957 European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)
13 The Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963 and the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention
14 The 1979 Vienna Convention on Physical Protection of Nuclear Material
15 The 1968 Convention on Early Notification of a Nuclear Accident

As defined by the Republic of Lithuania Law on Nuclear Energy, the Government of the Republic of Lithuania shall:

1. in the manner prescribed by law, adopt decisions on the construction of individual nuclear facilities;
2. form a commission for the commissioning of a nuclear facility;
3. prepare the nuclear safety and radiation protection regulatory system and the mechanism of its functioning;
4. establish nuclear energy control and supervision institutions and approve their regulations;
5. approve regulatory enactments for the acquisition, storage, transport and disposal of nuclear and radioactive materials and submit them to the ministries referred to Articles 14, 15, 16 and the Government institutions for approval in cases specified in the above articles;
6. establish the procedure of licensing of nuclear activities';
7. establish the specific conditions and requirements for the zones of sanitary protection and monitoring and the course of their development;
8. co-ordinate the activities of ministries and other state institutions in drafting nuclear accident prevention and management plans.

In adopting a decision on the construction of a specific nuclear facility, the Government of the Republic of Lithuania shall take into consideration:

1. the economic and public needs;
2. the principal characteristics of the use of natural resources and their impact on the environment;
3. nuclear safety and radiation protection guarantees;
4. the opinion of the local authority on whose territory the intended facility will be sited.

The Ministry of Economy shall:

1. perform the functions of the founder of operating organisations of nuclear facilities;
2. implement state policy in the sphere of nuclear energy;
3. organise bilateral and multilateral international co-operation in the area of nuclear energy;
4. organise nuclear accident prevention, accident management, investigation and elimination of the consequences of the accident in the nuclear facilities under its control;
5. within the scope of its competence represent the Republic of Lithuania in international nuclear energy organisations and conferences;
6. organise the drafting of a special scheme for the choice of the site of a new nuclear power plant and other state nuclear facilities, exploring several alternative sites;
7. after the approval of a detailed site plan, proceed in an established manner with the legal formalities of the acquisition for the public needs of the site for the construction of a nuclear power plant or other state nuclear facilities;
8. organise the development of the nuclear energy infrastructure in the Republic of Lithuania; establish institutions of design, research and technology (together with the Ministry of Education and Science) to meet the needs of the operating organisations of nuclear facilities;
9. perform the functions established by this Law and those assigned by the Government.

Local authorities in the territories under their jurisdiction which are within the sanitary protection or monitoring zones of a nuclear facility, within the framework of their competence, shall:

1. take part in controlling the activities of nuclear power plants, nuclear reactors and other nuclear energy installations for which sanitary protection zones have been established;
2. control the compliance with the landscape and architectural requirements of a nuclear facility, also with the sanitary, hygienic and nature protection requirements of a nuclear facility and its territory;
3. take part in decision making about the construction of nuclear facilities in their territory, the reconstruction of the facilities or their decommissioning;
4. obtain information from the facility operator about the failure, shut-down, release of radioactive materials and other incidents;
5. prepare the population protection plans, implement them in the event of nuclear accidents;
6. inform the population about the radiological situation in the area where nuclear plants and other nuclear facilities are sited and about the radiation protection measures which are being implemented.

The Ministry of Health shall:

1. prepare and approve standard acts and rules on the health of the personnel of nuclear facilities and the population residing in the monitored zones of the facility and control compliance thereof;
2. undertake environmental health studies of radiation impact on people and their environment and establish health protection requirements;
3. co-ordinate the siting for nuclear facilities and undertake state environmental health analysis of their construction;
4. take part in the authorisation of the constructed or reconstructed nuclear facilities, issue the environmental health passport for work with radioactive materials and other sources of ionising radiation;
5. establish the standards for medical examination for the personnel working with radioactive materials and the sources of ionising radiation, the frequency of the examination, contraindications and control the compliance with the standards;
6. undertakes monitoring of the health of the nuclear facility personnel and the residents of the monitored zone of the facility;
7. ensure the preparedness of medical institutions for the elimination of the consequences of the accident;
8. establish the radiation protection norms for the population and control compliance with them;
9. organise medical examination of the containment forces of a nuclear accident and the

population affected by radiation exposure and submit findings and proposals for the reduction of radiation exposure;
10. determine occupational diseases for the personnel in the sphere of nuclear energy and study the causes of the diseases;
11. carry out population education on radiation protection.

The Ministry of Environment shall:

1. in coordination with the Ministry of Health establish the limits of radioactive emissions into the environment and the permitted pollution norms, monitor compliance with them, and establish the procedure of emission licensing;
2. jointly with the Ministry of Health establish radiation protection standards and monitor compliance with them;
3. assess the impact on the environment;
4. together with VATESI approve technical regulations for the design and construction of nuclear facilities;
5. co-ordinate the projects for sitting, reconstruction and expansion of nuclear facilities and facilities related to their operation;
6. take part in state supervision of the design and construction of nuclear facilities(structures) in accordance with the procedure established by the Government of the Republic of Lithuania.
7. issue licences for the use of natural resources, organise and co-ordinate state radioecological monitoring, and control radiological monitoring;
8. organise and co-ordinate scientific research of the impact of nuclear facilities on the environment;
9. prepare and approve methods of assessment of radiation damage to the environment and its compensation;
10. periodically inform the public, national and local authorities about the radiation situation in the country and in the environment of nuclear facilities.

The State Labour Inspectorate at the Ministry of Social Security and Labour shall control compliance with the requirements of labour, safety at work and related statutory acts.

The Ministry of Transport:

1. take part in drafting laws and secondary legislation regulating transportation of nuclear and radioactive materials;
2. participate in training and certification of the personnel involved in transportation of nuclear and radioactive materials;
3. organise railway transport for the evacuation of the population from the danger zone in the event of a nuclear accident.

The Ministry of National Defence:

1. take part in drafting and implementing co-ordinated interdepartmental anti-terrorist and anti-penetration protection plans of the nuclear power plant and other nuclear facilities;
2. ensure the security of transportation of nuclear and radioactive material cargoes across the territory of the country.

The Department of Civil Defence of the Ministry of National Defence:

1. draw up a population radiation protection plan in the event of a nuclear accident which shall be a model for other institutions authorised in a prescribed manner
2. in preparing their respective plans of nuclear accident prevention, accident management and elimination of accident consequences.
3. within the framework of its competence implement the measures for the elimination of the accident and its consequences;

4. jointly with other state institutions organise training sessions of population protection in the event of nuclear accidents.

The Ministry of the Interior:

1. ensure fire protection of the nuclear power plant and other nuclear facilities, conduct the state fire protection examination of their construction and reconstruction designs, co-ordinate the fire protection systems of those facilities;
2. set forth fire protection requirements for nuclear facilities, exercise compliance with them and apply sanctions laid down in statutory acts for violators of fire protection regulations;
3. promptly extinguish fires breaking out at nuclear facilities, participate in the management of a nuclear accident and its consequences, organise radiation monitoring of a contaminated area;
4. exercise and ensure physical safety of a nuclear power plant;
5. draft, co-ordinate and implement interdepartmental anti-terrorist and anti-penetration action plans;
6. analyse and control the crime situation in the regions with nuclear facilities;
7. investigate the cases of theft and illegal possession of nuclear and radioactive materials, also of other dual-purpose commodities;
8. provide assistance in ensuring the safety in transportation of nuclear and radioactive materials in the territory of the country.

The State Security Department:

1. exercise prevention of subversive, sabotage and terrorist acts as well as other offences aimed at damaging the interests of state security at nuclear facilities, in their environment, and on transportation routes of nuclear and radioactive materials;
2. in keeping with the state security interests, undertake operations and inquiries to detect and investigate actions constituting a threat to nuclear facilities, nuclear installations, equipment and technologies.
3. decide upon the credibility of persons working at nuclear facilities or those who are appointed to transport nuclear and radioactive materials;
4. control the effectiveness of physical safety and emergency preparedness of the nuclear power plant and other nuclear facilities;
5. take part in drafting and implementing the nuclear power plant and other nuclear facilities interdepartmental anti-terrorist and anti-subversive co-ordinated action plans.

The Governmental Emergencies Commission:

1. direct the activities of management of a nuclear accident and elimination of its consequences;
2. mobilise material and other resources necessary for the containment of a nuclear accident;
3. perform other tasks and functions provided in its regulations.

In implementing state regulation of nuclear safety, radiation protection and accounting for nuclear materials in the sphere of nuclear energy State Nuclear Power Safety Inspectorate (VATESI) shall:

1. together with the Ministry of Environment approve technical regulations of the design and construction of nuclear facilities, and of maintenance of the structures;
2. approve standards and rules of operation of nuclear facilities, standards and rules of storage and disposal of radioactive materials used in nuclear energy and establish the procedure for their drafting;
3. control the compliance with the requirements stipulated in licences and safety regulations;
4. draft the state regulatory system for the accounting for and control of nuclear materials and ensure its viability;
5. establish the procedures of accounting for and control of nuclear materials in the Republic of Lithuania and monitor compliance with them during the import, export, re-export, transport,

use, storage and disposal of nuclear materials;
6. issue licences to legal and natural entities for the design, construction, operation, safety appraisal of nuclear facilities and their systems, and other work related to safe operation of nuclear facilities;
7. inform the mass media about the radiation and safety situation in nuclear facilities;
8. prepare surveys on the safety of nuclear facilities and submit them to the Government, local authorities and other authorities concerned;
9. organise and support research into and expert analysis of nuclear safety and radiation protection, independently carry out the analysis of incidents and occurrences;
10. co-ordinate and control the preventive measures for the staff and the population in the event of a nuclear facility accident, monitor the state of accident preparedness of the facility;
11. impose sanctions established in statutory acts on violators of safety rules;
12. organise bilateral and multilateral international co-operation in the sphere of nuclear safety and radiation protection.

In performing its functions VATESI shall act independently, in accordance with laws, its own regulations and other legal acts. To prevent a possible nuclear accident, VATESI may resort to any preventive measures within its competence, a temporary shutdown of a nuclear facility included.

***Basic Licensing Conditions in Nuclear Energy of the Republic of Lithuania***

The Republic of Lithuania Law on Nuclear Energy defines basic licensing conditions in nuclear energy sector.

Without a licence issued in prescribed manner of the Government of the Republic of Lithuania, it is prohibited:

1. to design, construct and reconstruct nuclear facilities, installations and equipment;
2. to operate nuclear facilities and repair their protection systems;
3. to engage in any activity that might have an effect on a safe operation of nuclear facilities;
4. to retire a nuclear facility from service;
5. to store and bury nuclear and radioactive materials and their waste;
6. to acquire, possess and transport nuclear materials;
7. to acquire, possess and transport radioactive materials;
8. to export, import and carry in transit in the territory of Lithuania nuclear, radioactive and other materials used in the nuclear energy sector, nuclear equipment, and dual purpose goods that may be used in nuclear technologies.

Licensing institutions:

1. Licences for the activities referred to in the item 1 of above paragraph are issued by VATESI after co-ordination with the Ministry of Health, the Ministry of the Environment and a local authority whose territory or its part is within the sanitary protection zone of a nuclear facility.
2. Licences for the activities referred to in the items 2-6 of above paragraph are issued by VATESI after co-ordination with the Ministry of Health and the Ministry of the Environment.
3. Licences for the activities referred to in the item 7 of above paragraph are issued by the Radiation Protection Centre after co-ordination with VATESI and the Ministry of the Environment
4. Licences for the activities referred to in the item 8 of above paragraph are issued by the Ministry of Economy after co-ordination with VATESI, the Ministry of the Environment and the Ministry of Health.

Regulations for Licensing of Nuclear Power Related Activities (Governmental resolution No.103, dated 27 Jan 1998) define in more detail way:

1 activities subject to licensing;
2 licensing process;
3 submission of the application;
4 review of the application;
5 inspections, as a part of the licensing process;
6 assessment, issue of the license;
7 validity of the license;
8 duties and responsibilities of licensee;
9 duties and responsibilities of licensing authority;
10 supervision of licence validity conditions, sanctions;
11 the list of application documents;
12 form of licence.

VATESI produced and issued in 1997 the Requirements for Licensing of Ignalina Nuclear Power Plant Unit, VD-L-001-0-97. This document presents specific licensing requirements related with licensing of INPP Unit.

VATESI requested time schedule from INPP regarding the delivery of all application documents necessary to be included in the licence application. The response from the INPP concerning the time schedule was accepted by VATESI. VATESI developed it's own time schedule for licensing of INPP Unit, nominated responsible personnel for reviewing and decision making process. VATESI also signed agreement with Lithuanian TSO for reviewing of application documents and participation in special inspections during licensing of INPP.

Safety guarantees in nuclear energy are based on the requirements of the laws and regulations, on the requirements of the international treaties that the Republic of Lithuania accepted, also on the recommendations of the IAEA and other international organisations.

The safety objectives and criteria, licensing issues, inspection, assessment and enforcement process regulating the safety of nuclear installations, also accounting for nuclear materials is defined in regulations and guides prepared and approved by the State Nuclear Power Safety Inspectorate (VATESI):

1 General Safety Regulations of Nuclear Power Plants, VD-B-001-0-97
2 Nuclear Safety Regulations for Nuclear Power Plant Reactor Installations, VD-T-001-0-97
3 General Regulations for the Development of Regulatory Documents on Nuclear Power Safety, VD-B-02-97
4 General Requirements for the Technical Maintenance of Nuclear Power Plants, VD-E-01-98
5 Requirements on the Application of "Leak-Before-Break" (LBB) Concept for INPP, VD-E-02-98
6 Application of "Leak-Before-Break" (LBB) Concept for INPP RBMK-1500 Reactors, VD-E-03-98
7 General Requirements for the Event Reporting System at Nuclear Power Plants, VD-E-04-98
8 Requirements for the Management of Ageing Process in Systems and Elements which are Significant for the Safety of Nuclear Power Facilities, VD-E-05-99
9 Regulations for Specification of INPP Reactor Installation, VD-E-06-2000
10 Requirements for Safety Justification and Maintenance Control of INPP RBMK-1500 Fuel Channels, Management and Protection System Channels and Graphite Stack, VD-E-07-2000
11 Requirements for Modifications of a Nuclear Power Facility, VD-E-08-2000
12 General requirements for the Decommissioning of INPP, VD-EN-01-99
13 Physical Protection Regulations of a Nuclear Facility, 1997
14 General Requirements for the Spent Nuclear Fuel Dry Type Storage Facilities, VD-B-03-99

15 Regulations on the Accounting for and Control of Nuclear Materials in Nuclear Power Facilities and other Facilities, 1997
16 General Requirements for Quality Assurance System at NPP and other Nuclear Power Facilities, VD-KS-02-99
17 Requirements for Licensing of Ignalina Nuclear Power Plant Unit, VD-L-001-0-97
General Procedure for Inspections Performed by VATESI, VD-VP-02-2000

# Article 8: REGULATORY BODY

1. *Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.*
2. *Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.*

### 8.1. Description of the mandate and duties of the Regulatory Body

Legal framework of VATESI is described in paragraph 7.2. of this Report.

The Republic of Lithuania has undertaken an obligation to ensure safety at all nuclear installations under its jurisdiction, and to establish the legal framework for the nuclear safety regulatory system, namely:

1 national safety rules and requirements;
2 licensing system for nuclear facilities , excluding operation of the unlicensed installations;
3 system for analysis and assessment of nuclear installations;
4 enforcement mechanism, ensuring observance of the requirements and license conditions.

To deal with these issues, the Government had established State Nuclear Power Safety Inspectorate (VATESI) on 18 October 1991. To ensure nuclear safety such system is a must for any country, envisaging the development of nuclear energy. The basic guidelines for the regulatory institutions are formulated in the recommendations of IAEA. On 21 October, 1992, the Government of the Republic of Lithuania approved the statute of VATESI, regulating its activities and determining the basic objectives, functions, and rights of the inspections.

On 1997 statute have been updated and Board of VATESI was established. At present time new version of Statute is under preparation. In performing its functions VATESI shall act independently in accordance with laws, its own regulations and other legal acts. To prevent a possible nuclear accident, VATESI may *restore* to any preventive measures within its competence, including a temporary shutdown of a nuclear facility.

VATESI is independent governmental institution. The Prime Minister appoints the head of VATESI. VATESI reports directly to the Government. The Head of VATESI has not been affected by political changes and has been in the post since 1997. There is a direct line from the head of VATESI to the Government and he has direct access to the Prime Minister on maters related to nuclear safety and other responsibilities of VATESI.

### 8.2. Basic document describing the authority and responsibilities of Regulatory Body

Basic document describing the duties and responsibility of nuclear safety regulatory body is Statute of VATESI.

The main goal of the Inspectorate, as prescribed by the statute, is to ensure the state regulation and supervision of nuclear and radiation safety at nuclear installations and other related organizations. In addition to that, VATESI performs the following functions to:

1 form the principles and criteria of safety in nuclear energy, safe utilisation, transportation and storage of radioactive and nuclear materials, establish safety related norms and regulations;
2 issue licenses for the operators of nuclear or radiation related production or technologies;
3 prepare and perform inspection programs;
4 make proposals related to preparation of laws and other normative acts, nuclear safety

documentation in the facilities under control;

5 supervise the accounting of nuclear and radioactive materials.

**8.3. Structure of the Regulatory Body; its technical and support experts and organizations if appropriate, and its human and financial resources**

The Structure of VATESI is shown in Annex to 8.3.

Nuclear Material Control Division organise accounting and control of nuclear materials, make the rules for accounting, supervise the physical protection of nuclear materials and nuclear facilities, participate in controlling the export, import and transit of commodities used in nuclear activities, co-operate with IAEA and other international organisations and respective institutions of other countries on issues of accounting and control of nuclear materials, maintain contacts with the Comprehensive Nuclear Test Ban Organisation and co-ordinate the activities of Lithuanian governmental institutions related with the said organisation.

Licensing division set the conditions for licensing the INPP and its safety systems, develop rules and regulations that govern INPP safety, assess the reliability of the safety important systems, establish the operation conditions for INPP, elaborate conditions for licensing other nuclear activities.

Decommissioning and radiation protection division control the radioactive waste management, license the spent fuel storage facilities, control the level of INPP preparedness for emergencies, notify international organisations and neighbouring countries about nuclear incidents, co-ordinate decommissioning issues of INPP.

On-site division at the INPP fulfils direct supervision functions at INPP, inspect safety systems, control technological processes and repairs.

Safety assessment division assesses design, produce reviews of safety analysis reports, check the adequacy of the computer software used for safety assessment and analyse the physical issues of the reactors.

In April 2001 the Government increased the total number of VATESI staff by 10 persons. Currently at VATESI are working 37 employers. VATESI was enounced competitive opening for 8 new employers who will be involved in regulating decommissioning of Unit 1 and licensing activities. Till the end of 2001 VATESI expects to fulfil all 48 positions. There are plans to hire 5 additionally persons in 2002 and 2003 annually.

The VATESI budget is defined every year in the framework of the State Budget allocated to all state administration. VATESI drafts its budget proposal and presents it to the Ministry of Finance and Government for considerations. The final State Budget approval is with the Lithuanian Parliament. In recent years, VATESI has experienced difficulties in receiving from the State Budget the financial resources it needed. On request of VATESI Parliament took into consideration the situation and allocated some additional funds to VATESI in 2001.

VATESI actively collaborated with the Lithuanian Energy Institute and its Nuclear Installations Safety Laboratory, departments and centers of Kaunas Technology University: the Center of Strength and Fracture Mechanics, the Department of Mechanics of Solids, Department of Thermal and Nuclear Energy, Commission of Experts for Non Destructive Tests, Institute of Physics, Vilnius Gedimino Technical University. The Coordinating Committee of Technical Support organisations have been established.

**8.4. Position of the Regulatory Body in the governmental structure, including its reporting obligations**

Position of the VATESI in Governmental structure is shown in Annex to 8.4.

In the execution of its duties, VATESI is obliged by law to coordinate its activities with other state bodies with responsibilities in the regulation and central nuclear safety and radiation protection. There is effective separation between the responsibilities and functions of VATESI and those bodies.

In addition to the Law on Nuclear Energy other laws are in force, which give responsibility to other state bodies in the process of nuclear safety regulation. These other Laws referenced above deal with aspects of radiation protection, fire protection, physical security and environmental matters. These institutions charged with these respective responsibilities have to collaborate with VATESI and solve relevant regulatory issues before final regulatory permission can be given by VATESI. The Law on Nuclear Energy authorizes VATESI or the competent co-ordinating authority for nuclear regulation and gives VATESI authority to issue orders that set out haw the requirements of the Law on Nuclear Energy should be met.

### 8.5. Relationship of the Regulatory Body to bodies responsible for the promotion and utilization of Nuclear Energy

The Ministry of Economy is responsible for the implementation of policy in the sphere of nuclear energy and is the responsible authority for promotion and ownership of nuclear facilities. The ultimate responsibility for safety is *planed* solely on the operator.

There is effective separation between the responsibilities and functions of VATESI and these organizations or bodies that are charged with the promotion or use of nuclear installations or activities.

VATESI independence is clearly stated in Article 14 of the Law on Nuclear Energy and in Article 5 of the Law of Radioactive Waste Management witch state that VATESI is responsible authority and can take preventive measures to enforce nuclear safety. This was demonstrated in May 1999 when VATESI refused to issue the license for operation of INPP Unit1 until all the license conditions had been fulfilled. This resulted in on extended period of shutdown for the INPP, but reinforced the independence of VATESI.

# Article 9: RESPONSIBILITY OF THE LICENSE HOLDER

*Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence and shall take the appropriate step to ensure that each such holder meets its responsibility.*

In 1996 the Parliament of the Republic of Lithuania passed the Law on Nuclear Energy of the Republic of Lithuania. The Law states that licenses issued according to the established order of the Government of the Republic of Lithuania are necessary for those activities:

1. To design, construct and perform significant repair activities of nuclear facilities or nuclear installations;
2. To operate nuclear facilities and repair its safety systems;
3. To perform any other activities that can impact safe operation of the nuclear facilities;
4. To decommission the nuclear facility;
5. To store and to dispose nuclear materials and its waste;
6. To obtain, possess and transport nuclear materials;
7. To obtain, possess and transport radioactive materials;
8. To export, import and to convey as transit goods via territory of Lithuania nuclear, radioactive and other materials that are used in the nuclear energetic, nuclear equipment and also goods of dual purpose that can be used in nuclear technology.

According to the requirements and regulations stated in the Law on Nuclear Energy of the Republic of Lithuania it was prepared the Regulations for Licensing of Nuclear Power Related Activities. The document was approved by the Government of the Republic of Lithuania in 27 of January 1998.

The Regulations for Licensing of Nuclear Power Related Activities determine two type license holders for the nuclear power safety related activities. The first type licence holders can be organisations/enterprises that have right to perform services and produce goods for nuclear facilities. And the second type licence holders can be organisations/enterprises that have right to construct, perform significant repair activities, operate or to decommission a specified nuclear facility (this type of licence is issued to the Nuclear Facility Operating Organisations only).

The Regulations for Licensing of Nuclear Power Related Activities determine these duties and responsibilities of license holders (licensees):

1 A licensee holding the first type license:

- must inform promptly the licensing authority and other institutions of regulatory authority about all deviations from the conditions of licence validity;
- must ensure radiation protection of workers;
- must follow the requirements of the legislation of The Republic of Lithuania, regulations of nuclear power safety and general industrial regulations which are legalised in the established order in nuclear energetic;
- must inform the institutions of regulatory authority about all significant events, incidents, accidents, collapses or similar incidents related with its activity;
- is responsible for the quality of the licensed activity, proper maintenance of documentation, its storage, renewal in time and approval from the licensing authority when it is necessary;
- must ensure the priority of nuclear safety in its activity;
- must follow the principle of ALARA, in accordance with which during the design and usage of ionising radiation sources, as well as during the performance of related activities, the exposure must be kept as low as is reasonably achievable, taking into account economical and social factors;
- must fulfil the quality assurance program.

2 A licensee holding the second type licence:

- is responsible for the safety of the nuclear facility,
- must ensure radiation protection of staff and inhabitants during normal operation, and for design basis and beyond design basis accidents not to exceed the allowed levels of exposure for staff and inhabitants;
- must develop and maintain efficient measures to prevent and control accidents in nuclear facilities;
- must promptly inform the licensing authority and other institutions of regulatory authority about all deviations from the conditions of licence validity;
- must develop the annual safety assessment report for the nuclear facility in accordance with the requirements of the nuclear safety regulations and submit it to the licensing authority;
- must follow the requirements of the legislation of The Republic of Lithuania, regulations of nuclear power safety and general industrial regulations which are legalised in the established order in nuclear energetic;
- must inform the licensing authority about the deviations from limits of the safe operation, other safety relevant incidents related with its activity;
- must promptly inform the institution of regulatory authority and mass media about the incidents which could cause the increased interest of society;
- is responsible for the quality of the licensed activity, proper maintenance of documentation, its storage during all time of nuclear facility activity, renewal in time and approval by licensing authority when it is necessary;
- must ensure a high level of safety culture in its activity, with safety the priority in decisions;
- must establish and maintain effective quality assurance of its activity;
- must inform the institutions of regulatory authority about existing (possible) hazard for the safety of the nuclear facility, incidents, accidents;
- is responsible for the safety of the nuclear facility even if the validity of the licence is suspended or it is revoked;
- must monitor the emission of radionuclides into the environment in a systematic manner;
- must monitor and investigate the contamination of the facility/site and environment in a systematic manner;
- present to the institutions of regulatory authority the data about emission of radionuclides, contamination of the facility/site and the environment in a systematic manner;
- must follow the principle of ALARA, in accordance with which during the design and usage of ionising radiation sources, as well as during the performance of related activities, the exposure must be kept as low as is reasonably achievable, taking into account economical and social factors;

3 The licensing authority may establish additional duties for the licensee, indicating that in the conditions of licence validity;

4 The licensee is responsible for the submission of documents to the institution of regulatory authority promptly;

5 The licensee supervises and is responsible for the quality of work, performed by the contractors, informs the institution of regulatory authority about the activity of the contractor when necessary;

6 The contractor may present the information relating to the safety of the nuclear facility directly to the institution of regulatory authority however it doesn't release the licensee from the obligation to submit all important information relevant to the safety of the nuclear facility to the institution indicated above;

7 By request of the regulatory authority, the licensee and its contractors must provide all

necessary information relating to the licensed activity;

8 In accordance with the legislation of The Republic of Lithuania the licensee is responsible for its activity and the activity of its contractors, that could hazard the safety of the nuclear facility or damage the nuclear facility, personnel, inhabitants and the environment.

Regulations for Licensing of Nuclear Power Related Activities (Governmental resolution No.103, dated 27 Jan 1998) define that the licence includes:

1 A document of A4 format, what shall include the following information.
2 The first enclosure – licence validity conditions.
3 The second enclosure – the list of documents submitted by the applicant (licensee), on the basis of which the licence is issued.

The licence validity conditions are established based on the following requirements to licensee:

2 to perform only the activity for which the licence is issued;
3 to follow the requirements of safety regulations;
4 to implement established quality assurance programs;
5 to inform promptly the institutions of regulatory authority about all changes made in quality assurance programs;
6 to co-operate continuously with each contractor in order to get adequate information about possible deficiencies of works performed or errors and(or) important events (accidents, incidents, falls etc.) caused by the contractors activity;
7 constantly and promptly to inform institutions of regulatory authority concerning all incidents, accidents or similar events, indicated deficiencies of licensed activity and preventive measures;
8 to maintain the system of technical documentation to ensure appropriate storage of all permissions, directives, acts, conclusions during all period of activities in nuclear energetics;
9 to maintain the system of accounting and reporting documentation;
10 to submit to the competent institution of regulatory authority all the required documentation of licensee;
11 to prevent unauthorised usage of nuclear technologies;
12 to submit the annual reports on licensee activity to the licensing authority, indicating the works that have been performed or are being performed, results of authors works, recommendations presented concerning the progress of mentioned works;
13 licensee must ensure the free entrance into the territory and premises of the licensee for the representatives of the licensing authority during supervision of licence conditions fulfilment;
14 to present the information to the licensee concerning scientific, technical and other meetings aimed to discuss main safety issues of nuclear facility;
15 to inform promptly the licensing authority about all changes of application documents;

After the independence of the Republic of Lithuania was declared, the order dated November 25 1991 of the Minister of Energy of the Republic of Lithuania delegated the rights and responsibilities of the INPP Operating Organisation to the INPP itself.

The main responsibilities of the Nuclear Facility Operating Organisation are also described (in general) in the Law of Nuclear Energy of the Republic of Lithuania. The Law states that the Nuclear Facility Operating Organisation:

1 is fully responsible for proper and safe operation of the Nuclear Facility;
2 has to perform the accounting and control of the belonging to Operating Organisation nuclear materials;
3 has to perform investigation of nuclear accidents and incidents;
4 has to inform VATESI and other concerned institutions about all violations of conditions and requirements for safe operation and all disorders of systems and elements that guarantee safety;
5 has to ensure the preparedness to eliminate consequences of radioactive accident;

6 under VATESI requirement has to present comprehensive information about technical status of nuclear facility or parts of it.

Additional responsibilities and duties for the Nuclear Facility Operating Organisation are specified during state nuclear power safety regulatory control and supervisory performance the responsible for that is VATESI. It was created strong regulatory body during short period and it established effective regulatory control system in the Republic of Lithuania that obligated the Nuclear Facility Operating Organisation to perform extensive activities in order to increase nuclear power safety. In short period it allowed achieving good results through implementation of safety increasing technical as well as organisational measures.

INPP is a "multi-facility site" consisting of two nuclear power plant units and spent fuel dry storage facility. At this time, INPP possess two second type licenses:

1 To operate the INPP Unit 1;
2 To operate INPP spent fuel dry storage facility.

INPP has to receive VATESI issued annual permission to operate the second unit because this unit is still under the licensing process.

Before annual outage starts, VATESI presents to the Nuclear Power Plant Operating Organisation the list of requirements. Only after implementation of these requirements permission to restart the unit can be issued. The requirements include presentation of reports of annually performed routine safety related measures as well as reports of planned to implement additional safety increasing measures. Through this regulatory control activities VATESI can fully control satisfactory level of routine and additional safety increasing measures performed by NPP Operating Organisation.

According to the requirements of the Law on Nuclear Energy of The Republic of Lithuania the Nuclear Facility Operating Organisation has to receive a license to operate nuclear facility. So even INPP Unit 1 is under operation since 1983, it was re-licensed based on a "western practice". VATESI issued a licence to operate the first unit of INPP in 29 July 1999. Recently VATESI carries on broad scope of licensing activities for the second unit of INPP. The INPP Operating Organisation is fully involved in the licensing process and performs extensive maintenance and safety analysis activities of INPP Unit 2.

# Article 10: PRIORITY TO SAFETY

*Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.*

### 10.1. Safety Policies

***VATESI Policy Statement***

In January 1998 VATESI has published its Policy Statement named "State System on Regulation of Nuclear Safety in the Republic of Lithuania". Purpose of the document was to describe the regulatory philosophy and policies that VATESI will follow in:

1 regulating nuclear facilities in Lithuania, principally the INPP;
2 cooperating between VATESI, operating organizations and state institutions in the development and implementation of new safety regulatory acts;
3 solving issues related to licensing and change of the license conditions;
4 inspecting nuclear installations in order to supervise the implementation of legal acts, rules, licensing conditions and obligations;
5 using measures of enforcement of norms and regulations;
6 describing criteria of evaluation and use by VATESI of the operational experience.

Policy Statement contains the following chapters: History and Background, Considerations for Development and Implementation of State System, Safety Principles and Standards of Protection, Responsibility, Licensing, Inspection Program, Enforcement Policy, Nuclear Safety Confirmation, Analysis and Reporting of Operating Experience, Shutdown and Decommissioning, Informing the Public.

In nuclear safety regulation VATESI will use reasonable assurance of adequate protection of public health and safety and will rely on the internationally approved principles.

It is the responsibility of the operating organizations of nuclear facilities to ensure adequate and safe operations. It is VATESI's responsibility to oversee the activities at nuclear facilities to assess and confirm that the plant is operated safely.

On the basis of safety cases presented by applicants and which contain a safety analysis, VATESI will make decisions on issuing nuclear facility construction, operation or decommissioning licenses.

VATESI will exercise independent regulatory oversight of nuclear facilities and activities important to nuclear safety through an inspection program conducted by VATESI Inspectors.

When VATESI finds that a nuclear facility does not meet a regulation or license condition, it is the policy of VATESI to require the operating organization to bring the facility into compliance with the regulation or license condition.

It is the responsibility of the operating organization to conduct safety analyses, tests, and research needed to assure facility meets the regulations and license conditions and is safe to operate.

VATESI will require the operators of nuclear facilities to systematically collect and evaluate data from both their own experience and the experience of other similar nuclear facilities.

VATESI will issue regulations governing the decommissioning and final disposition of nuclear facilities. It is the responsibility of the facility operator to maintain the nuclear facility in a safe condition during all decommissioning activities according to the license conditions.

It is the VATESI policy to inform the public about radiation and nuclear safety in Lithuanian nuclear facilities and about the activities of VATESI by means of mass media.

A complete text of the VATESI Policy Statement see in the Annex 10.1.1.

***INPP Policy Statement***

INPP, being the operating organisation of nuclear facility, in accordance with international practice undertakes fully responsibility for the plant safety and establish policy that gives the top priority to the plant safety.

INPP Safety and Quality Assurance Policy Statement was issued in 1998, it was re-issued in 2000. To perform the statements declared in the document, a booklet was developed and published in 1999 "Ignalina NPP Documentation Management Policy", PTOed 0108-6.

The documents "Ignalina NPP Safety and Quality Assurance Policy" and "Ignalina NPP Documents Control Policy" are presented in Annexes 10.1.2 and 10.1.3 accordingly.

## 10.2. Safety Culture and its development

### *10.2.1. Requirements of Regulating Authorities*

According to the Law on Nuclear Energy of the Lithuanian Republic, article 27 the following requirement is set forth: enterprise granted with the license on NPP operation shall guarantee to the regulating authority the high level of safety culture.

Such a requirement is described in Terms and Conditions of VATESI issued license No. 12/99 for Unit 1 operation, clause 17: INPP shall submit a report to VATESI presenting analysis of implementation of Safety Culture improvement measures.

### *10.2.2. Programme on Safety Culture Improvement at INPP*

General Director of INPP annually approves the Activity Schedule on Safety Culture development, PTOed-0141-4, where the specific measures on implementation of the INPP Safety Culture development programme are listed.

**Programme Objective –** Safety Culture at INPP integrates plant and contractor personnel behaviour and plant management methods based on the highest priority – **SAFETY ABOVE ALL**.

Safety Culture is linked with every INPP employee responsibility for safety.

The Programme sets priority tasks on Safety Culture improvement at INPP:

1 The Safety Policy shall obtain support of the plant management and such a commitment to this Policy shall be demonstrated.
2 Safety Culture shall become the key element of the plant activity management.
3 To change attitude of the plant employees to their work, to form new mentality and inner critical position of the plant personnel which would prevent negligence, develop self-regulation with regard to the safety matters.
4 To conduct Safety Culture audits resulting in the subsequent corrective actions and improvements.
5 To provide the plant personnel with open and effective information on all works performed at INPP in order to ensure understating of the common tasks and plant operation perspectives by each employee of INPP.
6 Training of INPP personnel on the Safety Culture principles using the examples of good and bad practice and lessons learnt.

### *10.2.3. Implementation results of Safety Culture Development Programme*

*Personnel information on INPP Policy towards Safety and Quality Assurance*

Booklets containing clarifications on the basic provisions of Policy towards safety and quality assurance were spread among INPP personnel. Contents of these booklets had been reviewed and discussed with the personnel at the Safety Culture seminars. Safety Culture audits were purposed to verify understanding and perception of INPP Safety policy by the personnel.

*Personnel information on Policy of openness towards errors and safety problems*

A booklet was developed wherein the General Director advised the plant personnel on the Policy of openness towards errors and safety problems and on the plant management approach to create the atmosphere of openness and trust should such error occur. It was explained that punishment for the error enables it to be hidden and its possible reoccurrence in future while informing on the error considers to be an act of plant safety improvement.

*Issue of booklet "Appeal to INPP personnel – high Safety Culture in the Nuclear Energy*

The booklet contains appeal of the General Director to the INPP employees to seek the high Safety Culture. The booklet refers to the daily activity arrangement and behaviour of each plant employee. This booklet is purposed to provide the plant personnel with the working guide for performance of the routine activity.

*Safety Culture workshops*

Within the period of 1997 – 2001 the specific work was performed concerning the conduction of the Safety Culture seminars for those plant employees who did not participate in them before. In order to conduct the seminars the monthly schedules were developed, coordinators for each plant department were appointed, special training tools were used. In total 126 seminars were conducted.

The programme of the seminars covered the information on the Safety Culture elements (IAEA INSAG-4), information on quality assurance programme, description of good and bad examples of Safety Culture on the base of INPP operation experience, issues of personnel incentive and punishment.

During these seminars the causes of Chernobyl NPP accident relating to the Safety Culture IAEA INSAG-7 were reviewed, the problems in the Safety Culture area and their possible solutions were discussed. Basing on the discussion results the participants proposed possible work improvements considering the operation and maintenance experience.

*Positive practice*

Positive practice was gain during implementation of Safety Culture Improvement Programme:

1 Seminars on Safety Culture development rendered significant assistance to establish understanding of necessity and advantage of the quality assurance programme, Safety committee foundation, implementation of the highest world-class principles of Safety Culture within the frames of INPP organisation structure.
2 Employees of the plant participating in such training seminars consider them to be successful which the big number of proposals submitted with regard to the safety improvements also witnesses.
3 Acceptance of the personnel information is referred to the positive aspects of the seminars results as well. One of the most important results of the seminars both for the management and personnel was the creation of the collective approach – team work on the basis of the trust, openness, co-operation and mutual assistance which form the elements of new management

style.

4 Experience gained while conducting the seminars provided good support for the development of quality assurance programme and was used for QA programme implementation.
5 Safety Culture audits were purposed to verify the practical aspects of Safety Culture in INPP departments.
6 Programmes of personnel training and test-papers were updated with the issues from IAEA report on Safety Culture and Policy of safety and quality assurance.

*Audits*

The plan of internal audits of Management procedures of QA programme includes issues on Safety Culture topic. On the basis of results of the internal audits conducted in 2000 the plant management made a decision on development of working procedure of personnel incentive. This procedure enables to avoid ill-founded punishment methods with regard to the employee who committed an error and informed about it. Motivation of plant personnel shall be addressed to the errors to be notified and the lessons to be learnt. In 2002 the training of the plant line and higher managers is planned to conduct with respect to motivation methods for Safety Culture improvement.

*New procedure on review of personnel proposals*

Procedure on processing of proposals for improvements, PTOed -0312-1 was developed and implemented. The plant employees can submit their proposals to the heads of departments in accordance with this procedure. Each plant department is provided with the proposal journals, besides the control points and the change-over points of the plant are provided with the mail-boxes and the forms for proposal submission to the General Director, Heads of Directorates and Services. In 1997 25 proposals and in 1998 18 proposals were submitted to the General Director.

*Management procedure QA-2-022, Safety Culture*

Project group was established for implementation of Management procedure QA-2-022, Safety Culture. Highly qualified specialists of Technical Directorate, Personnel Directorate, Physical protection service and QA department participated in this group activity. The draft procedure, which meets IAEA recommendations: IAEA INSAG-4, IAEA INSAG-13, IAEA SRS-1, has been developed within 2000. Implementation of this procedure will be completed in 2001. The following results were achieved in course of procedure QA-2-022 preparation:

1 Implementation plan of management procedure QA-2-022, Safety Culture was developed.
2 Questionnaires were prepared for evaluation of Safety Culture level in INPP departments.
3 New information posters had been issued – STARK method (stop, think, act, review, communicate), which were placed in the personnel working area. There are indications given at the posters how to monitor oneself during work performance.
4 The work was continued with regard to the development of Safety Culture indicators. INPP personnel was interviewed concerning the issues the internal information, draft Policy on plant personnel internal information was developed.
5 In 2000 the Technical Directorate implemented 44 proposals of 48 proposals submitted by the personal at the seminars held within 1997-1998. The remaining 4 proposals concerning personnel motivation are planned to implement in 2001.
**6** Trainers of the training centre and full-scope simulator are involved to the teaching process of Safety Culture principles, training programmes and personnel test papers were analysed.

### *10.2.4. Assessment of Safety Culture*

Implementation of **recommendation of SAR 9.2.1-4.** In August 1998 the IAEA seminar was held at INPP - Self-assessment of Safety Culture. Experience of the British company BNFL was presented at the seminar, viz. Application of self-assessment method and Safety Culture indicators in the organisation. The reason of shutdown of the seven units, Ontario Hydro company were reviewed,

which was caused by the Safety Culture related problems occurred in this company.

Assessment method is based on the interview sheets – questionnaires which were developed considering the Safety Culture features and applied in the world nuclear energy together with the items listed in IAEA documents, INSAG-4 and IAEA recommendations INSAG-13.

Assessment of Safety Culture levels consists of 5 steps:

1 Determine problem areas (causes impacting the safety level reduction)
2 Selection of importance priority of each problem area
3 Analysis – determine the connection between problem areas and indicators of Safety Culture
4 Determination of Safety Culture weak elements
5 Determination of corrective actions priority regarding the increase of Safety Culture level.

Within the period from December 2000 till February 2001 the attitude survey of 1500 plant employees was carried out, the participants were represented by employees of 10 plant departments, mostly Technical Directorate and QA department.

The questionnaires were filled anonymously and were purposed for the three categories of INPP employees:

1 Heads of departments of the plant and their deputies;
2 Technical engineers;
3 Workers.

Preparatory work was performed prior to the plant personnel attitude survey:

The attitude survey objective and sequence of assessment performance were explained to the heads of department involved to the personnel attitude survey, it was mentioned that this information would facilitate to work improvement in the organisation;
Specialists of the corresponding department were involved in attitude survey arrangement and performance of filled questionnaire analysis.

In March 2001 the tentative assessment results were submitted to the heads of INPP Directorate and Services at the meeting with the General Director. Management and representatives of VATESI participated as well.

Table 10.2.1. below presents the results of attitude survey held in 1998 and 2000 at INPP. The following was used as criteria: features of Safety Culture of the world level applied by company BNFL and presented to the plant in 1998 at IAEA seminar.

***Table 10.2.1. Results of Attitude Survey held in 1998 and 2000 at INPP.***

| No. | Safety Culture features | World level data of BNFL, % | 1998 | 2000 | rating |
|---|---|---|---|---|---|
| 1. | Visible leadership and commitment of top management | 80 | 69 | 83 | good |
| 2. | Safety role of line management | 100 | 79 | 81 | good |
| 3. | Strategic business importance of safety | 92 | 91 | 80 | good |
| 4. | Supportive organisational culture | 80 | 84 | 78 | good |
| 5. | Involvement of all employees | 69 | 74 | 62 | satisfactory |
| 6. | Organisational learning | 80 | 80 | 78 | good |
| 7. | Objectives and management of safety | 74 | 84 | 82 | good |

| | | | | | |
|---|---|---|---|---|---|
| | performance | | | | |
| 8. | Mutual trust and confidence between management and workshop | 85 | 76 | 82 | good |
| 9. | Openness of communications | 80 | 62 | 64 | Improvements are needed |
| 10. | Absence of safety vs. production conflict | 72 | 62 | 65 | Improvements are needed |
| 11. | Demonstration of care for all those affected by the business | 100 | 82 | 55 | Improvements are needed |

Assessment results will be used for identification of the problems impacting the Safety Culture level deterioration and for determination of the corrective measure purposed to Safety Culture improvement.

### *10.2.5. Safety Culture Indicators*

Safety Culture indicators are used for timely prevention of hidden deficiencies and also in such cases when the positive trends towards safety level increase occur in the organisation.

The plant Guide specifies six indicators of Safety Culture annually used at INPP:

*Indicator 1* - Safety Culture seminars.
*Indicator 2* - Recommendation of Safety committee.
*Indicator 3* - Deficiencies identified during audits.
*Indicator 4* - Repeated events.
*Indicator 5* - Human error.
*Indicator 6* - Proposals on safety improvement.

These indicators shall be used together with Safety Culture assessment in the future.

### *1) 10.2.6. Further development of Safety Culture and good practice*

The following works are included to the Programme of Safety Culture development at INPP in 2001-2002:

1 Continue conduction of seminars on Safety Culture issues held in the TC for the employees not participated in similar seminars before with the TC trainers involved in seminar process;
2 Establish committee for preparation of corrective actions on the basis of proposals submitted by the seminar participants within 2001;
3 Prior to implementation of Management procedure QA-2-022, Safety Culture the relevant training of the higher and line managers shall be conducted;
4 Develop working procedures relating to the activity under Management procedure QA-2-022, Safety Culture, update the existing procedures.
5 Submit to the plant management the results of Safety Culture assessment held in 2000, form the committee from the representatives of the plant departments for preparation of corrective actions in order to rectify causes of deterioration of the Safety Culture level;
6 Conduct audit of implementation process of the Management procedure QA-2-022, Safety Culture and develop improvement plan;
7 Complete development of Safety Culture indicators in order to provide the plant management with the tools of Safety Culture level assessment;
8 Complete development of Policy of personnel information and publish it at INPP;

9 Improve practice of reviewing the proposals submitted by the personnel and implementing the proposal accepted by the plant management;
10 Carry out meeting with the heads and co-ordinators of INPP departments on Safety Culture issues.

### 10.3. Safety Commitment

The INPP management headed by Director General undertakes overall and official responsibility for plant safety and commitments in respect to Quality Assurance and Safety.

The goal of INPP is to become the safest RBMK nuclear power plant and a competitive performer in the industry. To meet the objectives, it is necessary to assure that:

Activities at all levels are performed safely, with high level of quality, and plant safety is considered an overriding priority. Good quality is achieved when all requirements and objectives of the owners are met, and the people of Lithuania believe in the INPP safety.

INPP personnel clearly understand the requirements and objectives of the INPP owners, VATESI and the public.

All employees take an active part in safety and quality improvements. To ensure such participation every employee must know the INPP objectives, his own functions and be continuously informed about the results of activities performed at INPP.

INPP personnel is properly qualified to perform their functions in accordance with plant objectives. A level of every employee's competence shall be improved to strengthen both INPP and the individual.

All INPP managers exhibit personal activity and leadership. The main task of every manager is to formulate tasks and requirements facing his department, put them into an assessable form, communicate to all employees, and to provide every employee with a working environment consistent with the tasks to be accomplished.

All INPP activities are continuously evaluated to improve their quality and efficiency. The INPP and its personnel must make the use of their experience and that of others to improve the organisation, operations and their competence.

The INPP and each of its employees are responsible to society. All laws must be abided by and the safety requirements must be met with a sufficient safety margin.

Efficient and integrated management and quality assurance program is implementing at INPP.

If the INPP Director General can answer «YES» to all these items, the plant will operate to the required quality level. If every employee can answer «YES» to all these items, he will perform his job to the required quality level.

To accomplish these tasks, the Director General appoints the Safety and QA Department to head the establishment of the INPP quality assurance system, evaluate its effectiveness and provide the necessary quality training for personnel.

### 10.4. Regulatory Control

General Regulations for Nuclear Power Plant Safety VD-B-001-0-97 and Nuclear Safety Regulations for Reactors of Nuclear Power Plants VD-T-001-0-97 provide the main principles emphasising overriding priority of safety and main issues to be implemented in that respect.

In accordance with above regulations safety culture is practical and psychological training of

individuals in which the assurance of nuclear plant safety is a priority goal and an inherent requirement leading to individual awareness of responsibility and self-monitoring in the implementation of all tasks which can affect safety.

The safety of a nuclear plant shall be guaranteed by applying the principle of "defence-in-depth", i.e. by the sequential implementation of protection measures based on a system of barriers to prevent the spread of ionising radiation and radioactive materials to the environment and a system of technical and organisational measures to protect these barriers and retain their effectiveness, and to provide direct protection for the population.

The system of barriers includes the fuel matrix, the fuel element cladding, the boundary of the primary coolant circuit, and a hermetically sealed protective enclosure surrounding local safety systems. The system of technical and organisational measures among other includes implementation of safety culture at nuclear facilities.

Safety culture shall be inculcated to all personnel and organisations employed in the nuclear power field through:

1 Appropriate selection, teaching and training of personnel in each sphere of safety related activity;
2 Creation and maintenance of a strict discipline with a clear distribution of personal responsibility among managers and executives;
3 Instructions preparation and strict observation the work performance, as well as their periodical updating with consideration of experience.

All personnel involved in safety-related activities should fully understand the nature of their work and the manner and degree in which it affects safety. They should be fully aware of the consequences, which might follow the violation of rules or any deficient application of the prevailing norms and technical requirements.

The Operating Organisation shall be responsible for ensuring the safety of the nuclear plant and shall bear full responsibility for that safety, including measures designed to prevent and/or mitigate the consequences of accidents, the accounting for and storage of nuclear materials and radioactive substances, protection of the environment and monitoring of the state of the environment in the sanitary-protection zone and in the observation zone, and the controls required to ensure that the nuclear plant is used only for the purposes it was designed and built for.

The overall responsibility of the Operating Organisation shall remain intact despite the independent activities and responsibilities of companies - institutions, organisations and their unions, managing staff or other persons performing work or providing services for the plant (designers, suppliers, firms responsible for the installation of equipment, assembly workers, builders, engineers responsible for final adjustments and so on) and despite the functions and responsibilities of the State Control and Supervision Institutions.

To fulfil these tasks, the INPP input the procedures of permission obtaining for the organisations involved in work performance and services provision. Beginning from 1999 any subcontractor shall receive the permission of the 1$^{st}$ category for work and services provision at safety systems and normal operation systems important for safety, and the permission of the 2$^{nd}$ category for the work performance at non-safety related normal operation systems. The permission is issued after the INPP Quality Assurance Department performs the documents check and audit of contractor’s Quality Assurance system. 1$^{st}$ category permission is issued by Safety and Quality Assurance Department, 2$^{nd}$ category permission is issued by Maintenance Planning Department. The permissions are issued only to those organisations, which had obtained the permission or license from VATESI or other state Lithuanian institutions to perform the corresponding activity at the nuclear facilities of Lithuanian Republic.

Before a construction permit for plant or systems (components) of an nuclear facility is issued, the Operating Organisation shall establish the infrastructure (subdivisions) required for safe operation of the nuclear plant, endowing those subdivisions with the necessary rights as well as financial, material and human resources, imposing on them full responsibility for their activities, and monitoring the correct implementation thereof.

The Operating Organisation shall bear responsibility for establishing the necessary organisational structures for safe nuclear plant operation. It shall ensure that the plant has the necessary financial, material and technical resources, norms and technical requirements, scientific support, quality assurance in the all stages of lifetime. It also has to organise the physical protection and the fire protection of the plant, as well as recruitment and training of operating personnel, maintain safety culture and must perform continuous monitoring of plant safety.

The INPP permanently perfects its organisational structure in order to increase the responsibility for the plant safety. Decommissioning Department was established at the INPP in 2001.

The Operating Organisation shall ensure continuous monitoring and own supervision of all safety-related activities. The results of safety inspections and periodic reports on plant safety are to be submitted by the Operating Organisation to the State Control and Supervision Institutions.

To perform these requirements, the Department for Safety Supervision is established at INPP as part of the Safety and Quality Assurance Department. It carries out safety inspections, which audit the adherence to the requirements of the safety rules in accordance with the Annual Plan, daily inspections of safety conditions, inspections of work and modification implementation.

Inspection findings are recorded in reports. Annually INPP prepares an INPP Safety Report covering the year. The Report is submitted to all INPP Departments, VATESI and to other interested organizations. The results of daily inspections are conveyed by phone to VATESI duty engineer and by e-mail to VATESI headquarters and to the Lithuanian Republic Delegation at IAEA.

In accordance with national regulations and the statute VATESI carry out the independent regulatory inspections of Ignalina NPP, which cover an assessment of safety culture.

### 10.5. Voluntary activity and good practice related to safety

Beginning from the year 1998, INPP is improving the safety culture continuously; safety culture aspects are included into the audits, having the goal to reveal the drawbacks in the existing work methods and procedures that helps to identify corrective measures for safety improvements. From 2000 the indication system of safety culture is developing at INPP.

STARK self-control method is implemented into the daily work of the personnel. INPP personnel was trained on how to use this method, currently self-control method is widely expanded and promoted. STARK method posters are hung at the workplaces of INPP personnel.

In 2001 INPP concluded an Agreement with IAEA for joint development of safety operation new parameters in order to increase the efficiency of safety assessment.

In 2001 INPP completed the procedure preparation for unusual events analysis in order to improve the investigation quality of operational occurrence and incidents according to ASSET methodology, which helps to identify the reason most fully and to take the corrective measures for their repetition preventing. The procedure of HPES method use (it's Sweden analogue AMTO) is currently being completed in cooperation with Sweden consultants for identifying the direct reasons of human errors. This procedure supplements the event analysis performed by ASSET methodology, where the human errors took place. This procedure is planned to be used since 2002. The incident due to the error in operator actions was additionally analysed by AMTO method in 2001. This analysis allows specifying the additional barriers, which are to be introduced to prevent human errors.

INPP personnel skills are extending through IAEA International symposiums and seminars, including those conducted in Lithuania.

The international audit of INPP Safety Committee performance was carried out in 2000 on INPP initiative. The international audit presented the recommendations for the improvement of this Committee performance. These recommendations are currently implementing.

In 2000 Quality Assurance Group was enlarged and reformed into the Quality Assurance Department (QA), which performed the audits of quality assurance program fulfilment for the plant activity and assessed this program efficiency. QA monitors the activity of the contractors, providing work or service for INPP. The workshop was conducted for the permanent contractors for their clear understanding of quality assurance tasks regarding products, works and services they were responsible for.

In the course of Quality Assurance Program development a decision was made to add some procedures to the second level procedures. Currently 5 second level procedures are at the stage of development, namely:

1 Safety Culture
2 Projects Management
3 Software Architecture Control
4 Economics and Finance
5 External and Internal Information

INPP pays attention to the training of the executive staff and engineers on international standards. Therefore, at the stage of Quality Assurance Program development and implementation, a number of workshops were conducted at INPP on ISO 9001:1994, ISO 14001:1996 series standards, Environmental Protection.

In 2001 the workshops for the executive staff and engineers were conducted on the new ISO 9001:2000 and ISO 9004:2000 series standards, Quality Management System Requirements and Improvements Recommendations, accordingly.

# Article 11: FINANCIAL AND HUMAN RESOURCES

1. *Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.*
2. *Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.*

### 11.1. Financing sources

INPP is the main energy generator. 75% of electricity is produced and supplied by INPP.

***Table 11.1.*** **Energy generated by INPP is supplied to the only Purchaser – AB "Lietuvos energija"**

| No. | Years | Sold electrical energy M/kWh | Income (K Lt) | Rate cents/kWh | Profit/loss (K Lt) |
|---|---|---|---|---|---|
| 1. | 1998 | 12288 | 724980 | 5,9 | 93664 |
| 2. | 1999 | 8917 | 526103 | 5,9 | -10488 |
| 3. | 2000 | 7417 | 491021,9 | 7,04 | -55700 |
| 4. | 2001 I half | 3528 | 224266 | 7,04 | -40000 |

To the most extent the loss incurred by INPP is caused by the following: scope of electricity sale decreased and the electrical energy rate does not cover INPP costs.

One of the most important task of INPP is the implementation of Safety Improvement Programme (SIP-2). Programme of safety measures to be implemented includes the following stages:

1998 - 16,96 M Lt from budget resources;
1999 - 16,2 M Lt from privatisation fund;
2000 - 3,7 M Lt from privatisation fund;
2001 - 20,0 M Lt from INPP funds.

Additionally the resources are received from the donors-countries: Sweden, Denmark, etc.

1998 - 26,0 M Lt;
1999 - 23,9 M Lt;
2000 - 24,8 M Lt;
2001 I half - 5,7 M Lt.

### 11.2. Personnel employment and training for performance of safety-related activities at Nuclear Facilities

INPP has a quantitatively high number of personnel in comparison with the other NNPs in the world (except for the former Soviet plants). Firstly, it is caused by the fact that INPP operation and maintenance requires a lot of efforts and manpower. The other reason is that after Lithuania gained its independence, the former system ensuring maintenance and repair of the nuclear installations collapsed as well. In order to preserve the experienced personnel recruited to perform outage works and other activities, INPP had to incorporate all these external organizations into its structure.

When INPP became property of Lithuania, there was much work initiated to upgrade plant and improve safety by applying nuclear experience gained by Sweden, Germany, USA, Japan and other

countries. Supported by the above countries, INPP safety and reliability have been sufficiently upgraded and this work is still ongoing. The relevant activities on implementation of procedures, manuals, guidelines performed purposed to meet IAEA standards.

The above ongoing activities allow to classify INPP as the safest RBMK Nuclear Power Plant.

A lot of INPP experts have been trained and are currently being trained at the nuclear power plants of Sweden, USA, Canada, Japan and other countries. This activity is the brilliant tool to adopt the safety improvement experience.

INPP personnel is highly trained and educated. More than 31% have higher education, 24% of experts are specially educated, 20% of personnel have professional education and the others have the general secondary education.

The personnel change rate is very low about 1.2% and therefore there is no problem with staffing.

There is a Department of Thermal and Nuclear Power at Kaunas Technological University established for educating the nuclear specialists.

Taking into account the peculiarities of the RBMK reactor, INPP concluded an agreement with the Obninsk Nuclear Power Energy Institute (Russia). Every year 5-7 nuclear engineers are being trained there to operate nuclear facilities.

In addition, in the residence of INPP personnel there is a Vocational School which trains qualified workers to satisfy the INPP needs in electricians, welders, electronics specialists and tool-makers.

Procedures on INPP Safety Culture development have been developed, which are permanently being upgraded in order to increase individual responsibility of the personnel while performing the work and to provide reliable and safe operation of plant.

1999 the National Energy Strategy was approved which set forth INPP Unit 1 closure to take place in 2005. Currently the technical designs of Unit 1 decommissioning and programmes of plant personnel social insurance are being developed.

However, Lithuania has not yet made any political decision concerning the nuclear power industry future. It results in the growing uncertainty in future which will probably have an unsatisfactory impact while recruiting the staff, defining the required number of the personnel to be trained and educated at educational institutions. Moreover the moving of the highly experienced staff to the plants of the other countries will probably take place. Finally, it could lead to negative consequences for INPP safe and reliable operation and cause problems for its decommissioning.

### 11.3. Organization and structure of training at INPP

***General Provisions***

The Training Centre was founded on 1 August 1996 on the basis of the existing training unit.

The Training Centre is the structural department of the state enterprise INPP and is located at the same address – village Karlu, Rimšės seniūnija, 4752, Ignalina region, Lithuanian Republic.

Activity of the Training Centre is regulated by the Norms and Standards of the Lithuanian Republic in accordance with the List of main laws regulating nuclear energy safety in the Lithuanian Republic VD-VP-01, section XIII:

1 Law of the Lithuanian Republic on nuclear safety, 1996 No. 119
2 Law of the Lithuanian Republic on professional education No. V111-450 dated 1997 10 14;

3 Regulations for training, instruction and qualification safe operation issues (БТ-230) approved by Order No. 85 dated 1997 07 07 of the Ministry of social insurance and labour of the Lithuanian Republic, and

*Recommendations of guidelines:*

1 Basic principles of nuclear power plant safety, IAEA INSAG-3, item 3.3.3;

2 Nuclear Power Plant personnel employment and selection, professional training and access to work of the Operational staff, IAEA No. 50-SG-01;

3 Safety of Nuclear Power Plants: Operation, No. NS-R-2, п. 3.

***Activity of training center (TC)***

TC has the following rights purposed to performance of its activity within its competence frames:

1 To make independent decisions with respect to its working activity;

2 To submit proposals of work improvements to INPP Top Management, in the written form and orally;

3 To manage the general process of assessment and feedback in course of training when permanently supported by the plant departments (workshops) that the training is conducted for and tightly interconnected with.

The Training Centre is responsible for:

1 Together with the Personnel Directorate conduct training of INPP employees, check their knowledge and skills;

2 To provide high technical and pedagogical competence of TC instructors, proper qualification of other employees of TC;

3 To use training and methodological documentation and techniques purposed to effective training conduction;

4 To ensure operative and proper condition of the full-scope simulator and other equipment of TC;

5 To develop programmes of training, continuing and re-qualification training of INPP personnel in tight co-operation with the plant departments involved;

6 To develop perspective and annual plans of INPP personnel training;

7 To develop training materials for training conduction for the plant personnel, to provide monitoring of such training conduction.

***Sequence of personnel training***

All categories of operation personnel are trained in the Training Centre (irrespective of their age and education), job positions of which are included in the Position List of managers, experts and qualified workers subject to the compulsory training at TC, code PTOed-1416-1, as well as employees servicing equipment subject to the surveillance of the State Technical Inspectorate and performing potentially dangerous works.

The basis for training of a specific employee shall be the order by the Technical Director.

In accordance with the order a theoretical training instructor and an operational training instructor shall be appointed.

Expert from the corresponding plant department can be appointed as an operational training instructor.

***Basic provisions of personnel training***

Personnel training system is purposed to provide knowledge and practical skills necessary for work

performance and process and equipment control, as well as the responsible attitude to work which is required for implementation of the established tasks and allotted functions as per the job description.

Personnel training system comprises the following components:

1 Psycho-physiological examination of the candidates for training,
2 Input check of knowledge and development of individual training programme,
3 Training in accordance with the training programme,
4 Routine check of knowledge and skills
5 Preparation and archiving of training documentation

At INPP the personnel training is conducted by means of initial training and continuing training.

***Initial training***

Initial training – training of a fresh-comer for the relevant position at INPP, as well as training of INPP employee for promotion.

The initial training is conducted in the following sequence:

1 After the corresponding procedures are performed in the personnel department the employee's manager shall perform the primary on-the-job instructing of the employee,
2 To determine the input knowledge level and practical skills of the trainee the input knowledge check shall be performed. It is performed by the TC instructor in form of interview or written test in the presence of the trainee's manager,
3 On the basis of the input knowledge check and in accordance with the approved and registered training programme for the relevant position the individual training programme shall be developed for the specific employee training,
4 Upon passing all training stages in accordance with the individual programme the employee shall take internal exam at the TC or at shift (for operation personnel),
5 In case of the positive result of the internal exam the employee shall take the primary exam in committee with subsequent certificate issuance,
6 In case the primary exam is satisfactorily passed the employee on the basis of the committee conclusion and the relevant order is allowed to the doubling work performance.

Thus, the primary training is considered to be completed. After successful doubling performance the employee is allowed to independent work performance in accordance with the relevant order.

Training to the job position is conducted in accordance with the training programme and consists of the several stages:

1 Theoretical training,
2 On-the-job training (probation),
3 Simulator training or using other technical training means (if any and as appropriate).

Each position listed in INPP manning table is provided with the relevant training programme and INPP registration code.

Number of the theoretical training items and their contents is specified in accordance with the specific activities performed at INPP.

Theoretical training of the personnel can be performed in form of courses or individually by the TC instructors or the relevant experts of INPP departments.

As a rule, the course method training is applied for personnel studying the allied jobs, the group shall consist of no less than 8-10 trainees.

Individual training is used for personnel training for promotion.

Training using the full scope simulator or other technical means (training computer programmes, equipment mock-ups, actual components and samples, etc.) shall be indicated in the promotion training programme and is conducted by the TC instructor.

On-the-job training (probation) is purposed to the personnel to acquire practical skills and attitudes in site and is conducted by the on-the-job instructor.

In course of probation the employee studies and applies in his working area the rules, standards, job description and operation manuals in accordance with his job description. The employee shall familiarize with requirements of proper, safe and least-cost operation of the serviced equipment.

Knowledge conformance to the established requirements for the operation personnel (qualification) is checked by the qualification committee. The knowledge level is checked using the test papers and special questions by means of written and oral quiz. During exam additional questions can be asked within the frames of the training programme for corresponding job though not covered by the particular test-paper. Examination result is recorded in the protocol and certificate.

The doubling shall be performed under surveillance and guide of the experienced employee.

***Continuing training of the operation personnel***

Continuing training is purposed to maintaining and improvement of operation personnel job proficiency including knowledge, skills and attitude to work.

There are the following forms of continuing training:

1 Maintaining and improvement of operation personnel job proficiency in INPP TC,
2 Periodic instructing,
3 Studying of materials on evaluation and analysis of industry and in-house experience,
4 Periodic checking of knowledge (qualification),
5 Performance of practice exercises,
6 Increase of professional and qualification level at re-qualification courses held in other organizations, at special institute faculties in Lithuania and abroad,
7 Self-preparation.

The annual document “Plant of INPP personnel preparation” includes schedules of continuing and re-qualification training of INPP personnel, schedule of instruction conduction, emergency and fire protection training, examination schedule.

Personnel training purposed to job proficiency maintaining shall be conducted as minimum once per four years for the operation staff and once per five years for the rest of the personnel.

Maintaining of operation personnel job proficiency shall be performed in accordance with the programme including theoretical training, training using the technical means, personnel on-the-job training in INPP departments.

Instruction conduction is one of the forms purposed to maintaining the operation personnel job proficiency and improvement of personnel knowledge of rules, job descriptions and operation manuals, as well as upgrade of operation and maintenance techniques used for equipment, systems and facilities of INPP.

Lessons dealing with review of the unusual event reports, design modifications, new plant techniques and continuing training of skills required for rarely performed job.

Periodicity of knowledge checking is determined in accordance with the approved schedule on the basis of the Guidelines for work arrangement with operation staff, code PTOed-1408-1.

In accordance with such schedules the relevant emergency and fire protection training is conducted in INPP departments in order to maintain the skills required for accident mitigation, proper behaviour in the emergency situation, to verify shift personnel interaction, skills required for rendering the medical aid and using the individual protective and fire protective means.

Personnel re-qualification training is performed in TC in accordance with the programmes (Individual and group programmes) including training duration and sequence, extension of both technical knowledge and knowledge on safety culture, industry and radiation safety, ALARA principles.

Re-qualification training of workers includes professional training purposed to update of the corresponding professional knowledge and skills as minimum once per five years.

Training can be conducted both individually and in groups. As a rule training groups are formed from the specialists or workers of similar or allied position, approximately equal job proficiency and the same educational level. The number of trainees of theoretical training group shall not exceed 20 people. The number of trainees in the practice training group is conditioned by the capabilities of specific training means.

Re-qualification training can be conducted both as an on-the-job process or as a specific lesson course.

Re-qualification training forms: individual training, working courses, specific-purpose courses, increase of professional level and category (for workers).

Working courses are purposed to increase of job proficiency, extension of personnel knowledge and skills to meet the current operational requirements.

Specific-purpose courses are intended for studying the new equipment, goods, materials, processes, mechanical and automated tools used in operation process, rules and requirements of their safe operation, technical documentation and economical issues relating to the operation.

Professional level increase at the re-qualification courses held at other organisations, special institute faculties of the Lithuanian Republic and abroad is performed on the contract basis for in-depth study and practical acquiring of the latest technological achievements, modern management techniques and labour organisation methods required for responsibility and obligations performance relating to the specific job or for promotion needs.

### *1) MCR Operators and Plant Shift Supervisors*

In compliance with the work programme on INPP safety improvement and in order to facilitate the MCR crews training the full-scope simulator was put to operation in 1998

The main tasks set forth for the MCR crews continuing training are as follows:

1 Maintaining of the basic knowledge scope at the proper level;

2 MCR staff training with respect to the diagnostics skills and emergency situation mitigation using the full-scope simulator;

3 Complex training on the basis of modifications performed;

4 Training of organisational and managerial skills;

5 Training of operative work skills;

6 Improvement of team work methods and importance of human factor with respect to the plant

safety.

Within the frames of personnel continuing training in accordance with the Programme of MCR staff qualification training in TC the annual sessions are arranged consisting of lecture, seminars, practice exercises on the full-scope simulator.

In course of these sessions the Safety Culture lessons, seminars and lectures on are conducted, e.g.:

"Communication. Team work. Dispute resolution";
"Human factor impact to incidents at NPPs";
"Review of MCR staff training programme on using the symptom-based EOPs";
"Alterations and new approaches to the emergency preparedness plan";
"Programme of erbium fuel loading, objectives, results, forecasts»";
"ECCS – testing results, problem";
"Interim spent fuel storage: concepts, problems, perspectives";
"Results of metal inspection of main equipment systems and pipelines";
"Condition of reactor graphite cladding, Unit 1, INPP", etc.

Training using the full-scope simulator is conducted in accordance with scenarios of normal operation, emergency situation and accidents.

In course of continuing training the new knowledge is given, relevant skills and interconnections between operator are trained. Each lesson is analysed upon its completion to solidify the skills acquired and:

1 To indicate good achievements throughout the exercise task performance;
2 To reach thorough understanding of technological process dynamics;
3 To work out ability of situation analysis;
4 To work out skills of teamwork.

While working out skills in the accident mitigation training it is taken into consideration that operator can act in the following circumstances:

1 Time constraints;
2 Sudden increase of information flow in case of accident;
3 Possible stress of operator,
4 Lack of experience of work in accident conditions;
5 Probability of safety systems hidden failure to occur.

According to the order of General Director No. 106 dated 2000 02 17 "Performance of verification and primary training of symptom-based EOP" the verification of EOP package and primary training of MCR staff to use the symptom-based EOPs were arranged and performed.

***Rights, Obligations and Responsibilities of personnel trained in TC***

The Training Center is dealing only with the training of the operation personnel of INPP. All rights, obligations and responsibilities of an employee trained are specified and authorized in the job description of the corresponding employee.

***Qualification Requirements to Instructors, their Rights, Obligations and Responsibilities***

Position of the TC instructor can be rendered to a person having technical education, experience of INPP equipment operation no less than 2 years and medical permit.

Position of the MCR senior instructor can be rendered to a person having higher technical education,

experience of INPP equipment operation no less than 5 years with at least 2 of them performing the relevant MCR job, having medical permit and passed psycho-physiological selection.

Prior to the independent work performance the instructor shall be trained in accordance with the programme for job preparation, acquire the relevant psycho-physiological training in the TC or corresponding educational institution and be qualified by the relevant plant committee for such a position.

Checking of instructors' knowledge is performed in accordance with the test-papers, approved by the Technical Director and endorsed by VATESI.

Further on, the instructor once per 3 years shall take regular exam on technical operation rules, industrial safety rules, fire safety rules, operation manuals and job description.

All rights, obligations and responsibilities of the MCR senior instructor, TC instructor are listed and authorized in the corresponding job descriptions.

***Examination***

Knowledge of trainees during qualification (exam) is marked (checked) on the scale: GOOD, SATISFACTORY, UNSATISFACTORY.

Persons got unsatisfactory mark at the routine exam shall take re-examination in one month at the latest.

Checking of knowledge and skills of INPP personnel is accomplished by the examination committees appointed in accordance with the order of the General Director.

Number of examination committees at INPP is determined considering the necessity of timely and proper check of knowledge. Examination committee shall consist, as minimum, of three members.

Persons appointed as examination committee chairmen shall have the relevant qualification on industrial safety and certificate of the standard pattern.

Examination results are documented in the certificate of standard pattern given to the employee upon passing his first exam. Qualification category on electrical safety and permit for special work performance is indicated in the certificate as well.

Qualification of qualified workers completed their training in TC, as well as of workers trained for qualification level (category) increase is performed by the qualification committee.

Such qualification includes the following:

1 Qualification trial work shall be performed. Qualification (trial) work is considered to be successfully performed if no time limits were exceeded, no spoilage is found caused by the examined person, no industrial safety rules are violated.
2 Qualification exam shall be taken.

Committees on qualification examination are appointed in accordance with the General Director order.

Training and qualification of employees on performance of dangerous works and works with the potentially dangerous equipment shall be accomplished in accordance with the Regulations for training, instruction and qualification safe operation issues (БТ-230) approved by Order No. 85 dated 1997 07 07 of the Ministry of social insurance and labour of the Lithuanian Republic.

***Management of training center***

The Training Center makes part of the Technical Directorate and directly reports to the Technical Director (Chief Engineer).

The Training Center is guided by and the responsibility for its activity rests with the Head of TC.

Organization structure and manning table of the Training Center are approved by the General Director when submitted by the Technical Director and Personnel Director.

The Training Center comprises training service and technical means service.

The Training Center services are guided by and the responsibility for their activity rests with the Deputy Heads of TC.

***Resources of the training center***

INPP personnel training in the TC is accomplished in accordance with the annual training plan.

Training costs are covered from INPP personnel training budget calculated in compliance with the planned costs.

All TC buildings are covered by balance of INPP.

***TC archive and records***

TC documentation on training and qualification of operation personnel is maintained in accordance with the requirements of procedure "Documentation control and records", code PTOed-0211-1.

Regulating documentation is maintained in accordance with the requirements of procedure "Records maintenance" No. 1 developed on the basis of the Lithuanian norms.

*TC Reorganization and wind-down*

TC Reorganization and wind-down shall be performed within frames of the state enterprise INPP and in compliance with provisions of Law of the Lithuanian Republic and INPP Statute.

# Article 12: HUMAN FACTORS

*Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account through the life of a nuclear installation.*

Human factors influence all aspects of safety of an operational nuclear power plant. They are a significant element of the plant safety culture.

In “The General Regulations for Nuclear Power Plant Safety" (VD-B-001-0-97) which are main high-level document in Lithuania containing standards and regulations on the aspects of safety is stated that *"The NPP must be provided with trained staff capable of operating independently. The manning table and the training programs for the staff shall be prepared by the plant administration. The training programs shall be approved by the Operation Organization and agreed by State Nuclear Power Safety Inspectorate (VATESI).*

*The personnel of every nuclear plant, including those who have servicing functions, shall undergo training at training centers (sites) using simulators, and later on-the-job training. Their knowledge and abilities must be tested, and experienced personnel must back them up until they are ready for independent work. Periodic retraining is to be given in accordance with the norms and technical requirements in force.*

*The plant training center (site) shall begin operation no later than the time of physical start-up of Unit 1.*

*In the training and retraining of personnel, particular attention must be given to personnel actions and interactions during accidents and to the development of practical skills for the control of the reactor installation and the plant as a whole. Training shall be designed to take into account errors committed in the past so that personnel understand their causes and consequences and their significance for staff safety as well as the safety of the population and the environment.*

*The qualifications required of plant personnel shall be established by the Operating Organization as part of the personnel training programme and agreed by the State Nuclear Power Safety Inspectorate)."*
Formally the Human factor activity at INPP is regulated by “Regulation for Operating Personnel Management at INPP” (PTOed-1408-1), which has been in force since 1999. This Regulation includes all fields, which are given in IAEA recommendations and have been applied by international practice for the recent years. The Regulation was developed due to the requirement of VATESI to review the document PORP-89, which had been applied before and was not in compliance with IAEA recommendations. The new document defines:

- Objective;
- Scope of application;
- Liabilities of the Operating Organization in the area of work with INPP personnel;
- Organizational foundations;
- Employment and instructions for work;
- Qualification requirements for managers, experts, clerks, skilled workers;
- Requirements for state of health;
- Personnel training;
- Job trainee;
- Personnel knowledge assessment;
- Examination team members and their job;
- Personnel backup and leave for work;
- Staff briefings;
- Emergency preparedness and fire preparedness training;

- Retraining and maintaining of skills level;
- Training center;
- Surveys of working places;
- Administrative methods of work with personnel;
- Management of work of the Technical Library and Offices.

At present the Human Factor work is being implemented in the following directions:

1 Selection, training and retraining of staff;
2 Developing teamwork;
3 Procedure for co-operation and relationships;
4 Leadership;
5 Methods for identifying, reviewing and preventing human errors;
6 Self-checking and self-assessment;
7 Motivation;
8 Man-machine interface;
9 Using internal and external experience;
10 Upgrading procedures and working conditions.

The personnel action not defined in the instructions and errors are subjected to reviewing to identify direct and indirect causes and contributors to the event, to eliminate causes and prevent further recurrence, the corrective actions are developed and taken.
The analysis of human factor influence on safety is an integral part of study and application of internal and external experiences. The final goal of the analysis is to improve safety and reliability of INPP.

The activity on registration and analysis of events related to human factor is regulated by requirements of the "Safety Assurance Manual" (QA-1-009), "Personnel Training and Qualification" (QA-1-018), "Corrective Measures and Improvement Program" and Management Procedure (QA-2-003) "Assessment of Internal and Industrial Experience". Criteria for event registration, order of the reports about events, methodology and order of the events analysis, and responsibility of the staff for the activity is defined in the "Instruction on Reports about Unusual Events at INPP" (PTOed-0312-8V3) and the "Instruction on Analysis of Unusual Events" (PTOed-0312-5V1).

Methodology of the events' analysis is in compliance with ASSET methodology and is based on identification of direct and indirect causes of the event.

At present the plant specialists together with advisors from Sweden are working under putting into force the procedure of HPES method application (its Swedish analogue is AMTO) aimed to identify direct causes of human errors and barriers that might prevent human errors in future. The procedure will supplement the analysis of events with human errors.

It is planned that the procedure will come in force at the beginning of 2002. In 2001 an event with improper actions of operators has been analysed according to AMTO methodology in addition to the analysis conducted with the help of ASSET methodology. The analysis has defined additional barriers that will be necessary to put in order to exclude human error in future.

The procedure for self-checking and self-assessment has been perfected owing to regular special training of the plant personnel. Nowadays STARK system is being generalized and popularised. There are posters presenting requirements of STARK system at working places of the plant personnel.
Different aspects of motivating are highlighted in "Policy" of the plant management and in the "Policy Content". These booklets have been distributed among INPP staff. In addition, the motivation issues are included in a leaflet "INPP Personnel Regulations" and considered during workshops on safety culture. It is planned to arrange the workshops on safety culture for all INPP workers.

The nuclear control operators are subject to testing and questioning regarding ways and tools for data displaying and computer applications. The intensity (rate) of using computer controls and applying to

data display tools is currently under review. On the basis of the results obtained the corrective actions are taken to upgrade the man-machine interface.

The use of Internal and External Experience is regulated by the procedure of Quality Assurance Program "Assessment of Internal and Industrial Experience".

Production Department distributes the internal experience reports among all INPP departments and divisions, where a department coordinator in this area reviews them. Then the coordinator hands the reports over to a department manager and workers in so that they could define and perform corrective actions (if they have been not defined before). The coordinator reports the results of the corrective actions to the Production Department.

External experience reports received from WANO, IAEA, NucNet and other NPPs with RBMK reactors are considered by the plant managers and distributed among coordinators in assessment and use of experience, to Production Department and other departments. The acceptable experience is disseminated to the relevant personnel and then practically used.

Every department of the plant has assigned its qualified engineers as coordinators in assessment and use of experience. They provide the department staff with information and deal with feedback. Coordinator in assessment and use of experience, who works in Production Department, provides coordination of activities regarding assessment of experience at the plant.

The staff training and retraining are provided in accordance with standard programs taking into account a level of the previous training and characteristics of a position. There are two methods of training being used at the plant: training in teams and individual training.

The retraining programs are developed on the basis of amendments incorporated into projects, processes, procedures and regulations, as well as on the results of internal and industrial experience. Any training or retraining program end in an individual proficiency examination.

The computer simulator is used to train the nuclear control operators (MCR operators).

At present the simulator has been completed by the personnel of the Training Center and being in operation at full capacity. Every year the nuclear control operators (MCR operators), plant shift supervisors and their deputies are being retrained at the simulator for 2-3 weeks session. During the training course the personnel develop their skills in equipment control under different operation conditions and learn how to work in team.

The responsibility for staffing rests with INPP Personnel Management. There are procedures and requirements for staff recruitment in accordance with Lithuanian legislation considering physical condition, education and knowledge basis of candidates.

The Technical and Training Center management staff is responsible for training and retraining of the plant personnel.

The operational managers (department and service managers) bear the responsibility for practical training of the staff. This work is conducted in compliance with annual and monthly training plans and schedules.

The Safety and QA Service staff carries out regular audits of the INPP activities. The Human Factor activity is an incorporated section of the INPP Audit Programs.

Though the responsibilities of VATESI are described in pervious chapters of this report, it would be relevant to mention that human performance questions has been always in the focus of the Regulatory Body. In accordance with Lithuanian regulations all safety related activities are to be reviewed by the regulatory authority (VATESI). It includes inspection, monitoring and review of all nuclear safety aspects with aim to eliminate human errors or mitigate their consequences.

# Article 13: QUALITY ASSURANCE (QA)

*Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with the view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.*

**13.1. Regulatory requirements**

In accordance with the General Regulations for Nuclear Power Plant Safety, VD-B-001-0-97 the safety of NPP must be ensured by the implementation of system of technical and organizational measures, which includes also the implementation of quality assurance system at NPP.

The General Requirements for Quality Assurance at Nuclear Power Plant and other nuclear facilities VD-KS-02-99 were issued on the basis of the Law on Nuclear Energy of the Republic of Lithuania and approved by the Resolution of the Government of the Republic of Lithuania. The Regulations VD-KS-02-99 establish regulatory requirements to the organizations operating nuclear power facilities with respect to their obligations to develop, implement and maintain the efficient QA system. The requirements are of general type and concern all types of activities, which have direct and indirect influence to the safety of nuclear power facility. The requirements are obligatory for organizations, carrying out transportation, treatment and storage of nuclear and radioactive materials and as well shall be considered by the organizations, which activities can influence the safety of nuclear facility. In accordance with VATESI requirements QA system at INPP complies with recommendations of IAEA safety guidance QA 50-C/SG and follows the ISO 9000 standards. Besides, INPP follows requirements of laws of the Republic of Lithuania, as well as current regulations on nuclear energy and safety.

For administrative management of QA system development and implementation INPP has established the Safety and Quality Assurance Department. It is an independent division subordinated directly to the General Director of the plant. INPP General Director has defined the commitments to achieve sufficient QA level and appropriate safety culture at the nuclear power plant. At present the Safety and Quality Assurance Department together with the other INPP departments have developed and implemented the QA program.

The Safety and Quality Assurance Department Manager is responsible for development and implementation of the QA program as well as monitoring of its elements efficiency that provide achievement of goals in the quality assurance area and sufficient training of the plant personnel.

In 2000 INPP established the Quality Assurance Division under the Safety and Quality Assurance Department, which performs continuous monitoring of the QA program fulfillment in all INPP activities as well as its efficiency. The QA Division together with the other INPP departments develops corrective actions providing the QA program improvement. In order to ensure the plant personnel understanding of INPP policy and goals as well as principles of quality assurance and safety culture, INPP has conducted several workshops for the plant management, engineers and operating personnel. Moreover, the questions on quality assurance and safety culture have been included into the current INPP personnel training and retraining programs.

The Quality Assurance Division controls the activities of organizations performing work or providing services for INPP. Organizations involved in design, construction, installation and adjustment work, as well as companies, which manufacture nuclear plant equipment, shall have prepared their own quality assurance programs relating specifically to the activities in which they are engaged. To provide more precise understanding of commitments of a supplier in the quality assurance of the production, goods and services, for which the supplier is totally responsible, the Safety and Quality Assurance Department conducted a workshop for permanent suppliers.

The Safety and Quality Assurance Department pays special attention to INPP management and engineers training in the area of international standards. Thus, at the phase of the QA program development and implementation INPP conducted several workshops on standards ISO 9001:9004, ISO 14001:1996, Environment Protection.

In 2001 the Safety and Quality Assurance Department held several workshops for INPP management staff and engineers on new standards ISO 9001:2000 and ISO 9004:2000 (requirements for quality management system and recommendations on activities improvement).

QA Policy, procedures, all elements, requirements and regulations established at INPP for general quality control system, are documented in the form of hard copies and files, systematized, monitored and maintained in a certain order applied at INPP.

### 13.2. INPP QA Policy

To achieve the goals defined at a certain level of efficiency, implementation of QA system at INPP is ensured by efficient management structure that defines the hierarchy of authorities and their relations, clear distribution of responsibilities, duties and authorities for each type of activity, which influences the quality.

INPP has clearly defined the goals as well as QA and Safety policy. The main goal of INPP activities is to provide safe, reliable and effective operation of both units and competitive position among other nuclear power facilities. The main principles of QA and Safety policy include:

1. implementation of safety culture at all INPP levels;
2. implementation of effective and integrated quality assurance and management program;
3. reliable, safe and economic performance of works;
4. clear distribution of authorities and responsibilities among the managers of Directorates and Services in order to avoid mistakes in the plant management;
5. constant improvement of the management structure;
6. sufficient qualification of the personnel and reliable equipment;
7. responsibility of each manager for definition of tasks and requirements applied to a department personnel and creating appropriate conditions for the personnel performing the tasks;
8. attracting of INPP personnel to active participation in safety and quality improvement process;
9. constant assessment of works performed at INPP aimed at quality improvement.

### 13.3. Development and Implementation of QA Program at INPP

INPP has established three levels system of QA documentation. The main first level document on development and implementation of the QA system is the Quality Assurance Manual, which presents the basis for management of all activities performed at INPP and includes the following sections:

1. Mission and Objective
2. Legal Framework For Operational Activities at INPP
3. Regulations To Be Used For Quality Assurance and Safety
4. Organization and Responsibility
5. INPP Safety Performance and Quality Assurance Policy
6. Management and Assessment of the Plant
7. Self Assessment of Management Activities
8. Description of INPP QA System
9. Definitions To Be Used in QA System
10. Safety
11. Planning
12. Training and Qualification of Staff
13. Management of Non-Conformances
14. Corrective Actions and Improvement Program
15. Document and Records Control
16. Work Process Control
17. Design
18. Procurement of Items and Services
19. Inspection and Testing
20. Audits

The second level of QA program is the Management Procedures. INPP has developed and

implemented, and now constantly updating according to the new data 20 documents covering main kinds o operational activities that are important with respect to safety of the plant:

1 Document and Records Control
2 Assessment of the Plant and Industrial Experience
3 Environment Protection
4 Radiation Protection
5 Fire Protection
6 Industrial Safety
7 Emergency Preparedness
8 Operation
9 Maintenance
10 Inspection and Testing
11 Core and Fuel Management
12 Handling of Radioactive Waste
13 Personnel
14 Chemical Control
15 Plant Modifications
16 Procurement
17 Design Control
18 In-house Fabrication
19 Storage of material and Equipment
20 Physical protection

Five more Management procedures are being developed at present:

1 Safety Culture
2 Project Management
3 Software Configuration Control
4 Economics and Finance
5 Internal and External Information

In 2001 several workshops were held for the personnel involved in development and implementation of the above documents as well as for the majority of personnel, which activities are related to the documents.

New procedures are developed and implemented in accordance with detailed Implementation Plans for all activities. These plans define the leader, the person who is responsible for implementation of the procedure, human resources, the scope, the time schedule of the plant personnel training, the work procedures revision and development of the lacking procedures, if necessary.

The documents of the third level include detailed working procedures that are developed in compliance with the requirements of management procedures and implementation plans. These documents define goals and characteristics of various activities that provide effectiveness of the QA system.

### 13.4. Techniques used for implementation and assessment of QA Program

One of the techniques for monitoring of QA program fulfilment and efficiency and performance of corrective actions are internal audits at INPP conducted by the Quality Assurance Department. Each element of the QA program shall be checked once in three years; thereat every department shall be checked once in two years. Moreover, the Quality Assurance Department performs external audits of organizations that supply goods, perform works and provide services to INPP. The plant has developed and implemented the working procedures that define requirements for planning, preparation and performance of internal and external audits. Results of audits are documented in reports of audits. The reports are delivered to the plant General Director and Technical Director and to the managers of departments and services where the audits have been conducted, as well as to VATESI.

INPP staff and technical experts with appropriate level of qualification, experience and training perform the internal and external audits. A separate working procedure defines the requirements to qualification of the auditing group leader and the auditor. INPP has a list of competent audit groups' leaders and auditors, which is reconsidered annually and approved by the Safety and Quality Assurance Division manager.

VATESI performs continuous monitoring and supervision of QA program implementation. Once in three months the Safety and Quality Assurance Division presents to VATESI progress reports on QA program implementation.

In 2000 there were two VATESI inspections and independent audit of the Safety and Quality Assurance Division conducted by Swedish company. It was an assessment of QA program and its procedures' implementation status. The Safety and Quality Assurance Division together with INPP departments, which received some comments after the inspection had been performed, developed the corrective actions. All findings and comments are considered in new versions of the procedures and QA documents.

INPP General Director constantly monitors the activities related to quality assurance. The issues on quality assurance are considered at regular meetings arranged by the General Director. The QA program implementation and fulfilment process is being analysed, and the results are documented and presented in annul safety reports.

### 13.5. Development of QA system within VATESI

The main responsibility of VATESI to supervise the activities of nuclear facilities, to assess and confirm that plant is operated safely.

To improve performance and results of overseeing of nuclear safety within Lithuania VATESI has decided to develop and implement Quality Assurance management system. The QA system aims:

2 to improve the efficiency of organization management;

3 to optimise planning and the use of organization resources;

4 to ensure proper selection, recruitment and training of VATESI personnel;

5 to ensure proper licensing processes and regulatory supervision;

6 to ensure the effective management and use of information;

7 to ensure proper assessment of expertise and services;

These goals will be achieved via development and implementation of the following system.

The first level procedures:

1 VATESI Mission,

2 VATESI Policy and objective.

QA system describe a mission and the main responsibilities of VATESI, work principals and basic values and system which aims to achieve set objectives and goals.

The second level procedures describe main processes of overseeing of nuclear safety within VATESI. It includes the following procedures: 1) Administration of VATESI activities; 2) Planning; 3) Licensing and safety assessment Documentation Management; 4) Inspection and enforcement; 5) Resources and training management; 6) Development of regulations; 7) Public relations.

QA system implementation within VATESI program approved by Head of VATESI set steps and methods of development of procedures, responsible persons for submitting of each procedure. Experts of Sweden, France, Great Britain, Germany and Finland support to collect good practices of EU countries and provide assistance to develop procedures.

After implementation of the above-mentioned program further development and maintenance of QA system will occur taking into account the best experience of VATESI, EU practices and International Atomic Energy Agency recommendations.

# Article 14: ASSESSMENT AND VERIFICATION OF SAFETY

*Each Contracting Party shall take the appropriate steps to ensure that:*

1 *comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;*

2 *verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.*

## 14.1. Licensing process and Safety Analysis Reports for different stages of a Nuclear Installation project (e.g. sitting, design, construction, operation)

### *14.1.1. Licensing Process*

It is stated in the Law on Nuclear Energy (Articles 25 and 26) that it is prohibited to design, construct, reconstruct, operate and decommission nuclear facilities, installations and equipment without a license issued by VATESI. Article 27 of the Law says that VATESI may establish additional requirements for the licensed activity. One of such principal requirements of VATESI to the applicants is a submission of safety analysis reports for getting a license.

These statements are further specified and developed in the "Regulations for Licensing of Nuclear Power Related Activities", "Regulations for Procedures for Issuing a License for Unit Operation at Ignalina Nuclear Power Plant", "General Regulations for Nuclear Power Plant Safety", "Nuclear Safety Regulations for Reactor Installations of Nuclear Power Plants" and in the other norms and standards.

For example, it accordance with point 1.2.18 of the "General Regulations for Nuclear Power Plant Safety" every nuclear plant design must include a special document called a "technical justification of nuclear plant safety", which has to be based on highest scientific and technical knowledge. Technical justification has to have an independent expertise review, and to be approved by the Operating Organisation and to be presented to VATESI for the regulatory review.

The "Nuclear Safety Regulations for Reactor Installations of Nuclear Power Plants" in their turn say that the “Technical Justification of Nuclear Power Plant Safety” should contain the chapter "The Reactor Plant Technical Safety Justification". "The Reactor Plant Technical Safety Justification” shall be prepared by competent organizations and approved by Operating Organization. The shape and content of the reactor plant Safety Justification Report should conform with the current normative technical document. The indicated regulations also set a number of specific requirements to the content of safety justification (safety analysis) reports.

On 10 February 1994 the Grant Agreement was signed between Lithuania and the EBRD acting as administrator of grant funds provided by the Nuclear Safety Account. The Agreement includes the effort to produce and review a safety analysis report on western style and to use the results as a major input for safety improvement efforts and for licensing of the INPP Unit 1 for continued operation. The deadline for the licence was set by Agreement at mid 1998, but later it was postponed to May 1999. Lithuanian Government had accepted recommendations and is obliged to fulfil them.

The following documents shall be submitted to VATESI by INPP for review, assessment and decision about License, such as:

*Administrative*

”Application letter” in which the Operator presents to VATESI the request to be licensed

Certificate of NPP state registration

Document certifying that the Operator is in charge of NPP property Statute of the Operating organisation (Operator)

Plant organisation for operation and safety management arrangements

QA manual and procedures Plant personnel qualification and training program

*Technical (Safety validation)*

Technical Safety Justification of Nuclear Plant (TOB AS) and of the Reactor Unit (TOB RU) with updating Justification of the plant safety status

The Safety Analysis Report (SAR)

Probabilistic Safety Assessment Report (PSA)

Status of implementation of the remedial measures (including commissioning program and test results) and plan for the future Compliance demonstration with the yearly permits conditions

Operator position on international recommendations and status of their implementation

Preliminary decommissioning program

Commissioning program and test results

Description and verification of current plant state History of safety performance and environmental impact

Operating experience evaluation (analysis of safety significant events occurred in the plant and lessons learned from experience of similar plants and world-wide plants)

Assessment of plant systems design and capability

Improvements and updating of safety analysis (considering assumptions and data consistent with the actual status of the plant and with an enlarged spectrum of reference events)

Modifications (design, implementation and commissioning) and repairs

Backbiting from technical developments (including research findings)

Management of equipment ageing

Equipment qualification

Human factors

Radiation protection

Emergency planning and preparedness

Fire protection

Waste and spent fuel management

List of modifications since unit commissioning etc.

*Operation*

Technical Specifications

List of operating procedures

Emergency and accidents management's procedures

Emergency planning

Long term in-service inspection program

Physical security provisions.

### *14.1.2. Safety analysis reports for different stages of a Nuclear Installation project*

It is stated in the Law on Nuclear Energy (Articles 25 and 26) that it is prohibited to design, construct, reconstruct, operate and decommission nuclear facilities, installations and equipment without a license issued by VATESI. Article 27 of the Law says that VATESI may establish additional requirements for the licensed activity. One of such principal requirements of VATESI to the applicants is a submission of safety analysis reports for getting a license.

These statements are further specified and developed in the "Regulations for Licensing of Nuclear Power Related Activities", "Regulations for Procedures for Issuing a License for Unit Operation at Ignalina Nuclear Power Plant", "General Regulations for Nuclear Power Plant Safety", "Nuclear Safety Regulations for Reactor Installations of Nuclear Power Plants" and in the other norms and standards.

For example, in accordance with point 1.2.18 of the "General Regulations for Nuclear Power Plant

Safety" every nuclear plant design must include a special document called a "technical justification of nuclear plant safety", which has to be based on highest scientific and technical knowledge. Technical justification has to pass an independent review and to be approved by the Operating Organization before its submission to VATESI.

The "Nuclear Safety Regulations for Reactor Installations of Nuclear Power Plants" in their turn say that the “Technical Justification of Nuclear Power Plant Safety” should contain the chapter " Reactor Plant Technical Safety Justification". "The Reactor Plant Technical Safety Justification” shall be prepared by competent organizations and approved by Operating Organization. The shape and content of the reactor plant Safety Justification Report should conform with the current normative technical document. The indicated regulations also set a number of specific requirements to the content of safety justification (safety analysis) reports.

“Guidelines for Production of Safety Analysis Report for Ignalina NPP Unit 2” was prepared and agreed on with VATESI in January 2001. It states the content of SAR to be prepared in the frame of Unit 2 licensing process to be completed in 2003. In comparison to SAR-1 content of SAR-2 is expanded and generally corresponds to the content directed by US NRC Regulatory Guide 1.70.

Overview of the safety assessments performed for INPP and the major results of those assessments are presented in section 6.3 of this report.

### 14.2. Summary of essential generic results of continued monitoring and periodic Safety Assessments of INPP using deterministic and Probabilistic Analyses

As to the deterministic safety assessment of INPP, it was performed initially by the designers of reactor plant and INPP as a whole and was documented in so called "Technical Justification of Safety". The first in-depth safety analysis of INPP using Western methodology was completed in 1997. Main results of this analysis were presented in the last report on NSC. Principal message received from the analysis and from its independent review was that, in spite of numerous non-compliances with the modern norms and standards, further operation of INPP could be considered as acceptably safe, with the condition of timely implementation of all recommended safety upgrading measures.

A wide range of additional safety analyses was performed in the frames of Safety Improvement Program No.2 implementation. These analyses are described in section 6.3 of this report.

Both Level 1 and 2 PSA studies were completed for INPP. The main results are presented in section 6.3 of this report.

### 14.3. In-service inspection of main components

Lithuanian Nuclear Power Safety Inspectorate VATESI performs the supervision of ISI program at INPP in accordance with legislative basis provided by the Law on Nuclear Energy and in compliance with General Requirements for Nuclear Power Plant Safety (VD-B-001-0-97) issued by VATESI in 1997.

In-service inspection is carried out according to INPP regulations for systems, equipment and pipework important for safety. These regulations have been developed in accordance with the requirements for in-service inspection [PNAE G-7-008-89] and experience of in-service inspection in other nuclear power plants, and IAEA Guidelines [50-SG-02, 50-P-2]. They determine the in-service inspection requirements for all safety-related systems, except for the metal components of the active zone, which are inspected in accordance with the requirements of other regulations.

Much importance is attached to the condition of the plant and pipework, and this is checked by both destructive and non-destructive testing, carried out according to regulations for RBMK-1500 reactors. These detail the objectives, activities, methods, quantity, frequency, and the organisational and administrative arrangements. The manager of the INPP Safety and Quality Assurance Service is responsible for this.

Non-destructive testing is carried out by the INPP Department of Metals and Technical Inspection and, if necessary, by certified organisations, with the permission of VATESI. The regulations list the plant that must be inspected, and the areas and volumes for defined non-destructive testing. They also present the programme for checking the state of the corrosion samples for each Unit, and describe the main inspection methods used for metals, such as non-destructive surface and volumetric methods, and the destructive methods and inspection using samples. All inspections are carried out according to existing standards or instructions, agreed by VATESI.

The regulations define the methods for assessing the results, consistent with the IAEA Guidelines, and the recording requirements. Personnel carrying out inspections are certified, in accordance with the regulations [PNAE G-7-010-89], to carry out inspections according to specified methods. Staff's performing non-destructive testing are certified according to the European Standard EN473. Personnel supervising the inspections are also certified.

Regulatory supervision of ISI at INPP includes:

- Review and approval of Standard ISI program of INPP,
- Review of annual ISI programs of INPP,
- Review and assessment of annual ISI results of INPP,
- Review, development and approval of ISI regulations,
- Review and approval of ISI methodologies and procedures,
- Review of the results of materials investigations of INPP components and pipelines,
- Review and consideration of safety justifications in case of deviations from ISI acceptance standards.

### 14.4. Regulatory control activities

As it was already mentioned above, Lithuanian nuclear power safety inspectorate (VATESI) in accordance with the national regulations for the verification of the safety of nuclear installations is performing combined day to day and year to year surveillance and systematic safety reassessment reviews through the inspection program with consideration of cumulative effects of modifications, changes to procedures, the aging of components, operating experience and technological developments. This is a basis for decision on reissuing the annual operating license for the INPP Units. Regulatory control cover such activities:

1 Application of quality assurance principles at all stages;
2 Assessment of the safety of the design (particularly design modifications)
3 Review of tests;
4 Continuing monitoring and inspection of the installation during operation, including environmental monitoring;
- Assessment of the need for and control of modifications.

# ARTICLE 15: RADIATION PROTECTION

*Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.*

### 15.1. Summary of Laws, Regulations and Requirements Dealing with Radiation Protection as Applied to Nuclear Installations

The protection of the general public and the workers of the INPP and the environment against possible influence of the ionizing radiation is regulated by the following legislation:

1 Law on Radiation Protection (No. VIII-1019, 1999)
2 Law on Nuclear Energy (No I-1613, 1996, as amended 1999)
3 Law on the Management of Radioactive Waste (No. VIII-1190, 1999)
4 Law on Health System (No. I-552, 1994)
5 Law on Institutions of Health Care (No. I-1367, 1996)
6 Law on Environmental Protection (No. I-1352, 1992, No. I-2223, 1996, 1999)
7 Law on Environmental Monitoring (No. VIII-529, 1997)
8 Law on the Influence of the Planned Economical Activities to the Environment (No. I-1495, 1996)
9 Law on Enterprises (No. I-196, 1990, No. I-888, 1995, No. VIII-422, 1997)
10 Government Resolution No. 233 On Approval of the List of Types and Objects of the Planned Economical Activities with Obligatory State Examination (1997)
11 Government Resolution No. 578 On Approval of General Regulations of Dosimetric Control in the Case of Radiological Accident (1998)
12 Government Resolution No. 653 On Regulations of Licensing the Practices Involving Sources of Ionizing Radiation (1999)
13 Government Resolution No. 651 On the Establishment of the State Register of Radiation Sources and Exposure to Workers and Approval of Its Statute (1999)
14 Government Resolution No. 436 On Approval of Complex Programme Relating to Civil Protection Preparedness Improvement in Visaginas Town, Ignalina and Zarasai Districts (1999)
15 Order of the Minister of Health No. 146 On Procedure of the Control of Verification of Compliance with Radiation Protection Requirements (1999)
16 Order of the Minister of Health No. 171 On Procedure of Mandatory Training and Instructing for Persons, Responsible for Radiation Protection and Workers, whose Work Involves Sources of Ionizing Radiation (1999)
17 Order of the Ministry of Health, the Ministry of National Defence, the Ministry of Internal Affairs No. 600/528/1063 On the Information Exchange in the Case of Usual Situations and at Emergencies (1997)
18 Order of the Minister of Health No. 335 On Procedure of the Information Submission about Sources of Ionizing Radiation and Workers Exposure to the Register of Sources of Ionizing Radiation and Workers Exposure (1999)
19 Order of the Minister of Health No 301 On Prophylactic Medical Examinations at the Institutions of Health Care (2000)
20 Lithuanian Hygiene Standard HN 73-1997 "Basic Standards of Radiation Protection" (1997)
21 Lithuanian Hygiene Standard HN 83:1998 "Radiation Protection and Safety of Outside Workers" (1998)
22 Lithuanian Hygiene Standard HN 52:1999 "Radiation Protection and Safety in Industrial Radiography" (1999)
23 Lithuanian Hygiene Standard HN 84:1999 "Maximum Permitted Levels of Radioactive Contamination of Foodstuffs and Feedingstuffs Following a Nuclear or Radiological Accident" (1999)
24 Lithuanian Hygiene Standard HN 85:1998 "Natural Exposure. Standards of Radiation

Protection" (1998)
25 Lithuanian Hygiene Standard HN 86:1999 "Non Medical Nuclear and X-rays Equipment" (1999)
26 Lithuanian Hygiene Standard HN 87:2001 "Radiation Protection in Nuclear Power Plant" (2001)
27 Lithuanian Hygiene Standard HN 88:2000 Radiation Protection and Safety of Non Medical Unsealed Sources (2000)
28 Lithuanian Hygiene Standard HN 99:2000 "Protective Actions of Public in the Case of Radiological or Nuclear Accident" (2000)
29 Lithuanian Hygiene Standard HN 112:2001 "Requirements for Monitoring of Internal Exposure" (2001)
30 Normative Document LAND 34 – 2000 "Clearance Levels of Radionuclides, Conditions of Reuse of Materials and Disposal of Waste" (2000)
31 Normative Document LAND 36 – 2000 "Measurement of Radionuclide Content in Environmental Components – Gamma Spectroscopic Analyse of Samples by Spectrometer with Semiconductor Detector" (2000)
32 Normative Document LAND 37 – 2000 "Measurement of Radionuclide Content in Environmental Components – Concentration of Caesium Dissolved in Water Employing Absorbing Filters and Estimation of Water Activity Concentration" (2000)
33 Normative Document LAND 42 – 2001 "Limitation of Radioactive Discharges from Nuclear Facilities, Permitting of Discharges and Radiological Monitoring" (2001)
34 Order of the Director of the Radiation Protection Centre No. 15 On Approval of the Application Form for the License for the Practices with Sources of Ionizing Radiation and on Approval of the License Forms (1999)
35 Order of the Director of the Radiation Protection Centre No. 44 On the Order of Monitoring of Workers' Exposure and Workplaces (1999)
36 Order of the Director of the Radiation Protection Centre No. 16 On Approval of the Form of Workers' Exposure Passport (2001)

## 15.2. Implementation of National Laws, Regulations and Requirements relating to Radiation Protection

### *15.2.1. Requirements on Occupational Radiation Protection*

The basic regulation which sets out requirements for radiation protection of workers working at the nuclear power plant and for radiation protection of members of the public during the nuclear power plant operation, is the Lithuanian Hygiene Standard HN 87:2001 "Radiation Protection at Nuclear Power Plant". It was approved by the Order of the Minister of Health and came into force on 1 April 2001. The Hygiene Standard shall be applied for all legal persons and enterprises without the status of a legal person and natural persons conducting their activities at the NPP. The requirements of the Hygiene Standards are in compliance with International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources, BSS No. 115, Vienna, IAEA, 1996, and Council Directive 96/29/EURATOM of 13 May 1996 laying down Basic Safety Standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation, No L 159, vol. 39.

The requirements of HN 87:2001 and other legal documents establishing radiation protection requirements shall be included in the radiation protection instructions of nuclear power plant.

Below are listed the most important demands for radiation protection of workers established by HN 87:2001.

Practices at the nuclear power plant shall be authorized and conducted in accordance with the basic radiation protection principles: justification of the operation of radiation sources, optimisation of exposure and limitation of doses.

Keeping the high safety culture and proper quality assurance programme implemented at the plant shall ensure that the doses of workers are as low as reasonably achievable and below the established dose limits.

The license holder shall ensure that doses of NPP workers do not exceed limits of occupational exposure determined by HN 73-1997 "Basic Standards of Radiation Protection", with the exception of cases, when special conditions are applied. HN 73-1997 establishes following dose limits:

***Table 15.2.1.1.***

| Application | Dose limit | |
|---|---|---|
| | Occupational | Public |
| Effective dose | 100 mSv in a consecutive 5 year period, subject to a maximum effective dose of 50 mSv in any single year | 1 mSv in a year, in special circumstances- up to 5 mSv in a single year provided that the average dose over 5 consecutive years does not exceed 1 mSv per year |
| Annual equivalent dose: | | |
| in the lens of the eye | 150 mSv | 15 mSv |
| for the skin | 500 mSv | 50 mSv |
| for the extremities (hands and feet) | 500 mSv | |

Establishing the investigation levels and dose constraints shall ensure the radiation protection of workers. The investigation levels are established in order to fix the achieved real level of exposure and to ensure optimal measures for protection of workers against the dangers of sources, used during the NPP operation. Investigation levels shall be regularly reviewed taking into account the radiation protection conditions at the NPP. The daily effective dose constraint established by the license holder for INPP workers is 0.2 mSv.

As regards the limitation of public exposure that might cause the NPP operation, HN 87:2001 establishes the dose constraints for the members of public. The annual effective dose constraint for the members of public because of operation of NPP is 0.2 mSv. The annual dose constraint is a basis for calculation of maximum permitted activity levels of radionuclides released to atmosphere or discharged into the water.

The premises of the NPP shall be divided into controlled and supervised areas. Controlled area is an area subject to special rules for the purpose of protection against ionising radiation or of preventing the spread of radioactive contamination and to which access is controlled. The supervised area is defined as an area subject to appropriate supervision for the purpose of protection against ionising radiation. The premises of controlled area shall be divided into categories. The categorization of premises and of controlled area is a part of the radiation protection programme, which is discussed in more detail in Chapter 15.3.2.

The radiation protection requirements of outside workers are listed in the Lithuanian Hygiene Standard HN 83:1998 "Radiation Protection and Safety of Outside Workers". The principal requirement is that the radiation protection of outside workers shall be at the same scale as of permanent workers. The employers whose workers are performing their activities within the controlled area of the nuclear power plant, shall establish the co-operation agreements with license holders, where the order and procedure of registration and estimation of workers exposure, measures of exposure reduction and other significant means from the radiation protection point of view shall be described.

Number of outside organizations involved in maintenance and service activities at the INPP, is 17 (as for August 2001). Mostly they are conducting their activities within the controlled area during the outage periods. The activities of outside organizations within the controlled area are licensed according

to Government Resolution No. 653 (1999). The Radiation Protection Centre issues the licenses. Outside workers are trained in radiation protection in the same manner as permanent workers. The Radiation Protection Centre carries out periodical radiation protection inspections of outside organizations.

The exposure results of outside workers, after they are finished work connected with ionising radiation, are recorded to the Passport of Outside Workers' Exposure and all information is submitted to the State Register of Radiation Sources and Exposure to Workers according to the procedure established by the Order of the Minister of Health No. 335. The Radiation Protection Centre maintains the State Register.

Besides the registration of workers exposure, the sources of ionising radiation are also included into the Register. At the INPP, sources of ionising radiation are used for control of technological flows, for calibration and checking of equipment, for maintenance of systems etc. As for September 2001, there are 19196 radioactive sources used at the INPP. 19188 of them are sealed sources (18440 are sources installed in smoke detectors, 748 - others), and 8 X-ray generators used in defectoscopy. The activities with them are licensed according to Government Resolution No. 653 (1999) and shall comply with requirements set out in HN 88:2000, HN 86:1999, HN 52:1999 and other legal acts. In May 2000 the Radiation Protection Centre issued the licences to INPP to conduct activities with sources of ionising radiation and to transport the radioactive sources and radioactive waste.

The occupational exposure results of NPP workers and outside workers are distributed as follows (1998-01/08/2001):

***Table 15.2.1.2.***

| | | Collective dose, manSv | | | | |
|---|---|---|---|---|---|---|
| | | | | | INPP workers | Outside workers |
| 1998 | 3268/956 | 11.48 | 3.58 | 15.06 | 3.50/37.5 | 3.74/36.8 |
| 1999 | 3315/830 | 10.33 | 2.46 | 12.79 | 3.12/31.9 | 2.96/33.3 |
| 2000 | 3269/575 | 8.52 | 2.19 | 10.71 | 2.61/24.0 | 3.81/19.7 |
| 01/08/2001 | 3166/1009 | 3.06 | 0.77 | 3.83 | 0.97/16.3 | 0.76/15.9 |

In 2000 the average annual collective dose per Unit was approximately 16.3 percent lower than in 1999. In 1999 the collective dose was 6.4 man·Sv per Unit. Such dosimetric trends were caused by effective implementation of ALARA programme, using of work management programs and modernization of equipment at the INPP. The comparison of planned and actual doses illustrates the effectiveness of the measures applied in order to reduce occupational exposure. Planned annual collective dose for INPP personnel in 2000 was 10,3 man·Sv, for outside workers - 3,60 man·Sv. Total planned annual collective dose was 13,90 man·Sv or 6,95 man·Sv per Unit. In comparison with doses real achieved in 2000 (10,71 man Sv), it shows, that 23 percent of planned dose budget was saved.

The requirements for monitoring of internal exposure are set out in the HN 112:2001 "Requirements for Monitoring of Internal Exposure" (2001). In 2000 the assessment of internal exposure for 465 NPP and outside workers was carried out. There was no internal overexposure detected.

In 2001 it is expected to not exceed the maximum individual dose over than 20 mSv. The individual dose above 20 mSv shall be justified by the license holder, according to requirements set out in HN 73-1997, and agreed with the Radiation Protection Centre well in advance.

***15.2.2. Radiation Protection Programme at the INPP***

According to the requirements set out in HN 87:2001, the radiation protection programme is established at the plant. Following items shall be included in the programme:

1 classification of working areas and access control;
2 local rules, measures of supervision of safety at work and order of organisation of work;
3 procedures of monitoring of workplaces and individual monitoring of workers;
4 individual protective equipment and rules for their application;
5 main premises, control systems for assurance of radiation protection;
6 application of optimisation principle (ALARA) and measures on exposure reduction;
7 programs of health surveillance;
8 mandatory training of workers and their instructions.

As it was mentioned earlier, the premises of the INPP are classified into controlled and supervised areas.

Depending on the dose rate, surface and air contamination levels, the premises within the controlled area are divided into three categories:

***Table 15.2.2.***

| Category of premises | | I | II | III |
|---|---|---|---|---|
| Controllable values | Dose rate, μSv/h | >56 | 12-56 | <12 |
| | α contamination of surface, $Bq \cdot cm^{-2}$ | >20 | 4-20 | <4 |
| | β contamination of surface, $Bq \cdot cm^{-2}$ | >266 | 40-266 | <40 |
| | Concentration of airborne activity, $Bq \cdot m^{-3}$ | >1110 | 185-1110 | <185 |

The license holder marks the categories by following colours: I is marked red, II and III - yellow and green accordingly.

### *15.2.3. Internal Control of Workers Exposure and Measures on Exposure Reduction (ALARA Programme)*

The activities at the INPP are carried out observing the requirements of internal instructions.

The main responsibility for the radiation protection of NPP workers lays down on the director general. The plant manager (technical director) is responsible for the coordination of technical activities related to improvement of the radiation protection.

The Work safety department of the plant is responsible for the organization, control and implementation of radiation protection and safety requirements. The tasks, duties, coordination of the activities between the divisions of the department are described in the statute of the department. The main responsibilities of the department are following:

1 classification of working zones;
2 control of training on radiation protection;
3 monitoring of external and internal exposure;
4 control of radioactive contamination of workplaces;
5 control of releases;
6 organization and control of works which may lead to increased exposure;
7 technical maintenance of equipment and systems used for dosimetric control;

8 presentation and analysis of reports related to radiation protection and safety.

Activities within the controlled area, if they are connected with potential individual exposure increase, are allowed only if appointment - permits are issued. There is the following order applied:

1 radiation conditions within the premises are being investigated and estimated (dose rates et.);
2 operational workers prepare the working places;
3 protective equipment to be used is described and appointed;
4 workers are instructed how to perform particular jobs;
5 work permits are issued by the Work Safety Department;

The individual dosimetric control is carried out by thermo luminescent dosimeters (ALNOR system). The individual dosimeters are changed not less than once per month. For those who are engaged in maintenance activities, additionally electronic dosimeters are used. They are checked and changed every day. The monitoring of internal exposure is carried out by the whole body counter. The equipment is regularly calibrated according to established order.

Monitoring of workplaces is carried out according to order established by the license holder and approved by the Radiation Protection Centre.

The staff is regularly trained in the field of radiation protection. The frequency of training is established by the Order No. 171 of the Minister of Health.

The medical examination of workers is carried out once per year according to the requirements of the Order No. 301 of the Minister of Health. Depending on the contra-indications detected, activities within the controlled area are either forbidden or limited.

In 1996 the ALARA programme was started at the INPP. The establishment and implementation of the ALARA programme is required by the HN 87:2001. The main aim of the programme is to ensure that the exposure of workers is being kept as low as reasonably achievable, social and economical factors taking into account. There is the ALARA group established at the plant. The main task of the group is to ensure that ALARA principle is applied in all stages of operation that may lead the exposure of workers.

Following conditions are subject to successful implementation of ALARA programme:

1 proper organization of works;
2 improvement of working conditions;
3 perfection of technological processes;
4 training of personnel;
5 implementation of quality assurance programme;
6 improvement of safety culture;
7 evaluation of influence of "human factor".

Decontamination is carried out before starting the activities that may lead to increased exposure, e.g., the decontamination of the main circulation circuit is one of methods for the reduction of doses. The activities, during which an increased exposure is expected to be received, are carried out using the following means: installation of lead blankets, application of distance equipment, video-control systems etc.

The ALARA programme was reviewed in 1998. The "alpha value" calculated for the reduction of collective exposure per 1 man Sv is 4000 Litas (1000 USD).

Improving above-mentioned activities will continue further implementation of the ALARA programme. The successful implementation of it is reflected in the workers exposure results.

The license holder once per year shall provide reports on implementation of ALARA principle to the Radiation Protection Centre and to the State Nuclear Power Safety Inspectorate.

The implementation of quality assurance programme at the INPP has begun in 1997. The management procedures of the first and the second levels have been prepared and applied in the practice.

### *15.2.4. Requirements on Environmental and Public Radiation Protection*

From the beginning of construction of the INPP, the monitoring of the contamination of foodstuffs, drinking water and soil by the technogenic radionuclides is being carried out. The investigation works cover the surrounding of the power plant equal to 50 kilometres. The aim of that monitoring is to observe the contamination of foodstuffs and drinking water by radionuclides, to determine the influence of the INPP to the environmental radioactive contamination. The investigation data show that the contamination of foodstuffs and drinking water by the radioactive isotopes of caesium and strontium in the area of the power plant and other places of Lithuania do not considerably differ from and do not exceed the activity levels laid out in Lithuanian Hygiene Standard HN 84:1999 "Maximum Permitted Levels of Radioactive Contamination of Foodstuffs and Feedingstuffs Following a Nuclear or Radiological Accident".

Starting from 2000 the Radiation Protection Centre performs the monitoring of natural exposure in the zone of 50 kilometres around the INPP and in the Kupiškis region. It was determined that the external exposure dose in the environment is equal in both regions and does not exceed 1 mSv.

#### *15.2.4.1. Control of radioactive discharges from nuclear facilities*

A normative document LAND 42 – 2001 limiting discharge of radionuclides into environment has been accepted in order to protect humans, other living organisms, natural resources (the land, forest, water) and other environmental entities from harmful influence of ionising radiation and contamination by radionuclides from nuclear installations. The requirements of this document are obligatory to nuclear facilities when designing, constructing and operating them as well as to nuclear facilities during decommissioning. This normative document regulates operation of nuclear facilities under normal conditions, including short-time anticipated operational transient, and it is not applicable for accidents.

Prior authorisation inform of permission is required for discharges of radioactive substances into environment. INPP willing to get the permit shall have to submit the Ministry of Environment an application for the permit, the plan of radioactive discharge as well as the plan of radiological monitoring. The activity of effluents shall not exceed the discharge limits specified in the permission issued by the Ministry of Environment.

Before starting operation of the nuclear facility or its decommissioning, in accordance with the critical group members dose constraint indicated of this document, the operator shall estimate airborne and aquatic radioactive discharge limits. The limits are to be calculated for all relevant radionuclides or their groups. In the case of grouping, characteristics of the most hazardous radioisotope in the group shall be used in calculations.

Public exposure from all controlled practices (excluding natural background radiation and medical exposure) shall not exceed 1 mSv per year. Dose assessment shall be made for critical group members. As members of the critical group can be simultaneously irradiated by other controlled or exempted sources the average annual dose to the critical group members due to operation of nuclear facility shall not exceed the dose constraint of 0.2 mSv/year. Assessment of impact to the environment shall be based on principles according which protection measures ensuring an adequate safety for human are sufficient to protect both the environment and natural resources. In the case there are no population in the vicinity of the nuclear facility, a hypothetical critical group, members of which could live within this area, shall be considered.

The plan of radioactive discharge into the environment is to be prepared by the INPP in advance and

shall contain the following information:

1 Physical and chemical characteristics of substances to be discharged and quantities as well as radionuclide composition and the activities
2 Description of release points, fluxes (pathways) and the discharge methods
3 Time dependent distribution of the discharges and the need or probability of short term releases and causes
4 Determination of the significant radionuclide migration routs in the environment and human exposure pathways, based on the results of the initial background investigations as well as on experience of nuclear facility operation or analogues
5 Assessment individual doses of the critical group members, caused by the planned operational discharges
6 Assessment of radionuclide airborne and aquatic discharge limits and dose conversion factors
7 Radiological monitoring plan.

INPP is obliged:

- to reduce discharges as low as reasonably achievable;
- to fulfil monitoring of radioactive releases, in order to confirm the requirements of the permission and to assess the exposure doses;
- to store the data of monitoring and results of the dose assessment during whole period of operation and decommissioning
- in a case new sources, fluxes or routes due to changes in the operator's activity, to revise the plan of discharges
- to analyse the causes, reasons, circumstances and consequences of increased discharges
- to take measures to liquidate the causes of the releases and ensure that the situation will not repeat again

A special permission for temporary discharges exceeding the established discharge limit can be issued in the case of special circumstances, under the requirement that annual dose of critical group members shall not exceed 5 mSv and five year average dose shall not exceed 1 mSv/year (all other controlled sources are to be included). In this case the additional conditions and requirements for operator can be determined.

*15.2.4.2. Radiological monitoring*

Law On Environmental Monitoring describes three levels of environmental monitoring:

- State level
- Municipality level
- Level of economical entity (operator)

Radiological monitoring, consisting from both radioactive releases monitoring and monitoring of the environment, shall be carried out for all nuclear facilities as it is described in the Normative document LAND 42 – 2001. In addition the INPP shall carry out meteorological and hydrological measurements during whole period of their operation and decommissioning.

INPP has to work out the radiological monitoring programmes and implement them. Monitoring programme have to be worked out in accordance with potential or actual contamination of environment taking into account chemical and physical characteristics and composition of the discharged substances, peculiarities of the environment, demographic characteristics and habits.

INPP implementing the monitoring programme has:

- to demonstrate that the discharge limits are not exceeded,

- to obtain the data necessary for the assessment of planned, actual and possible exposure,
- to check the mode of operation satisfies the required one and inform on the anticipated operational transient,
- to make sure that the monitoring should be effective even in the case of accidents,
- to inform the population about releases and levels of contamination of the environment,
- to make possible the separation of an input from the nuclear facility into environmental radioactivity.

The monitoring programme shall include principles of organisation, organisations of monitoring, type of samples, sampling locations, the sampling frequency of sampling and, procedures of samples analyses, detection limits, procedures for calibration and quality assurance, data storage, models used for dose assessment. The monitoring programme shall cover all important routes of radionuclide dispersion and population exposure to enable the proper evaluation of annual airborne and water discharges, likewise their short term and consequently doses for critical group members, changes.

*1) 15.2.4.3. Clearance of materials, conditions for recycling or reuse and disposal*

The normative document LAND 34 – 2000 "Clearance Levels of Radionuclides, Conditions of Reuse of Materials and Disposal of Waste" establishes criteria when materials, equipment, installations, buildings and waste, contaminated with radionuclides or containing radionuclides, and other sources of ionising radiation may be used or disposed of without any application of requirements of radiation protection.

The requirements of this Normative document are applied to substances, equipment, machines, installations, buildings, solid waste and spent oils, which are produced during operation or decommissioning of nuclear installations and installations for processing of radioactive waste, or when radioactive substances are used in industry, medicine, research, etc., and to spent sources of ionising radiation (hereinafter substances and waste).

Substances and waste with radionuclides, whose mass specific or surface specific activities do not exceed the conditional clearance levels, approved by the Ministry of Environment, are removed from regulatory control only in case, when the substances and waste are used or disposed of by means (under conditions), for which the conditional clearance levels have been determined.

On the initiative of the operator, the conditional clearance levels, which exceed the unconditional clearance levels, may be set. These levels are set for the defined means of reuse or disposal of substances and waste.

### 15.3. Regulatory Control Activities

According to the Law on Radiation Protection, the regulatory body co-ordinating the activities of executive and other bodies of public administration and local government in the field of radiation protection, monitoring and expert examination of public exposure shall be the Radiation Protection Centre. Among other responsibilities of the Radiation Protection Centre is responsible for the radiation protection of workers and the general public from negative impact, which may cause the ionising radiation.

State Nuclear Power Safety Inspectorate (VATESI), implementing state regulation of nuclear safety, radiation protection and accounting for nuclear materials in the sphere of nuclear energy, is performing surveillance over compliance with radiation protection regulations, standards and procedures during operation and maintenance.

Ministry of Environment organize and co-ordinate state radio ecological monitoring within the monitoring zone of a nuclear facility and control radiological monitoring within the sanitary protection zone of the facility.

# Article 16: EMERGENCY PREPAREDNESS

1. *Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.*
2. *For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.*
3. *Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.*
4. *Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.*

### 16.1. General description of laws, regulations and requirements for on-site and of-site emergency preparedness

The main document that regulates development of defence and national security system of the Republic of Lithuania, is the Law on the Fundamentals of National Security accepted in Seimas (Parliament) on 19 December, 1996. The system of national security in Lithuania consists of the basic resolutions, principles and methods confirmed by this purpose activities of the State and citizens, the whole complex of means directed towards the country integration into Europe and Transatlantic Unions, laws and other legal acts, activities of state institutions founded for this purpose and ways of their interaction. There are civil protection and rescue institutions among them. Government manages all national security means implementation and obligates all civil protection institutions and Lithuanian economy infrastructure objects to execute compulsory rescue and civil protection tasks.

Atomic Energy Law, accepted in Seimas (Parliament) on 14 November, 1996, defines allocation of functions for responsible institutions in the field of nuclear accident prevention and management of accidents and their consequences.

The Civil Protection Law (15 December, 1998). The Law says how the Civil Protection and Rescue System activities must be organized in Lithuania, provides the basics for legislative and organizational matters and describes responsibilities which lie on state and municipal authorities, public and private organizations and citizens of Lithuania.

The procedure of stockpile, storage, renewal and usage of the national reserves of civil protection means is defined by the Law State Reserve, approved by Seimas on 31 August 2000.

Governmental resolution No.122 of February 4, 2000, regarding approval of Provisional Regulations of the Civil Protection Department under the Ministry of National Defence of the Republic of Lithuania provides tasks and functions of the Department in the field of civil protection, rights and work arrangements in the Department.

National Emergency Response Plan in the Event of a Radiological Accident at Ignalina Nuclear Power Plant verified by the order No. 371 of Ministry of National Defence, dated April 11, 2000, provides means of protecting the population, their scope, terms, assignment of responsibilities, and implementation procedure.

Resolution No.727 of the Government of the Republic of Lithuania of July 17, 1992 obliges the Civil Protection Department notify the residents about the emergency situations through Lithuanian radio and television broadcasting. The draft of regulations on public information in the case of nuclear or radiological emergency according EU Directive 89/618/Euratom was prepared this year and in the meantime is being agreed among the responsible institutions.

Governmental Resolution No 578 “On the approval of general provisions of dosimetric control in case of radiological accident” approved by the Government of the Lithuania on 12 May 1998 is the main document co-ordinating dosimetric control of the workers at the accident site, population and environment. In case of an radiological accident dosimetric control should be organised and carried out

according to this Resolution and following to the approved instructions of the Fire protection and rescue services. Radiation Protection Centre and Joint Research Centre under the Ministry of Environment are responsible institutions for organising, co-ordinating and control of dosimetric procedures within the limits of its competence.

General Regulations for Nuclear Power Plant Safety. Order of VATESI No.56, June 9, 1997 establishes the purpose, reference points and basic criteria of safety, and also the main principles and character of the technical and organizational measures aimed at ensuring safety including on-site emergency response planning.

There are other normative legitimate acts which, inter alia, covers emergency preparedness issues such as Hygiene Standards of the Republic of Lithuania HN 73-1997 "Basic Standards of Radiation Protection", HN 99:2000"Protective actions of public in case of radiological or nuclear accident" etc. Numerous legitimate acts regulating specific fields exist at the district and local levels.

The responsibilities for various governmental or other institutions are stated in legal acts approved by the Government.

The Law on Rescue Works are in the process of developing at the meantime.

## 16.2. Implementation of emergency preparedness measures

### *16.2.1. Classification of emergency situations*

A radiological accident is an infringement of planned operation due to the equipment damage, erroneous behaviour of the Plant's personnel, transgression from the technological processes, natural disasters or other causes, during which an unforeseen irradiation of the personnel and inhabitants beyond the normal operation limit may occur.

In accordance with the requirements of the main documents on radiation protection and safety of the International Atomic Energy Agency (IAEA) and the legislation of the EU, levels of emergency interventions at INPP are determined, during which mitigation measures of the plants operational disorders are taken and which are enabled while there are no technical or radiological indications of the accident, but its occurrence is forecasted.

Emergencies are classified into: alert, local accident and general accident.

***Alert*** means an operational disorder of an NPP, during which the radiological danger for the personnel and population occurs. In such a case, the personnel and relevant institutions outside the sanitary protection zone are prepared to carry out radiation protection measures; an additional analysis of the occurrence is carried out.

***Local accident*** occurs when the quantities of radionuclides and ionising radiation exceeding the normal operational limit values are released into the sanitary protection zone without spreading beyond its boundaries. Personnel exposure and contamination of facilities and buildings are possible. To localise and liquidate the accident, measures of the emergency preparedness plan are taken. Special-purpose units and technical equipment are concentrated; the personnel not involved in liquidation operations is evacuated, the first aid is provided to the victims, individual protective means are used, the work of emergency services and their commanders is arranged in shifts observing the specified normal operational limits of exposure level set down in Standards of Radiation Protections of the Republic of Lithuania HN 73-1997 "Basic Standards of Radiation Protections".

***General*** nuclear power plant accident is an infringement of plant operation in which off-site release of radioactive materials outside of sanitary protection zone exceeds the specified normal operation limits. In this case not only the personnel but the population as well is exposed to the threat of radiation. Urgent safety and protection actions have to be taken. Emergency response actions are carried out according to the INPP Emergency Response Plan and the National Emergency Response Plan in the Event of an Accident at INPP.

### *16.2.2. Overall national emergency preparedness scheme*

Civil emergency preparedness is one of the main state functions that includes the preparation of all governmental institutions, local authorities executive institutions, all economy entities and population for crisis situations and operational activities during them, utilisation of all state resources to provide

its vitality, inhabitants survival, to protect property and environment from the consequences of the extreme situation, when inhabitants take active participation in these activities. Civil emergency preparedness is the whole complex of activities and means of state executive bodies and special forces, it is a prior trend of the governmental activity, providing organised, directed and expedient utilisation of forces and resources, implementing effective liquidation of disaster consequences and solving war time problems.

Territory and publicity principles are the main principles according to which activities of civil protection and rescue institutions are organised. Civil protection is organised in the whole state territory according to its administrative division and covers all the population of the country and the foreigners who are in the territory of the Republic of Lithuania. All activities of governmental institutions connected with assuring safety of population are open for the society and its information means.

Three level organisational system for civil protection and emergency preparedness has been established. According to the level these institutions are responsible for civil protection and preparedness:

1 At the state level – the Civil Protection Department, the Emergency Management Centre, the Fire Protection and Rescue Department, supporting services of the ministries and other state institutions.

2 At the regional level - the Regional Administration, the Regional Emergency Management Centre, other territorial warning, information and evacuation as well as supporting services.

3 At the municipality (local) level - the executive institutions of local authorities, the Local Emergency Management Centre, fire and rescue services, warning, information and evacuation services as well as industrial brigades.

The Civil protection and rescue system comprises of:

1 The Civil Protection Department,

2 The Emergency Management Centres,

3 The warning, information and evacuation, fire, search and rescue, other supporting services of the ministries, state and local authority institutions.

**The Civil Protection Department (CPD)** in case of emergency in the INPP becomes a part of the State Emergency Management Centre. It is appointed for co-ordination, planning and protection of population. CPD comprises of Central administration, Alarm and control service and Communication service. In addition to CPD there are 10 regional Civil Protection Departments at Regional administrations.

The Civil Protection Department shall implement the following objectives:

1 To warn and inform the citizens of Lithuania and appropriate managing institutions about the state scope hazard to life, health, property and environment in case of emergencies.

2 To plan and prepare measures for the state institutions, enterprises and citizens to be transferred from the regular work and living conditions into emergencies (or war) at the least possible damage, as well as to keep order, protect human life, health, and property;

3 To prepare measures for the maximum implementation of the state resources to preserve and sustain economy of the county, localise emergency points and eliminate their consequences.

4 To organise the preparedness of the authorities and society to emergencies.

To perform the tasks as prevention of population, to co-ordinate activities of ministries, state institutions and other supporting services in case of natural catastrophes or major technological accidents Department prepares Emergency response plans. These plans are designed to co-ordinate activities and response actions in emergencies. They give details of the technical and organisational procedures that are appropriate to reduce harmful effects on people, property and the environment in the event of an accident, as well as define the responsibilities and actions of all state institutions and departments in emergencies. The Plans also provides with details of possible means for evacuation, means of individual and collective protection, material and technical supply other civil preparedness means.

**The Emergency Management Centres** act as managing institutions of the civil protection and rescue system. The Emergency Management Centres have been established:

1 Under the Government of the Republic of Lithuania,
2 In the ministries,
3 In the governmental institutions,
4 In the regional administrations and local municipalities.

They perform preventive work from occurrence emergencies and technological disasters, prepare and analyse long-term projects of civil security strengthening, co-ordination and control activities in civil emergency preparedness. In case of emergency the Emergency Management Centres evaluate the situation, threats and danger to population, property and environment, according to their competence organise the search, rescue works and liquidation of consequences, co-ordinates the activity of all involved forces. In the case of a necessity in evaluation and investigation of the dangerous situation, as well as in advice how to eliminate consequences of accidents, Emergency Management Centres create the groups of specialists, consultants and experts appointed by the Higher education institutions, ministries and Governmental institutions.

**State Emergency Management Centre** organises the localisation of the state scope natural calamities, technological accidents or disasters, people and property rescue works, liquidation of consequences in case if regional and local authorities are not able to manage the situation.

**The Emergency Management Centres of the ministries** co-ordinate the activities of subjects attached to them, control the situation in large scale emergencies, organise specialised support in emergency and provides material supply to population, as well as help the state, regional and local Emergency Management Centres. Emergency Management Centres of the ministries also perform the supporting functions in emergencies appointed by the Government.

**The Emergency Management Centres of the regions** co-ordinate the search and rescue as well as localisation and liquidation of consequences of accidents in their municipalities. In case of necessity they provide support to local authorities.

**The Emergency Management Centres of the local authorities** guide and manage search and rescue works, localisation and liquidation of consequences in case of a local accident when the consequences of accident are spread over the territory limits of the object.

**The Emergency Response Centre of State Nuclear Power Safety Inspectorate** continuously collect the information, analyse and forecast the course of the accident, provide information to the Government and other institutions, consult Emergency Commission, inform the IAEA and neighbouring countries as required by 1986 Convention and bilateral agreements. In order to meet those functions, State Nuclear Power Safety Inspectorate is attaching great attention to strengthening of VATESI's Emergency Response Centre. In 2001 it was completed equipping of ERC with modern telecommunication systems, reliable IT technologies and office equipment. In addition the project of implementation of dedicated data transmitting line between INPP and VATESI is close to end.

## 16.3. On-site and off-site emergency plans of INPP

### *16.3.1. Off-site emergency plan*

In case of emergency residents of Lithuania will be protected in accordance with the National Emergency Response Plan in the Event of a Radiological Accident at the Ignalina Nuclear Power Plant, approved by the Minister of the National Defence of the Republic of Lithuania on April 11, 2000.

This plan was developed by the Civil Protection Department based on IAEA-TECDOC-953 "Method for the development of emergency response preparedness for nuclear or radiological accidents" and IAEA-TECDOC-955 "Generic assessment procedures for determining protective actions during a reactor accident", Lithuanian legislation and other regulations. Every year governmental authorities repeatedly approve this plan. This plan obliges ministries, governmental services and authorities, town and municipal authorities to take specific actions in case of accident. The plan provides means of protecting the population, their scope, terms, assignment of responsibilities and implementation

procedure. The plan is needed for organisation and co-ordination of actions taken over by town and municipal authorities, ministries, governmental authorities and services for taking safety measures with regard to population and cattle, for arrangement of immediate response actions after the accident. The immediate actions of civil protection in case of an accident include: Organisation of warning and communication; Management; Radiation protection; Evacuation; Medical aid; Protection of cattle and plants; Fire protection; Keeping the public order; Logistics; Civil protection forces.

In the co-ordination with the Civil Protection Department appropriate emergency response plans have been developed in all regional administration and municipalities.

For the accident types, emergency response takes place over two distinct areas: sanitary protection zone and the area beyond the sanitary protection zone. Sanitary protection zone (SPZ) means the area surrounding the facility, which is under the immediate control of INPP.

The area beyond the sanitary protection zone is divided into three zones: Precautionary action zone (PAZ), Urgent protective action planning zone (UPZ), and Longer-term protective action planning zone (LPZ).

***Precautionary action zone*** (PAZ). Its goal is to substantially reduce the risk of deterministic health effects of ionising radiation before radionuclides emission into the environment.

***Urgent protective action planning zone*** (UPZ) means a predesignated area around the facility where plan for urgent protective measures is made in advance.

***Longer term protective action planning zone*** (LPZ) means a predesignated area around a facility farthest from the facility and including the urgent protective action planning zone. It is the area for the actions to reduce the long-term doses from deposition and ingestion should be developed in advance.

These zones should be roughly circular areas with INPP in the centre. The size of the zones has been determined by an analysis of international practice.

***Table 16.3.1. The Size of Controlled Zones is as follows:***

| Name of the Zone | Sanitary protection zone | Precautionary action zone (PAZ) | Urgent protective action planning zone (UPZ) | Longer term protective action planning zone (LPZ) |
|---|---|---|---|---|
| Distance from INPP | 3 km | 5 km | 30 km | 50 km |

UPZ and LPZ are evenly divided into 16 sectors, with the starting point from the geographical co-ordinates of the Unit 1 of INPP. The angle of every sector is equal to 22,5 degrees. Each sector in its turn is further sub-divided into 6 segments: 3-5 km, 5-10 km, 10-15 km, 15-20 km, 20-30 km, 30-50 km from INPP.

Presented in plan criteria of radiation protection for public are based on the recommendation of International Commission on Radiation Protection. Decisions on protection of population from radioactive irradiation in early and intermediate phases should be taken by comparing estimated doses with those of radiation effect criteria. Criteria for limiting consumption of contaminated food and drinking water are based on predicted doses, due to internal irradiation by radioactive nuclides.

The generic optimised intervention levels for urgent protective actions (sheltering, evacuation, iodine prophylaxis), generic optimised intervention levels for initiating and terminating temporary relocation and permanent resettlement, generic action levels for foodstuffs and drinking water are determined by the Hygiene Standard of the Republic of Lithuania HN 73-1997 “Basic Standards of Radiation Protection”. Operational intervention levels, administration of stabile iodine, clean-up procedures, foodstuffs, drinking water control, dosimetry of contaminated population are approved by Hygiene Standard HN 99:2000”Protective actions of public in case of radiological or nuclear accident”. Maximum permitted levels of radioactive contamination of foodstuffs and feedingstuffs following a nuclear or radiological emergency are approved by Hygiene Standard HN 84:1998. All the above mentioned Hygiene Standards meet the requirements of International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources (Safety Series No. 115),

EC Council and Commission regulations, directives and decisions.

To determine the level of radioactive contamination in the locality and specify doses of irradiation the radiation surveillance should be carried out by the survey teams of Fire Protection and Rescue Department. The main tasks of radiation surveying are these: to determine the level of radioactive contamination in settlements and routes of evacuation, to take samples and to deliver them for testing.

In 30 km zone iodine preparations are handed to inhabitants, within 50km zone iodine preparations are stored in curative prophylactic institutions which are obliged when necessary to distribute preparations.

Evacuation of population should be performed by decision of Government. Proposals for evacuation are submitted by the State Emergency Management Centre on the basis of analysis of current situation and forecasts of potential event.

Decisions to carry out evacuation are accepted when predicted public irradiation levels exceed criteria of radiation protection of population.

The roles and obligations of different institutions in case of an accident at INPP are determined by numerous legislative deeds.

One of the main institutions is the Lithuanian Nuclear Power Safety Inspectorate (VATESI), which in case of an accident shall accumulate information on the situation at the INPP, make analysis and advise the State Emergency Management Centre. VATESI also shall inform the Government of Lithuania and other relevant governmental institutions as well as the International Atomic Energy Agency (IAEA) and neighbouring countries as required by Convention and bilateral agreements.

The Ministry of Communication shall ensure the notification of management junctions and population in due time and maintenance of stable connection in organising and carrying out of immediate actions.

The Ministry of Health shall organise and render medical aid of all kinds, organise preventive activities of stabile iodine preparations, organise and carry out dosimetric control for people, hygienic control of food and potable water.

The Ministry of Environment shall carry out radiological monitoring, make prognosis, evaluate threat and consequences for environment and transfer the summarised data to the State Emergency Management Centre.

The Ministry of Interior shall ensure protection of 30 km zone, organise provisional control points, ensure public order, protection of national and private property and provide information to the Address Informational Service. The Fire Protection and Rescue Department shall carry out radiological survey besides fire extinguishing activities following the Operative Plan for Fire Extinguishing Operations in INPP, approved by the Director of Fire Protection and Rescue Department.

The Ministry of National Defence and Lithuanian Army should assist civil defence forces in making radiological survey from air and sanitary decontamination of people.

### *16.3.2. On-site emergency plan*

Emergency planning process at the INPP includes:

1. analysis of credible emergency situations and assessment of their consequences to the personnel, population, environment taking into account the worst conditions;
2. establishment of Emergency Response Organization (further ERO) capable to eliminate potential emergency situations and their consequences;
3. formation of Emergency Response Organization management structure capable to manage different emergency situations;
4. concern for continuous operability of technical devices ensuring emergency prevention, limitation and elimination;
5. accumulation of essential material assets, technical recourses allotted for functioning of Emergency Response Organization;
6. keeping in constant readiness for functioning ERO Emergency Operation Centres ;
7. training of ERO managers and personnel;
8. drafting of documents prescribed by VATESI and recommended by IAEA;

9 timely update of Emergency Response Plan considering results of tabletop drills and full scale exercises, conclusions of inspections performed by VATESI and INPP Safety and Quality Assurance Service.

Director General leads emergency planning process via Emergency Response Organization Staff.

*INPP Emergency Response Organization Organizational Chart*

INPP Emergency Response Organization (Heads of Emergency Response Organization Services and their subordinate personnel) is formed on the basis of production principle out of departments and divisions personnel considering the specific tasks that are dealt by the power plant divisions under the normal operation.

In order to ensure constant preparedness of Emergency Response Organization to act it is necessary to have not less than 3 specially instructed persons for each position in Emergency Response Organization meeting the requirements of that position.

Emergency Response Organization personnel should be adequately instructed and trained to meet the requirements of those positions.

*1) INPP Emergency Response Plan*

The new version of INPP Emergency Response Plan was drafted in 2001 and likely to be adopted on last quarter of the year. INPP Emergency Response Plan is the main operative procedure to carry out organizational, technical, medical, evacuation and other activities related to protection of the plant personnel and the environment from accident consequences, natural calamities, man made events.

The requirements of Emergency Response Plan (further ERP) are applied to Emergency Response Organization Management and personnel, also to all INPP personnel in case of an emergency at INPP.

ERP is drafted on the basis of the following national legislation and international practices.

The General Part of the Plan contains:

1 policy, objectives, tasks set by INPP management for Emergency Response Organization;
2 responsibility of INPP management for emergency planning;
3 INPP Emergency Response Organization organizational structure;
4 tasks set for INPP Emergency Response Organization Services and subdivisions;
5 notification and preparedness of INPP Emergency Response Organization;
6 measures applied in the event of an emergency at INPP;
7 premises and technical means necessary for executions of emergency preparedness functions;
8 co-operation with local, regional, state authorities while rending assistance in the event of an emergency;
9 resources available at the plant during an emergency;
10 radiation dose limits;
11 training of Emergency Response Organization managers and personnel, also INPP personnel in the field of emergency preparedness.

Operative part of the Plan contains:

1 -Emergency Planning Instruction;
2 -Notification Procedure in Case of an Emergency at INPP;
3 -Emergency Response Organization Management Assembly and Preparedness Procedure in Case of an Emergency at INPP;
4 -Personnel Assembly Places and Activities Organizing Procedure in Case of an Emergency at INPP;
5 -Emergency Operation Centre Staff Instruction;
6 -INPP Accident Classification Procedure;
7 -Instruction for Facility Personnel Protection and Activities against Impact of Harmful Toxic Materials in the Event of an Emergency at the Plant and Neighbouring Installations;
8 -Emergency Response Services Instructions.

-INPP Emergency Response Plan is applied to:

-Emergency Response Organization management and personnel;

-INPP personnel (not involved in Emergency Response Organization);

-Staff of Fire Rescue Service for Visaginas Town and the INPP;

-INPP Protection Team Staff;

-Contractor organizations personnel carrying out works at INPP;

-Measures related to requirements of Emergency Response Plan carried out at the INPP Controlled Area.

*Emergency intervention levels*

Emergency intervention levels are pre-defined at the INPP involving application of mitigating measures to decrease impact of power plant operation derangement.

The following accident classes are defined at the INPP:

*Alert* – it is a nuclear power plant status involving failures resulting in significant or unknown decrease in the level of plant safety. At the emergency of this class ERO is put into the state of readiness and additional assessment of the situation is performed.

*Site Emergency* –failures in the operation of nuclear power plant resulting in:

1. radioactive release into the controlled area in amounts greater than set for normal plant operation;
2. considerable decrease in the level of protection provided to the core or spent fuel;
3. any additional failures in the operation that could result in damage to the core or spent fuel. At the emergency of this class measures should be taken to perform protective actions off-site and to limit exposure of on-site personnel.

*General Emergency* – failures resulting in release or substantial risk of radioactivity release beyond the controlled area requiring urgent protective actions. The indicated failures include:

1. actual or projected damage to the core or large amounts of spent fuel;
2. radioactivity releases beyond the controlled area resulting in the course of several hours in doses exceeding the urgent protective actions intervention levels.

In case of declaring this accident class urgent protective actions are recommended for the public residing in the vicinity of the plant.

Each accident class is represented by respective emergency intervention level indicated in INPP Emergency Response Plan. Accident classification at the INPP is carried out on the basis of INPP Accident Classification Procedure.

*Notification and preparedness*

Emergency preparedness signals are predefined at the INPP that are communicated to the plant management and personnel by appropriate technical communication means.

In case of activation INPP Emergency Response Plan Plant Shift Supervisor notifies:

1. the plant management;
2. the plant personnel;
3. central dispatcher office of joint-stock company “Lithuanian Energy”;
4. Fire Rescue Service for Visaginas town and INPP;
5. VATESI officer on duty in Vilnius;
6. VATESI Supervision group at INPP;
7. INPP Protection Team;
8. Municipality of Visaginas town;
9. Officer on duty of Civil Protection Department of Utena County;
10. Officer on duty of Civil Protection Department under the Ministry of National Defence.

After assembly of Heads of Emergency Response Organization Services at Emergency Operation Centre and approval of accident class INPP management makes further notification:

1 Director General notifies Ministry of Economy, Director of Civil Protection Department under the Ministry of National Defence, SKI (Sweden), IAEA;
2 Technical Director notifies Head of VATESI;
3 Heads of Emergency Response Services notify Ministry of Environment, Ministry of Health Care, State Security Department.

#### *16.3.3. Measures for informing the public*

A central concern of civil protection is to warn and alert the population as quickly as possible. To warn and notify the population in case of an accident the state warning and notification system "Signalas" has been created as the network of 706 centralised electric sirens. Centrally controlled sirens can be triggered by the Civil Protection Department Operational Centre and to reach 2 million or 54% of the population living in cities and district centres. The 564 local electric sirens supplement this system. If case of a major accident or large scale threat Civil Protection Department shall notify the population through the first and the second Lithuanian radio and TV channels, most of commercial broadcasting companies (which work in FM), as well as through the wire radio communication network. For informing the public some additional means such as church bells, manual sirens, special cars with sound amplifying equipment and couriers can be used according to schemes prepared and approved with town and municipal boards in advance.

At the Operational Centre of the Department twenty-four hours duty officer gathers operative information concerning threats or accidents and keeps in touch with all managing units and key members of the community as well.

Population of the state is being provided permanently with information on civil protection issues via mass media, furthermore, special booklets including recommendations on behaviour during different emergency situations are being published.

### 16.4. Training and exercises

#### *16.4.1. General scheme*

The following groups of persons involved in the civil protection training:

1 Employees of the enterprises, institutions and organizations of all types (they are being trained without leaving their job duties),
2 Kindergartners, students of the general education, higher and high schools (they get fundamental knowledge on the civil protection and practical actions in the mentioned schools),
3 Civil Protection and Rescue System forces (they are being trained without leaving their job duties),
4 Heads, deputy heads, subdivisions heads and civil protection specialists of the governmental and local authorities, enterprises and organizations, members of emergency management centres and specialists of other institutions (being trained in training sections of the civil protection departments in counties and Civil Protection Training Section at the Military Training Centre).
5 The unemployed (discussions, lectures, TV, booklets, etc.).

The Civil Protection training is performed in the Civil Protection Training Section at the Advanced Military Training Centre and in civil protection departments training sections in 10 counties. A civil protection-training centre will be established in future.

The training for each selected person, depending on his/her position, is to be performed once in 3 - 5 years. The training courses adjusted to every specific purpose, last from 35 to 70 hours.

Officers of the fire-prevention service are trained in the Fire Protection Training centre in Vilnius.

Training sessions and exercises are organized at three levels.

Civil Protection Department at the Ministry of National Defence is responsible for the organization of training sessions and exercises at the national level.

Governors of the regions organizes training sessions and exercises at the regional level.

Mayor of municipality organizes training sessions and exercises at the municipal level.

Civil Protection Department at the Ministry of National Defence controls planning, organization and implementation of all training and exercises at all levels:

1 Training sessions at the national level are organized once a year, exercises – once in 3 years.
2 Training sessions at the regional level are organized twice a year, exercise – once in 3 years.
3 Training sessions at the municipal level are organized twice a year, exercise – once in 2 years.

In case of needs training sessions and exercise can be organized more frequently.

The main task of the training sessions and exercise is to check the procedures described in the "National Emergency Response Plan in the Event of a Radiological Accident at the Ignalina Nuclear Power Plant" and to continue to improve it. It would help counties, municipalities, ministries and other governmental institutions organize and coordinate all actions during an accident in the INPP on appropriate way.

### *16.4.2. Training of heads and personnel of Emergency Response Organization to act in case of an emergency at the INPP*

Director General as Site Emergency Director is trained once per three years at Training Centre of Civil Protection Department under the Ministry of National Defence.

Director General conducts:

1 annual training for managers of subordinate group in accordance with 6-hours training programme.
2 tabletop drills for heads of Emergency Response Organization Services not less than once per year;
3 full scale exercises once per three years.

Technical Director as Plant Operation Manager is trained once per three years at Training Centre of Civil Protection Department under the Ministry of National Defence in accordance with the same training programme as for Director General.

Technical Director conducts annual training for managers of subordinate group in accordance with 6-hours training programme.

Head of Civil Protection and Emergency Staff conducts annual training for managers of subordinate group in accordance with 6-hours training programme.

Heads of structural divisions as Heads of Emergency Response Services conduct training for sub-heads of subordinate services, teams, groups.

All the INPP personnel should be trained to act in case of an emergency. The training of personnel includes:

1 initial instructing in accordance with requirements for held position while assigning to work;
2 improvement of practical skills during exercises and drills;

Training of Emergency Response Organization Services personnel is conducted by heads of corresponding teams and groups.

After completion of theoretical course Emergency Response Organization Services personnel (part of personnel) participate in functional exercises for improvement of practical skills of carrying out the set tasks.

Once per three years Emergency Response Organization Services personnel (part of personnel) participate in full scale exercises for checking emergency preparedness level of personnel and its ability to work in complicated conditions while carrying out the set tasks.

### *16.4.3. Training and exercises of Regulatory Authorities' staff*

Main regulating institutions, such as VATESI, Radiation protection Centre, has established its own emergency staff training and exercising programs. In addition to national, key institutions are participating in the international exercises, for instance ALEX, JINEX – 1 etc.

### 16.5. International arrangements

The Civil Protection Department is responsible for the international level of civil protection and establishes contacts with the EU, NATO and other international organisations. Since April, 1994 the Civil Protection Department joined the activities of NATO countries and partner nations within the framework of Partnership for Peace programme, participates actively in plenary sessions of NATO Senior Emergency Planning Committee, seminars and exercises.

In 1994 Lithuania has joined to Convention on Early Notification of a Nuclear Accident and in 2000 to Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. VATESI and Civil Protection Department are responsible authorities respectively.

A great attention in Lithuania is paid to the development of bilateral co-operation with the neighbour countries. Mutual assistance policy between Lithuania and the neighbouring countries is based on bilateral agreements. Bilateral agreement between Lithuania and Denmark *On information exchange and co-operation in the field of nuclear safety and radiation protection* has been signed on 26 March 1993. The bilateral agreement between Lithuania and Norway *On Early Notification of a Nuclear Accident and Information exchange about Nuclear Objects* has been signed on 13 February 1995. The Arrangement between Lithuania and Poland *On information exchange and co-operation in the field of nuclear safety and radiation protection has been signed on 2 June 1995.* Bilateral agreement between Lithuania and Germany *On Mutual assistance in case of Natural Disasters and Large Scale Accidents* has been signed on 15 March 1994. Bilateral agreement between Lithuania and Poland *On Co-operation and Mutual Assistance in the field of Catastrophes, Natural Disasters and other Emergencies* has been signed on 4 April 2000. Bilateral agreement between Lithuania and Hungary *On Co-operation and Mutual Assistance to be provided in the event of Catastrophes and Severe Accidents was signed in May 2001.* Bilateral agreement between Lithuania and Latvia *On Mutual assistance in case of Natural Disasters and Large Scale Accidents* has been signed in the beginning of June 2001. Memorandum of mutual assistance between the Civil Protection Department of Lithuania and the Civil Protection Department of Czech Republic has been signed on 17 June 1997.

In addition to bilateral agreements on 8 June 2001 Lithuania has joined the *Agreement between Baltic Sea Countries Governments on radiological monitoring data exchange,* which enables direct access to the radiological data in all Baltic Sea countries.

Also, Lithuania is working on adhering to EC urgent radiological information exchange (ECURIE) system.

# Article 17: SITING

*Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:*

1 *for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;*
2 *for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;*
3 *for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to the continued safety acceptability of the nuclear installation;*
4 *for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.*

### 17.1. Description of licensing process, including summary of national laws, regulations and requirements related to sitting of Nuclear Installations

In making a decision on the construction of a specific nuclear facility, the Government of the Republic of Lithuania shall take into consideration:

1. economic and public needs;
2. the principal characteristics of the use of natural resources and their impact on the environment;
3. nuclear safety and radiation protection guarantees;
4. the opinion of the local authority on whose territory the intended facility will be sited.

Information about the site of nuclear facility is presented as follows:

1. geographical location of the nuclear facility, topographical and demographic situation on site area (taking into account the density of population and distribution in site area and its approaches);
2. characteristics of site (data of meteorological research - prevailing winds, geological structures, seismic activity, status of radioecology, description of possible consequences in case of accident, possible effects on food production);
3. situation of other industrial facilities around the nuclear facility, consequences to the safety of the nuclear facility caused by possible accidents in these facilities;
4. other parameters of the site, which can be important to ensure the safety of the nuclear facility and minimise risk to the inhabitants from radiation;

*General Provisions of the Activities of the Licence Issuing Authority*

The institutions referred to in Article 26, issuing licences for a certain type of activity in the nuclear energy sector, are obliged to ensure that enterprises, which have been issued licences, shall guarantee:

1. adequate standards of nuclear safety for the licensed activity;
2. responsibility for nuclear safety;
3. the system of internal control that would ensure the use of only licensed nuclear materials and wastes and would guarantee the implementation of the provisions of the Treaty on the Non-Proliferation of Nuclear Weapons.
4. high professional qualification standards of the executive personnel engaged in the licensed activity.

Without prejudice to the principal provisions of this Law and its separate parts, the issuing institution may establish additional requirements for the licensed activity.

*Issue of Licences*

The activities listed in this Law shall be licensed for a limited period in a manner established by the laws and other statutory acts of the Republic of Lithuania.

The licensing institution have the right to establish at a later date additional conditions and requirements for the safe operation of a facility, and in the event of their disregard, to suspend the licence and to prohibit any further operation of the facility until all the established shortcomings have been rectified. The issuing institution may at any time cancel the validity of the licence when it establishes that the nuclear safety conditions have been breached.

The competent licensing authority shall establish the procedure for applying new safety standards and rules at the operating facilities.

The refusal to issue a licence, its suspension, cancellation or prohibition of the activity of a facility may be appealed against in court.

**17.2. Special conditions for the design and construction of Nuclear Facilities**

Legal Prerequisites for the Design of Nuclear Facilities

A nuclear power plant or a nuclear reactor may be designed only subject to a resolution adopted by the Government of the Republic of Lithuania on the basis of the law on the construction of such a power plant or a nuclear reactor.

Other nuclear facilities may be designed, and the nuclear power plant may be reconstructed subject to a resolution adopted by the Government of the Republic of Lithuania on the recommendation of the Ministry of Energy.

A particular design of a nuclear facility shall be prepared subject to:

1. the drafting and approval of a special site selection scheme after consideration of several alternative construction sites in a manner prescribed by Law on Territorial Planning;
2. the approval of a detailed plan of the territory;
3. taking over of the land intended for the construction site for public needs in a legally prescribed manner.

Design Co-ordination Procedure

The construction or reconstruction design of a nuclear facility shall be co-ordinated in a manner prescribed by the Government of the Republic of Lithuania with the following state institutions:

1. the Ministry of Environment;
2. the Ministry of Economy;
3. the Ministry of National Defence;
4. the Ministry of Social Security and Labour;
5. the Ministry of Construction and Urban Planning;
6. the Ministry of Health;
7. the Ministry of the Interior;
8. the State Security Department;
9. State Nuclear Power Safety Inspectorate (VATESI);
10. local authority whose territory or its part is within the sanitary protection zone of the facility.

**17.3. Implementing provisions for fulfilment of the above mentioned criteria and activities related to maintaining the continued safety acceptability of the Nuclear Installation, taking account of site-related factors**

The structural components of the INPP are designed in accordance with the specification set forth in "Design Safety Regulations of Nuclear Power Plants (OPB-83)". The generic requirement of this document is that safety-related systems and elements of nuclear power plants have to be able to fulfil their functions under all conditions. This implies that they have to accommodate stresses imposed by natural phenomena as well as mechanical, thermal, chemical and other impacts, which may arise during design basis accidents.

The term "external events" (relative to a nuclear power plant) covers such natural phenomena as a earthquakes, flooding, strong winds, lightning, snow and ice, and such man-made events as aircraft crashes, industrial explosion, sabotage and terrorist action. On site fire and flooding are usually also considered as external events.

The mentioned site-related factors likely to affect the safety of nuclear installation were evaluated partly during the design stage of INPP in accordance with existed requirements. As it was described in section 6.3 and 14.2, an in-depth safety analysis of INPP using Western methodology was completed in 1997. The site was originally selected taking into account relevant factors like the above-mentioned and the population density at various distances. Present legal provisions to maintain the environmental conditions of the sites include restrictions for building activities close to the site. There are no chemical installations, gas pipelines and other facilities and human activities that might endanger the plant safety.

Safety analysis of nuclear power plants requires the consideration of an "Aircraft crash on the reactor hall". The consideration of this event is proposed in a list of hypothetical accidents defined in 1990 by the Kurchatov Atomic Energy Institute, Moscow, Russia. This requirement was imposed after completion of the INPP.

The requirements for considering an aircraft crash therefore were not imposed on any RBMK plant. This was due mainly to three major considerations:

A) There were no such regulatory requirements at the time when the plants were developed and no such requirements were introduced by the regulatory bodies,

B) Such events are sufficiently unlikely, besides, the RBMK sites are situated reasonably far from airports,

C) Until recently, there were no reliable statistics on flight incidents and fatal accidents involving both civil and military aircraft, which could be used when considering such events regarding nuclear power plants.

Note, that the nearest air route Svir-Rokiškis is ten km to the West of the INPP. In 1990 a total number of flights along the Lithuanian air routes was 65000. During the last 30-year period there were no commercial aircraft crash accidents in Lithuania. Nevertheless, there are administrative restrictions for flights over INPP in 3km range.

Seismic stability is the ability of equipment and structures to maintain integrity during seismic loading. This implies the maintenance of strength, tightness, maintainability, nuclear and radiological safety and the absence of residual deformation, which encumber normal operation.

Depending on the need for functionality during and after the earthquake, all systems, equipment and structures of NPPs with RBMK-type reactors, are designed according the "Code for Designing of seismic-resistant nuclear power plants".

Calculations of seismic stability criteria for the INPP structures, equipment and pipelines were conducted by the Research and Development Institute for Energy Technology, St. Petersburg (at that time Leningrad), Russia. These calculations were performed using a linear spectral theory of seismic stability. The seismic stability of buildings is given according to the above mentioned MSK-64 scale.

For the INPP area the design earthquake magnitude is 6 forces and the maximum possible calculated earthquake magnitude is force 7 according to the MSK-64 scale. This requirement implies that some structures of the INPP need to be strengthened.

Some systems, equipment and structures of the INPP do not fully comply with seismic stability standards. Measures aimed at reinforcing the existing building and equipment components are expensive, and are considered by plant experts as unfeasible. However, after effects of an earthquake will be diminished if the reactors are promptly shut down prior to the seismic wave approaching the plant. The implementation of the seismic monitoring system is under progress in accordance with Safety Improvement Program of INPP.

# Article 18: DESIGN AND CONSTRUCTION

*Each Contracting Party shall take the appropriate steps to ensure that:*

1 *the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defence in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;*
2 *the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;*
3 *the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.*

### 18.1. Description of licensing process, including summary of national laws, regulations and requirements related to design and construction of Nuclear Installations

A permit for the construction of a nuclear facility shall be issued in a prescribed manner by the administration of the county governor. On the proposal of the Government, the Seimas adopt a law on the construction of a new nuclear plant and its site and on the mounting of a new nuclear reactor, and also on the decommissioning of a nuclear facility. The law establishes the principal limits for a nuclear plant or a nuclear reactor and also for the zones of sanitary protection and monitoring.

The Government of the Republic of Lithuania shall:

In the manner prescribed by law, adopt decisions on the construction of specified nuclear facilities;

Form a commission for the commissioning of a nuclear facility;

Prepare nuclear safety and radiation protection regulatory system and mechanism;

Establish nuclear energy control and supervision institutions and approve their regulations;

Approve statutory acts regulating the acquisition, storage, transport and disposal of nuclear and radioactive materials and submit them to the ministries of the Government institutions for approval in cases listed in the above articles;

Establish the procedure of licensing for nuclear activities';

Establish the specific conditions and requirements for the zones of sanitary protection and monitoring and trends for their development;

Co-ordinate the activity of ministries and other state institutions in drafting of nuclear accident prevention and management plans.

An organisation operating a nuclear facility is responsible for conducting of nuclear activities in compliance with the provisions of this Law and other statutory acts of the Republic of Lithuania.

A competent authorities issuing licences for a specified activity in the sphere of nuclear energy must develop a system of requirements guaranteeing:

Nuclear safety;

Non-proliferation of nuclear weapons;

Only a lawful usage of nuclear materials and waste handling.

During all the stages of work compliance with the conditions and requirements set forth in the nuclear safety, radiation protection and other statutory acts shall be controlled and supervised by the following institutions within the framework of their competence: the VATESI, the Ministry of Health, the Ministry of Environment, the Ministry of Social Security and Labour, the Ministry of the Interior, the State Security Department and the county governor.

Sanitary protection and monitoring zones shall be established around nuclear facilities. The size of the area shall depend on the purpose of the facility and the requirements of operation safety rules and standards. The boundaries of the sanitary and monitoring zones shall be fixed in the documentation of the facility construction design.

Prior to the commissioning of the facility, all the population shall be resettled from the sanitary

protection zone in a manner established by the Government. Any activities as well as construction of installations and buildings unrelated to the operation or service of the facility shall be prohibited therein. Land, woods and water bodies on the territory of the sanitary protection zone may be used only subject to an approval of the Operating Organization and permits of the Ministry of Environment and the Ministry of Health. The basic requirements for the sanitary protection and monitoring zones of a nuclear power plant or a nuclear reactor, and the conditions for decommissioning conditions shall be stipulated by the law on nuclear power plants or on nuclear reactors.

Information about the design of nuclear facility is as follows:

1. Layout of the nuclear facility buildings and systems (general plan);
2. Reactor core:
   2.1. Description of the physical, thermal, mechanical and chemical processes in the reactor;
   2.2. Description of the main elements of reactor construction (static and dynamic loads are indicated);
   2.3. Comprehensive description of fuel design and physical parameters, operating parameters, limiting design indicators (parameters);
   2.4. Description of reactivity control system and justification of its reliability, taking into account the functional capability to maintain the design parameters of fuel in case of accident processes, analysis of systems operational reliability;
   2.5. Description of nuclear physics parameters of the reactor, analysis of thermal exchange processes, description of numerical methods for determination of reactor parameters, assessment of their accuracy and comparison with the experimental data;
   2.6. Description of the moderator and related systems, analysis of static and dynamic loads, analysis of moderator quantity sufficiency; taking into account its influence on the performance of reactor control and safety systems, accumulated radioactivity, systems for protection against radioactive contamination and for its monitoring;
   2.7. Other safety relevant information;
3. System of heat exchange and reactor cooling:
   3.1. Comprehensive description of system design principles;
   3.2. Description of main elements of system design;
   3.3. Design calculations, analysis of stresses in main design elements;
   3.4. Comprehensive analysis of reactor cooling system and emergency core cooling system constructional reliability during operation, transient and accident processes.
   3.5. Description of system parameters control system;
   3.6. Other safety related information;
4. Protective cover system of the reactor:
   4.1. Description of main principles of reactor design;
   4.2. Comprehensive description of the main functional elements by assessment of their interaction, control parameters, constructional reliability during performing of safety functions, energy supply for them;
   4.3. Comprehensive justification of leak tightness of reactor protective cover construction, taking into account the situation of constructional elements;
   4.4. Detailed description of the reactor cavity ventilation system, justification of its constructional reliability and leak tightness, analysis and justification of control, filtration means functional reliability;
   4.5. Description of systems for pressure relief and cooling in case of accidental processes, removal of fission products, justification of their constructional reliability and functional adequacy.
   4.6. Description of the methodologies and computer programs used for analysis;
5. Control and protection systems, control and measuring devices:
   5.1. Comprehensive description of control and monitoring systems, and monitoring instruments;

5.2. Comprehensive justification of the reliability of control systems:

- requirements established for the system;
- analysis of reliability;
- analysis of supply systems reliability;
- analysis of systems separation and independence;
- analysis of possible failures;
- analysis of functional redundancy and analysis of notification provisions;

5.3. Comprehensive safety justification of the protection system including:

- requirements established for the systems;
- analysis of functional reliability;
- analysis of supplying systems reliability, control methods and means;
- analysis of systems and their functional independence from non safety (service) systems;
- analysis of system redundancy, analysis of application of different control principles and physical separation;
- description of power supply systems, analysis of their reliability, ensuring continuous energy supply for safety relevant systems and emergency supply;

6. Description of the energy production system, including:

6.1. Elements of the design and performance principles of generators;

6.2. Analysis of the constructional reliability of generator during operation and emergency processes;

6.3 Analysis of the generator capacity control system;

7. Description of the fuel management system, including:

7.1. Loading and transportation equipment, requirements for its maintenance;

7.2. Analysis of reactivity control system reliability and adequacy of work procedures;

7.3. Justification of protection system reliability;

7.4. Justification of distribution and handling systems of fuel with respect to safety assurance;

8. Description of auxiliary systems, including:

8.1. ventilation systems;

8.2. fire protection systems;

8.3. communication systems;

8.4. pressurised air or technical gas supply systems;

8.5. technical water supply systems;

9. Description of radiation protection system, including the main principles of radiation protection assurance, design of premises, separation of the security zones, biological shielding, materials used, filtration and cleaning systems and other safety relevant elements;

10. Description of radioactive waste management system, including design of equipment, dosimeter control system;

11. Description of measures foreseen in the design of the nuclear facility, which shall be applied after shut down of the nuclear facility.

**18.2. Implementation of the "defence-in-depth" concept and the fundamental reactor safety principles**

A necessity to implement the "defence-in-depth" concept at all stages of safety related activities (including design and construction) is stated in the "General Regulations for Nuclear Power Plant Safety", item 1.2.3 of which reads:

"1.2.3. The safety of a nuclear plant shall be guaranteed by applying of the principle of "defence-in-depth", i.e. by the sequential implementation of protection measures based on a system of barriers to prevent the spread of ionising radiation and radioactive materials to the environment and systems of

technical and organizational measures to protect these barriers and retain their effectiveness, and also to provide direct protection for the population.

The system of barriers includes:

1 the fuel matrix;

2 the fuel element cladding;

3 the boundary of the primary coolant circuit;- a hermetically sealed protective enclosure surrounding localizing safety systems.

The system of technical and organizational measures includes:

1 the selection of an appropriate site for the nuclear plant;

2 the establishment of a sanitary-protection zone and a monitoring zone around the plant;

3 a conservative approach to plant design incorporating fail-safe characteristics in the reactor itself and specific safety systems;

4 quality assurance designed to guarantee the requisite systems (components) of plant and of all work carried out at the plant;

5 nuclear plant operation in accordance with norms and technical requirements;

6 maintenance of safety-related systems in good operating conditions through the implementation of preventive maintenance measures and replacement of worn-out components;

7 timely diagnosis of defects, detection of any deviations from normal functioning, and implementation of measures to remove their causes;

8 organization of an effective system for registration of the operational results and monitoring measures;

9 implementation of measures designed to prevent initiating events from developing into design-basis accidents, and design-basis accidents from developing into beyond-design-basis accidents;

10 mitigation of the consequences of accidents which could not be effectively forestalled through localization of the radioactive materials released;

11 measures designed to protect localizing safety systems against destruction during beyond-design-basis accidents and to maintain them in a functional state;

12 preparation, and scrupulous implementation when required, of emergency plans for the site itself and the area surrounding the site;

13 selection and training of operating personnel for the actions required in both normal and emergency conditions;

14 inculcation of safety culture.

The principle of "defence-in-depth" is activated at all stages of safety-related activities in the competent departments of a nuclear plant.

During normal operation all barriers and all resources designed to protect them must be in good operating condition. If any of the barriers provided in the plant design or any of the resources intended to protect those barriers are found to be out of order, operation at power is not permitted.

The extent to which the various safety functions are to be implemented and the manner in which this is done shall be specified in norms and technical requirements, and shall also be stated and justified in the technical design for each individual plant." (*the end of item 1.2.3)*

The INPP safety is provided by engineering devices and organisational activities, which ensure that the internal and external exposure of staff and public, pollution of environment by radioactive products under normal and design accidents do not exceed the prescribed limits.

The immediate cross rupture of 900 mm diameter pressure header resulted in a primary circuit leakage is taken as an example of a maximum design accident.

In accordance with the General Regulations for Nuclear Power Plant Safety the safety systems are designed in such way, which allows to ensure the plant safety in the event of any design accident.

The key safety design principles appear as follows:

Ensuring of reliable core cooling both under normal and emergency conditions;

Ensuring of full localisation of the coolant released from the circuit in the event of the accidents related with loss of circuit integrity or putting the process equipment out of order;

Ensuring of full localisation of the releases in the event of primary circuit tube rupture, which is regarded as the most severe from the radiological point of view;

Ensuring of premise protection of structures from collapse under emergency conditions in the event of overpressure in rooms and a primary circuit tube rupture;

Ensuring of equipment and pipelines protection from breaking in emergency conditions in the event of overpressure in the primary circuit.

The Plant safety is provided by:

Primary Circuit design, which ensures the satisfactory conditions for natural coolant circulation;

Designing of the Circulation Pump with additional excursion, which ensures the availability of extra pump force in the event of disconnection for the time required to change over to the reactor core cooling mode with natural circulation;

Locating pipelines and equipment with core coolant in protected rooms;

Locating the Primary Circuit pipelines in the tight compartments, which are designed to withstand the overpressure in the event of a pipeline rupture;

Using hermetically sealed pipe ducts which penetrate the rooms with different design pressure;

Installing leakage belts on pipes, which enable to reduce the coolant flow rate in the event of a pipe rupture;

Backing up safety devices and equipment for normal operation;

Implementing activities to ensure integrity of ECCS pipes in the event of Primary Circuit pipe rupture;

Installing the required number of process control devices;

Supplying reliable amount of power to the users who provide reactor control, operation and cooling;

Inspecting metal state and welds of pipes and equipment first while installing and then regularly while operating;

Providing activities to improve quality of normal operation and safety devices while manufacturing.

**18.3. Prevention of accidents and their mitigation**

In accordance with the "General Regulations for Nuclear Power Plant Safety" (items 1.2.12 and 1.2.14) the following measures should be taken for prevention of accidents and their mitigation:

Reactor and nuclear plant designs shall provide for technical means and organizational measures to prevent design-basis accidents and to limit their consequences and to ensure safety in the face of any of the initiating events anticipated in the design, with the assumption of one additional failure (independent of the initiating event) among any of the following safety system elements: an active element or a passive element having mechanical moving parts, or a personnel error independent of the initiating event.

In addition to the single failure (independent of the initiating event) of one of the elements mentioned above, account must be taken of undetected failures among elements which are not monitored during plant operation and which can also lead to a violation of safe operating conditions, thereby influencing the development of the accident.

Reactor and nuclear plant designs shall provide measures to control beyond-design-basis accidents, if such accidents are not excluded by virtue of the fail-safe characteristics of the reactor installation and the principles of its construction.

The scope and forms of safety functions to be provided are stipulated in Code and Standard Programme applied to NPP, justified and incorporated into INPP engineering design.

The design of the reactor facility and NPP includes engineering arrangements and organisational measures to prevent design accidents and to mitigate their consequences. The design allows to ensure

safety at any single designed initial event with overlapping of one event which is independent on the initial event of the failure of any following safety system element: an active or passive element having mechanical moveable parts or caused by a human error which does not depend on the initial event.

In addition, the design allows to account not only the failure of one of the above elements which does not depend on the initial event, but a number of unidentified failures of the elements which are not controlled in the course of operation but the failure of which has some impact on the accident generation.

**18.4. Measures for ensuring the application of technologies proven by experience or qualified by testing or analysis**

"General Regulations for Nuclear Power Plant Safety" require (item 1.2.4) that the technical and organizational arrangements made to ensure plant safety must be proven by prior experience or testing, experimental investigations and operational tests on prototypes, and must conform to the norms and technical requirements adopted for the nuclear power sector. This approach is to be taken not only in the design of equipment and of the plant as a whole, but also in the actual manufacture of equipment and in the construction and operation (decommissioning) of the plant.

The engineering and organisational decisions taken to ensure INNP safety have been proven and checked by previous practice or tests, appropriate studies, operational experience of the prototypes. It means that they are in full conformity to the nuclear codes and regulations as defined in the Feasibility Report for Reactor Facility.

When the first plants with RBMK-1000 were being designed, the initial emergency events were listed. Besides, the most dangerous ways of their generation were considered.

The original list of initial events has been sufficiently extended on the basis of experience gained from the reactor facilities operating at Leningrad, Kursk and Chernobyl NNPs and to meet the NPP safe operation requirements which lately have been tightened to meet the international nuclear excellency requirements in general and to implement INPP SAR recommendations in particular.

Applying the proven technology while performing civil work, which is to be supported by appropriate QA activities, provides the required quality of construction.

**18.5. Requirements on reliable, stable and easily manageable operation with specific consideration of human factors and man-machine interface**

In the above mentioned “The General Regulations for Nuclear Power Plant Safety" (VD-B-001-0-97) is stated that NPP design should provide means to eliminate single personnel errors or lessen their consequences, including those during the maintenance. The “Nuclear Safety Regulations for the Reactor’s of Nuclear Power Plants” (VD-T-001-0-97) define in detail the requirements of the "General Regulations for Nuclear Power Plant Safety" as to ensuring nuclear safety.

In general terms the above mentioned regulations require that design of the NPP’s (their systems and structures) shall be optimal for operator performance.

It is required that:

1 the working areas and working environment of the site personnel shall be designed according to ergonomic principles;

2 systematic consideration of human factors and the human-machine interface shall be included in the design process at an early stage and shall continue throughout the entire process, to ensure an appropriate and clear distinction of functions between operating personnel and the automatic systems provided;

3 the human-machine interface shall be designed to provide the operators with comprehensive but easily manageable information, compatible with the necessary decision and action times;

4 verification and validation of aspects of human factors shall be included at appropriate stages to confirm that the design adequately accommodates all necessary operator actions;

5 as equipment operator, the operator shall be provided with sufficient information on parameters associated with individual plant systems and equipment to confirm that the necessary safety actions can be initiated safely;

6 the design shall be aimed at promoting the success of operator actions with due regard for the

time available for action, the physical environment to be expected and the psychological demands to be made on the operator. The need for intervention by the operator on a short time-scale shall be kept to a minimum. It shall be taken in to account in the design that the necessity for such intervention is only acceptable provided that the designer can demonstrate that the operator has sufficient time to make the decision and to act; that the information necessary for the operator is simply and unambiguously presented.

# Article 19: OPERATION

*Each Contracting Party shall take the appropriate steps to ensure that:*

1 *the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;*
2 *operational limits and conditions derived from the safety analyses, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;*
3 *operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;*
4 *procedures are established for responding to anticipated operational occurrences and to accidents;*
5 *necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;*
6 *incidents significant to safety are reported in a timely manner by the holder of the relevant license to the regulatory body;*
7 *programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;*
8 *the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.*

### 19.1. Description of licensing process, including summary of National Laws, Regulations and Requirements related to operation of Nuclear Installations

According to the laws and regulations acting in the Lithuanian Republic any activity relating to the nuclear energy is allowed if the state control and surveillance authorities have issued the relevant license.

Construction of a new nuclear power plant or a new nuclear reactor, as well as decommissioning of any nuclear installation can be commenced only if the relevant Law proposed by the Government has been enacted by the Seimas. Construction of a new nuclear power plant or a new nuclear reactor, as well as decommissioning of any nuclear installation can be commenced only if the technical design has been duly approved and relevant license (permit) has been issued by the state control and surveillance authorities.

Nuclear Power Plant is put to operation in accordance with the programmes of physical, energy start-up and commissioning of NPP. The state control and surveillance authorities shall endorse the programmes.

The license for industrial operation of each of NPP can be granted to the NPP operating organisation by the State inspectorate of nuclear energy safety on the basis of positive results of commissioning works, availability of updated technical safety justification of reactor facility and NPP and statement on NPP Unit acceptance to industrial operation and endorsement of other state control and surveillance authorities.

License for operation of Unit 1 meeting the Western practice was granted to INPP in 1999.

Currently works on licensing of Unit 2 operation are under way. Licensing of Unit 2 operation is planned to take place within 2003.

Operational organisation bears complete responsibility for safe operation of INPP in accordance with the requirements established by the corresponding legislation of the Lithuanian Republic, regulations and standards of nuclear safety and radiation protection, operational organisation standards, discipline and organisational norms, as well as norms and standards listed in the license for operation including measures towards accident prevention and reduction of accident consequences, recording and storage of the nuclear materials and radioactive substance, environment protection and environmental monitoring in the sanitary-protective zone and surveillance zone and monitoring of the plant operation purpose, i.e. its operation shall meet the objectives it was designed and constructed for.

Operational organisation responsibility can not be reduced due to the independent activity and responsibility of enterprises, institutions, organisations and their co-operations, officials and other persons performing works or providing services to the Operational organisation (designers, suppliers, civil organisations, commissioning and repair organisations, etc.), as well as due to the independent activity and responsibility of state control and surveillance authorities.

**19.2. Description of steps undertaken by the Contracting Parties to perform their obligations under Article 19 of Convention:**

***19.2.1. The initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements***

The commissioning program was developed before the start-up of the INPP. The program was approved by the NPP General Designer, the Reactor Main Designer, the Research Manager and the Regulatory Authority, and then authorized by the Operating Utility.

Pre-commissioning tests gave the evidence that the whole INPP and its individual units, safety systems and components operate as designed. The plant was brought to first criticality and power in accordance with the statuary procedures.

When implementing each INPP unit commissioning program, the physical parameters of the reactor, safety systems and all components were determined, the operating parameters of the systems and components, and the limits and conditions of safe operation were improved, and the operating procedures were corrected.

Following the full-scale tests of the systems and components, each unit was accepted to put into commercial operation. The Regulatory Authority granted an operating permit for each plant unit.

***19.2.2. Operational limits and conditions***

It is stated in clause 5.1.2 of "General Regulations for Nuclear Power Plant Safety Provision" that the principal document defining safe operation is the technical specification, which lays down main modes and functions of safe operation as well as general instructions for the performance of all operations related to plant safety, and also specifies the limits and conditions of safe operation. The limits and conditions of safe operation shall be justified by design and/or other relevant documents".

For INPP, limits and conditions of safe operation was set and justified in the Technical Safety Justification prepared by the plant Main Designer (NIKIET, Moscow) and Scientific Adviser (RNC KI, Moscow) and the General Designer (St-Petersburg, Russia). In the frames of in-depth safety assessment (Safety Analysis Report of Western style, SAR-1) the limits and conditions of safe operation were reviewed and their correctness was confirmed.

Technical Specification - the basic document specifying the safety of INPP and determining the limits and conditions of safe operation - shall be reviewed every three years. If necessary, the relevant corrections are incorporated to the Technical Specification in case the norms, standards and regulations have changed in course of system and equipment modifications or operation experience of INPP

enrichments. Each new issue of the Technical Specification or after each update of the Technical Specification it shall be endorsed by the Regulating authority of the Lithuanian Republic. The last version of the Technical Specification entered into force on 4 April 2001.

In case the established limits and conditions of safe operation of any unit of INPP can't be met during the reactor operation on power it shall be shutdown.

***19.2.3. Operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures***

In compliance with the Quality Assurance Programme and Documentation control system acting at INPP all works relating to operation, maintenance, inspection and testing of all systems and equipment, including nuclear facility and safety related-systems shall be performed only on the basis and in accordance with the approved documents.

Document preparation shall be performed in accordance with the established procedures.

Normal and emergency operating procedures, as well as testing procedures are developed in the operation-by-operation manner. There are the stops provided to assess results. The most important operations are performed under the direct supervision of another person. All actions of both the executors and their supervisors are recorded and signed in the relevant reports. The application area, limitations, responsibilities and actions of the personnel to detect normal operation failures are determined in each procedure.

Any testing at INPP not covered by the Technical Specification and operation procedures shall be performed in accordance with the special programmes presenting measurers to provide testing safety.

Prior to the document entering into force (including testing programmes) the applicability, usability of the documents shall be confirmed (review, endorsement and approval). Confirmation of applicability shall be based on the critical analysis of adequacy of the measures providing safe and correct operation and shall be performed in compliance with the established procedures. The most important documents shall be agreed with the State regulating authority (VATESI).

All documents and records are registered in special electronic system (ARKI). These systems, on one hand, provide storage of documentation electronic copies and, on the other hand, access of all INPP users to the corresponding documents.

In course of preparation and registration of the documents each document shall be provided with the relevant identification according to the priority of each document with regard to safety.

Plant personnel use only the documents passed review, approval and registration. All key personnel are provided with access to ARKI system purposed to search of any necessary document.

Results of all works, first of all relating to the safety shall be recorded (reports, check-lists, statements, logs, etc.). Records are made on the material providing their safe storage within the required time. Records relating to the safety shall be kept all operation life-period of the plant and subsequently handed over to the State archive for storage.

In order to supply personnel with correct, currently acting at INPP documentation the maintaining of documentation is provided. The maintaining process covers the following stages: to put the document to operation, to determine commencement/completion dates of document using, to multiply the relevant numbers of copies, to distribute among the personnel, to analyse the existing documents referred to the new documentation, to incorporate corrections, to mark the uncontrolled copies in due way, to review and replace the obsolete documentation, to hand over the documentation to the State archive and to destroy the documentation not subject to storage.

Replacement and incorporation of corrections to the document do not require the corresponding document to be taken from the personnel.

Documents developed by external organisations (design, etc.) are subject to review and their applicability is subject to approval prior to their using at INPP.

All copies of the documents availability of which is currently sustained shall be taken away (eliminated) from the personnel.

The originals of the documents and records are stored in within the established storage time. Elimination of the documents and records not in action anymore and their archiving shall be performed in accordance with the established procedures.

Access to the archive documents and records shall be provided in accordance with the relevant procedures.

Reproduction of the records is ensured considering any and all changes of the documentation preparation, which may take place in the future in course of information system modifications.

Documentation with the expired validity term of storage at INPP and which considers to have scientific and practical value for the Lithuanian Republic shall be handed over to the State archive. As a rule, these are safety-related documents and records. The expert committee in accordance with the acting regulations shall perform selection of documentation to be handed over to the State archive.

### *19.2.4. Emergency Operating Procedures*

Point 5.1.4 of the "General Regulations for Nuclear Power Plant Safety" requires that the Operating Organization and nuclear plant administration shall, on the basis of the norms and technical requirements, technological reglament and the technical safety justification for the reactor and the plant as a whole, prepare and issue special instructions defining the actions of personnel to maintain safety during design-basis and beyond-design-basis accidents. The actions prescribed for plant staff in these special instructions shall be based on the attributes of the events and the conditions of the reactor, as well as on a forecast of conditions as they are expected to evolve during the accident. Actions shall be directed to restore essential safety functions and to limit the radiation consequences of the accident.

In mid 90-s existing event-based Emergency Operating Procedures at INPP were reviewed in the frames of in-depth safety assessment and were found to be corrected both from the point of view of their structure (to become more convenient for the operators) and to cover all necessary anticipated events. This work was recognized as very urgent and in accordance with Ignalina Safety Panel recommendations was done before restart of INPP Unit 1 in 1997.

In the frames of "Lisbon Initiative" a development of Symptom Based Emergency Operating Procedures for INPP was started. Experts from Lithuania, Russia, Sweden and the United States took part in this work that was completed in 2001.

According to this new procedures the actions of the plant personnel are based on criteria of events, condition of the reactor as well as on forecast of conditions as they are expected to evolve during the accident. The actions aimed to restore essential safety functions of NPP and limit the radiation consequences of the accident.

Symptom-based emergency operating procedures sufficiently compensate the drawbacks of the event-based emergency operating procedures providing maximum achievable safety of the plant within the design.

Efficiency of symptom based emergency operating procedures is determined by ensuring workability of the main safety systems using special Emergency Support Procedures.

These are the basic materials used for symptom based emergency operating procedures development:

1 The standards of the Republic of Lithuania;
2 IAEA Guidelines;
3 Reports from NIKIET;
4 USA standards, series NUREG, NUREG/CR, as well as INPO and DOE Guidelines.

The complete package of documents including symptom-based emergency operating procedures, emergency procedures of support and procedures of support was developed, verified and validated in 2000, and after the personnel training on the full-scale simulator, put in force in 2001.

Maximum efficiency while operation of an emergency situation (accident) can be achieved by integrated application of event-based and symptom-based Emergency Operating Procedures.

In order to prevent development of any deviations from normal operation into emergency situation INPP has developed and implemented special procedures for an operator's actions in case of alarm (reaction to alarm signal). These documents define the high priority actions of an operator after the deviation has been revealed. The documents are located on alarm panels that inform the operator about deviation from normal operation.

All instructions and procedures including emergency operating procedures and "reaction to alarm signal" procedures are periodically reviewed. After any systems or equipment has been modified the procedures are changed without delay.

### *19.2.5. Engineering and technical support infrastructure*

In 1991, when Lithuania gained its independence, the country lacked the national infrastructure (design and research institutes) to support safe operation of nuclear facilities. VATESI has made special efforts to establish the national Technical Support Organizations (TSO).

The first TSO was established in 1992. It was the Ignalina Safety Analysis Group (ISAG), formed by the Resolution of the Government of Lithuania at the Lithuanian Energy Institute. The experts from ISAG performed modelling and analysis of thermal and hydraulic processes in the Primary Circuit during transient and emergency situations, modelling of physical processes in the core, thermal and hydraulic calculations of the Accident Confinement System, assessment of INPP constructions reliability and other activities. Experts of Lithuanian TSO were involved in RSR teams. At present ISAG is a Lithuanian TSO with great experience in the area of nuclear safety.

In 1992 VATESI initiated co-operation with the Department of Mechanics at Kaunas University of Technology. On VATESI request the experts of the department together with Lithuanian Energy Institute have prepared a safety analysis report for the spent fuel storage casks and provided their conclusions.

VATESI sought advice from the specialists of the Department of Welding and Materials in Vilnius Gedimino Technical University.

In 1995 VATESI granted to the State Information Technology Institute (VITI) for design of information systems, software, automatic control system elements related to updating of the TITAN computer system at INPP.

The Construction Reliability Center was established according to VATESI requirements in 1994. The experts of the Center deal with assessment of remaining life of INPP equipment. The specialists of Ultrasonic Test Laboratory have designed and manufactured devices for measurement of thickness of the fuel channel walls.

To co-ordinate TSOs activities and to promote the growth of nuclear safety infrastructure in Lithuania,

special TSOs' Council for co-ordination was founded in 1997.

State Institute of Informational Technologies (VITI).At the same time technical and scientific support is provided by INPP designers (INPP General Designer, St' Petersburg, Russia) and by the designers of the reactor (reactor General Designer – NIKIET and Research Manager – Kurchatov Institute, Moscow).

At present the following TSOs institutions of Lithuania can provide assistance to analyse safety issues on request of VATESI or INPP:

1 Kaunas University of Technology (KTU):
2 Department of Thermal and Nuclear Energy,
3 Commission of experts for non-distractive tests,
4 Centre of strength and Fracture Mechanics,
5 Structural Reliability Centre;
6 Lithuanian Energy Institute (LEI):
7 Laboratory of Nuclear Installation Safety,
8 Laboratory of Heat Transfer in Nuclear Reactors,
9 Laboratory of Material Research and Testing;
10 Vilnius Gedimino Technical University (VGTU):
11 Nuclear Hidrophysics Laboratory,
12 Laboratory of Strength Mechanics,
13 Building constriction and Materials Laboratory;
14 Institute of Physics;
15 State Institute of Information Technologies (VITI);
16 ITECHA, JSC.

There are several special departments at INPP that provide engineering support to the plant departments:

1 Nuclear Safety Department that curates all issues related to nuclear safety, fuel and the reactor core;
2 Engineering Support Department provides assistance to the plant departments in the area of thermal and hydraulic processes, PSA (Probabilistic Safety Analysis) calculations, reliability and diagnostics and monitoring of rotating machinery vibration;
3 Design Department supports the plant departments in the area of equipment repair technologies development and design works;
4 Planned Preventive Maintenance Department assists the plant departments in planning and performance of PPM as well as provision of spare parts;
5 Production Department provides support to the plant department in the area of technical documentation management.

### *19.2.6. Incident Reporting and Feedback*

System for reporting of unusual events at NPPs is established in Lithuania in accordance with international practice and is based on IAEA recommendations (safety guide N.93). It means that exists all necessary administrative and technical measures to fulfil this task. In accordance with the regulatory requirements all categorized events shall be reported to the regulatory body (VATESI) in a timely manner . Orally regulatory body is informed as soon as possible, written information about the reportable event shall be transmitted to VATESI within 24 ours in special format, detail investigation reports should be transmitted to VATESI within 30 days.

Within Nuclear Power Plant is instituted measures to ensure that events significant for safety are detected and evaluated in depth, and that any necessary corrective measures are taken promptly and information on them is disseminated.

Plant management personnel use the safety information gained from the operating experience of other nuclear power plants as a source of lessons applicable at their own plant to improve plant safety. Main sources of this information are WANO and IAEA/NEA IRS database.

### *19.2.7. Radioactive Waste Management*

Under co-operation program between Lithuania and SKB Company (Swedish Nuclear Fuel and Waste Management) from Sweden an "Overall Plan for Radioactive Waste Management in Lithuania" was developed and presented to Lithuanian Authorities for review. The plan has become a practical guide for planning of activities related to radioactive waste management in short-term and long-term perspective. At present a draft of the National Strategy of Radioactive Waste Management has been prepared that includes detailed plans for short-term and long-term perspectives. In the near future the plan will be presented to the Government for approval. The first items of the plan consider establishment of organisational and financial systems.

Radioactive waste at INPP consists of solid and liquid waste, ion-exchange resins and a small amount of spent lubricant materials. It was decided that INPP spent nuclear fuel will not be reprocessed but considered as a radioactive waste.

According to standards that were applied in former USSR and which are applied in INPP now, solid radioactive waste at INPP is divided into three groups by the surface dose rate. New Lithuanian requirements for radioactive waste management were issued by VATESI at the end of July of2001. At present INPP is defining activities on implementation of the new regulations at the plant. VATESI has requested INPP to finalise preparation of the above mentioned activities by the end of 2001.
Thus, the solid waste at INPP is dumped into metal concrete compartments in storage buildings No. 155, 155/1, 157, 157/1 located on INPP site. There is no processing of solid waste before it is dumped.

Liquid radioactive waste at INPP is collected in special tanks, from where it is directed to evaporating facilities. The concentrate is processed and conditioned in the bitumen solidification facility, i.e. mixed with bitumen. The bitumen compound is pumped into a special storage (build. 158). The building is also located at INPP site.

Spent ion-exchange resins are not processed and stored in special tanks. The tanks are almost full. At present INPP and Framatom/Siemens Company have concluded a contract for design and delivery of cement solidification facility for spent ion-exchange resins. It is planned that the facility will be commissioned in 2004.

The National Strategy of Radioactive Waste Management is one of the projects of Lithuanian INPP Unit 1 Decommissioning Programme, which has been approved by the Government in the beginning of 2001.

Current storage facilities for low and intermediate level radioactive waste at INPP and in Maišiogala were originally designed as final repositories. However, there have been well-founded doubts regarding safety of these facilities in the long-term perspective. It was necessary to assess the situation in details and consider the possibility to provide safety at an appropriate level during long time. Within the frame of bilateral Lithuanian – Swedish co-operation three projects on assessment of long-term safety of current storage facilities for low and intermediate radioactive waste at INPP and Maišiogala have been implemented. The results of the investigations showed that the existing INPP storage facilities for solid radioactive waste (build. 155, 155/1, 157, 157/1) can't be used as final repositories. However, the bitumen compound storage can be considered as a final repository in future provided that certain engineering measures are taken. Moreover, within the frame of bilateral co-operation with Sweden some safety analysis reports for current INPP storage facilities of solid radioactive waste and bitumen compound were issued in March 2001. According to the reports the storage facilities could be used as intermediate ones for 10 years starting from the date of the reports issue. At present time these reports have been submitted to VATESI for approval.

In order to reconcile the existing radioactive waste management system at INPP with international standards and new "Regulations on Radioactive Waste Management in the Republic of Lithuania" it is planned to modify the system. The modification of the system will be carried out with financial and technical support from the Swedish side and the resources provided by countries-donors for decommissioning of Unit 1. It is assumed that the activities related to modification of radioactive waste management system will be completed in 2010.

Due to the fact that the issue of spent nuclear fuel reprocessing had been closed, it was decided to build an interim spent nuclear fuel storage facility at INPP. After announcement of international tender the bid presented by GNB Company (Germany) was approved as the most appropriate design for INPP. Russian Institute VNIPIET has designed an interim open-air storage facility for 50 years storage in metal CASTOR casks and metal - concrete CONSTOR casks. The spent fuel storage site and the casks have been licensed and commissioned in 2000. Since that time 20 CASTOR and 5 CONSTOR casks have been loaded with spent nuclear fuel and transported to the storage site. The storage site can hold 20 CASTOR casks and 52 CONSTOR casks. It is assumed that the capacity of the storage site is enough until 2007. By this time a new spent fuel storage facility will be constructed and put in operation within the frame of decommissioning program for Unit 1.

Lithuania shall also consider the issue of final repository for high level radioactive waste. The final repository for spent nuclear fuel will be required in 50 years only, nevertheless, we must start some preparatory works and researches to find applicable sites for spent fuel final repository in deep formations. We will certainly have to initiate some investment programs establishing favourable conditions and providing possibilities to build spent nuclear fuel final repository with acceptable level of safety.

# PLANNED ACTIVITIES TO IMPROVE SAFETY

**Summary of safety issues of concern identified earlier, and planned future activities to address those issues, including, where appropriate, measures of international co-operation**

In 2001, a new version of the Safety Improvement Program, SIP-2/2001, was issued, from which there were excluded already implemented measures, and also included additional measures – recommendations that appeared after carrying out safety analysis of the INPP systems.

By the end of 2005, the following principal measures are planned at INPP:

- Implementation of the second Diverse Shutdown System at Unit 2;
- Establishment of Spent Fuel Transportation Facility from Unit 1 to Unit 2;
- Design, equipment purchase and installation of Cementation Facility for ion exchange resins and slurry;
- Installation of small leak detection systems in rooms where reactor cooling system, feed water and live steam lines are located;
- Implementation of a new radioactive waste management system for the 1, 2, 3 waste group;
- Implementation of new maintenance techniques for works with large dose rates.

To complete the Program SIP-2/2001, which is planned to be fulfilled by the end of 2005, it will require about 250 MLt.

Safety Analysis Report for INPP Unit 2 must be prepared by the end of 2002 and transmitted to VATESI for its review in the frame of Unit 2 licensing process.

PSA Level 1 and 2 studies results after their review by IAEA IPSART mission in 2001 will be corrected in accordance with review comments and recommendations. INPP will follow its Living PSA program in monitoring current plant configuration and planned modifications.

# ANNEXES

**Annex to 6.1.**

**LIST OF EXISTING NUCLEAR INSTALLATIONS**

The INPP is the only nuclear installation in Lithuania. It contains two RBMK-1500 reactors (Russian acronym for "Channelized Large Power Reactor"). This is the most advanced version of the RBMK reactor design series (actually the only two of this type that were built). The INPP is provided with an improved ALS (Accident Localisation System). In most other respects, the plants are quite similar to their predecessors. Both reactors have two cooling loops, a direct cycle, fuel clusters are loaded into individual channels. The neutron spectrum is thermalized by a massive graphite moderator block. The plant can be refuelled on line and uses slightly enriched nuclear fuel.

The power plants were built as part of the Soviet Union's North-West Unified Power System. The first unit of INPP was put into commission at the end of 1983, the second unit in August, 1987. Their design lifetime is projected out to 2014-2017 accordingly. A total of four units were originally planned on this site. Construction of the third unit was terminated in 1988 because of political pressure, and construction of the forth one was never started.

The I NPP is located in the north-eastern part of Lithuania, near the borders of Latvia and Belarus.

The I NPP belongs the category of "boiling water" channel-type reactors. The reactor cooling water, as it passes through the core, is subjected to boiling and is partially evaporated. The steam-water mixture then continues to the drum-separators, the elevation of which is greater than that of the reactor. Here the water settles, while the steam proceeds to the turbines. The remaining steam beyond the turbines is condensed in the condenser, and the condensate is returned via the dearator by the feedwater pumps to the water of the same drum-separators. The coolant is returned by the main circulation pumps to the core, where part of it is again converted to steam.

This fundamental heat cycle is identical to the Boiling Water Reactor (BWR) cycle widely used throughout the world, and is analogous to the cycle of thermal generating stations. However, compared to BWRs used in Western power plants, the I NPP and other plants with the RBMK-type reactors have a number of unique features. The most important features are discussed in the subsequent sections.

Table 6.1. presents several of the most important plant parameters.

Table 6.1.

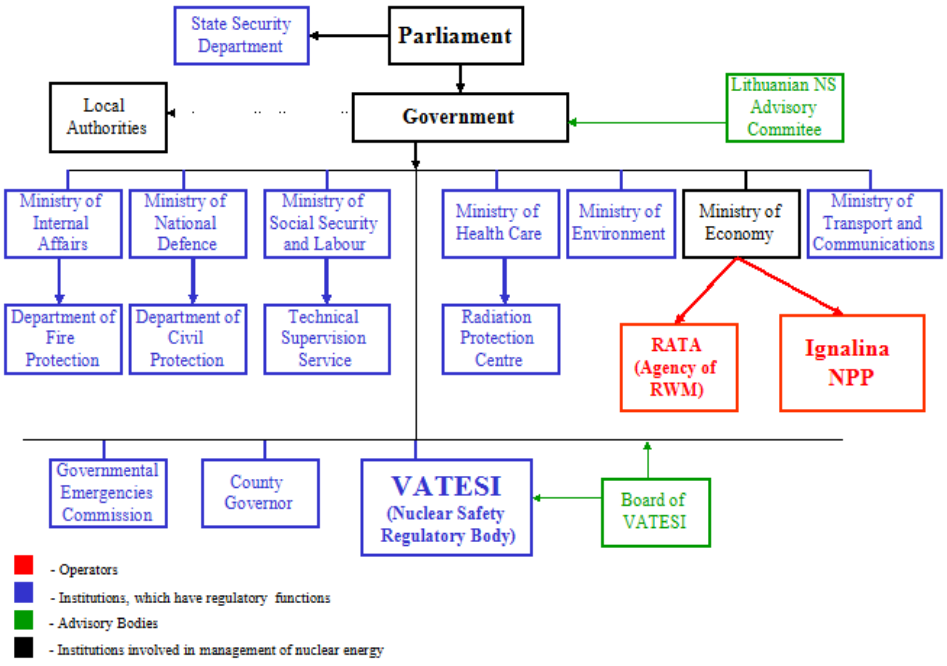
| | |
|---|---|
| Coolant | water (steam-water mixture) |
| Heat cycle configuration | single circuit |
| Power, MW | |
| Thermal (design) | 4800 |
| Thermal (actual) | 4200 |
| Electrical (design) | 1500 |
| Electrical (actual) | 1520 ± 20 |
| Core dimensions, m: | |
| height | 7 |
| diameter | 11.8 |
| Thickness of reactor's graphite reflector, m: | |
| end | 0.5 |

| | |
|---|---|
| side | 0.88 |
| Lattice pitch, m | 0.25 x 0.25 |
| Number of channels: | |
| fuel | 1661 |
| control and protect system | 235 |
| reflector-cooling | 156 |
| Fuel | uranium dioxide, uranium dioxide with erbium oxide |
| Initial fuel enrichment for $^{235}U$, % | 2.0 |
| Enrichment for $^{235}U$, % with 0.41% of erbium used since 1998 | 2.4 |
| Fuel enrichment for $^{235}U$, % with 0.5% of erbium, planned for loading in 2001 | 2.6 |
| Nuclear fuel burn up, MWday/kg | 21.6 |
| Nuclear fuel with erbium addition burn up, MWday/kg | 25.2 |
| Temperatures, $^{o}C$: | |
| maximum temperature at center of fuel pellet | 2100 |
| maximum graphite stack temperature | 750 |
| maximum fuel channel temperature | 350 |
| coolant temperature at fuel channel inlet | 260...266 |
| coolant temperature at fuel channel outlet | 284 |
| feedwater temperature | 177...190 |
| Excessive pressure, Mpa: | |
| steam pressure at separators | 6.38...6.87 |
| pressure in MCP pressure header | 8.6 |
| Coolant flow rate through reactor at normal power, kg/s | 8700...10550 |
| Steam produced in reactor at normal power, kg/s | 2361...2444 |
| Void fraction at reactor outlet, % | 23...29 |
| Maximum fuel channel parameters: | |
| fuel channel power, kW | 4250 |
| coolant flow rate through fuel channel, kg/s | 8.7 |
| void fraction at fuel channel outlet, % | 36.1 |
| Number of main circulation pumps | 8 |
| Capacity of main circulation pumps, kg/s | 1944...3056 |

The I NPP belongs to the RBMK-type of reactors designed and constructed by the former USSR's Ministry of Nuclear Power Industry. The development of the INPP project was realized by the All-Union Research and Development Institute for Energy Technology (Russian abbreviation - VNIPIET), St. Petersburg, Russia, which was the principal designer. Metal structures of the main building were designed by the Main Design Office "Leningrad Steel Design" (translation the Russian - " Leningradstalkonstrukcija "), St. Petersburg, Russia. The turbine hall and the open distributive system were developed by the Kiev branch of the Atomic Energy Design Institute (Russian abbreviation - "Atomenergoproekt"), Kiev, Ukraine. It had been proposed, that I NPP would be the pilot nuclear

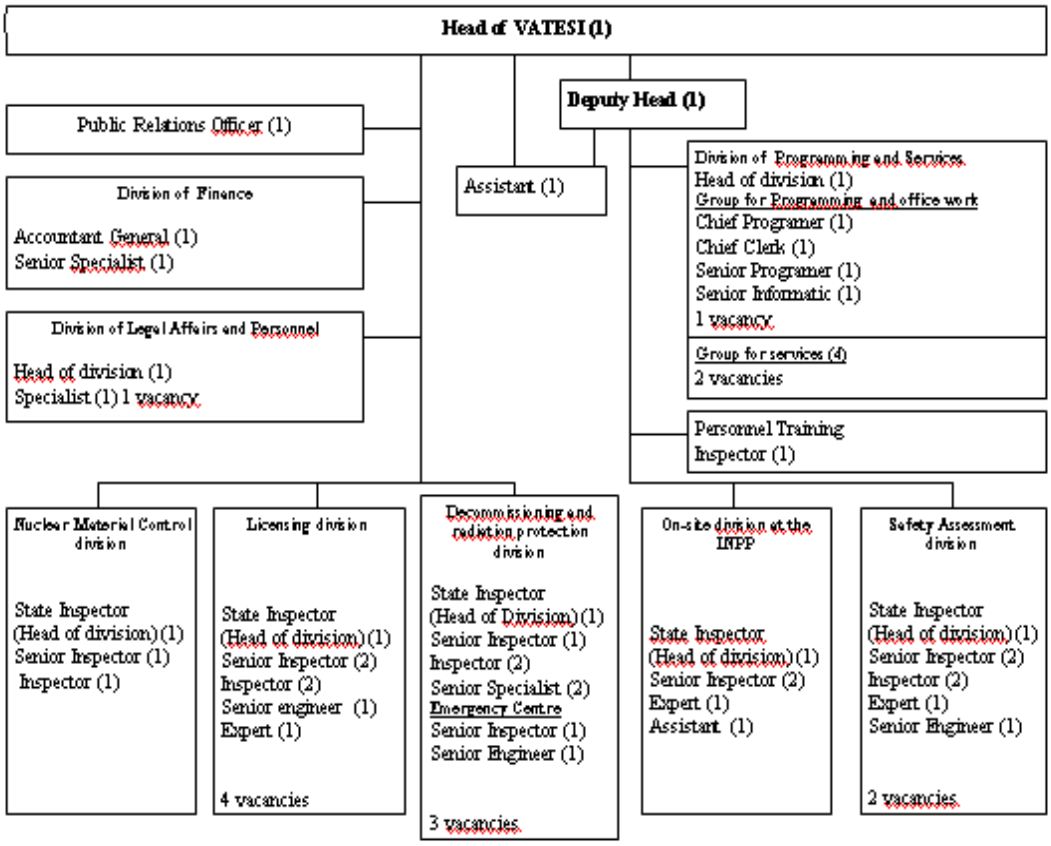
power plant with the RBMK-1500 type reactors. The scientific supervisor of the RBMK-1500 project was the Kurchatov Atomic Energy Institute (often referred to as the Russian Research Center "Kurchatov Institute"), Moscow, Russia. The principal designer of the nuclear steam supply system was the Research and Development Institute of Power Engineering (Russian abbreviation - NIKIET), Moscow, Russia.

**Annex to 7.1.** **Chart of interaction between regulatory bodies and INPP**

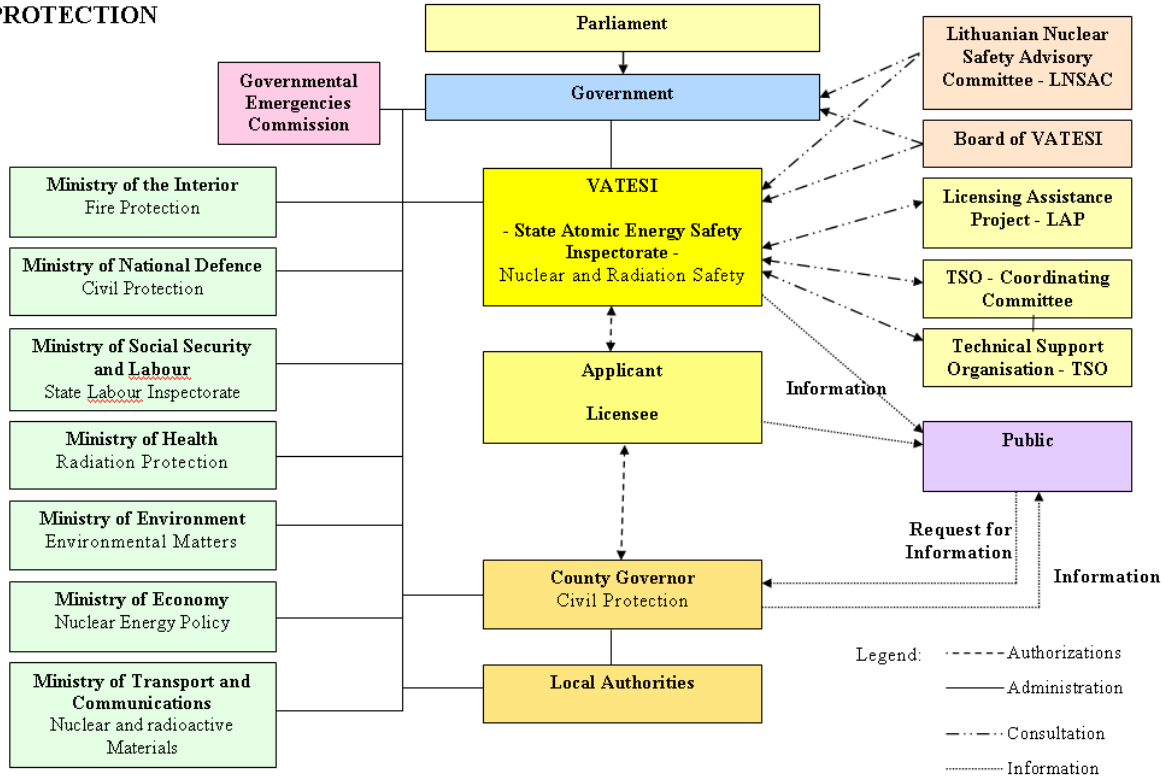


Annex to 8.3.

**THE STRUCTURE OF VATESI**



## GOVERNMENTAL STRUCTURE – AUTHORITIES FOR NUCLEAR SAFETY AND RADIATION PROTECTION



**Annex to 10.1.1**

**STATE SYSTEM ON REGULATION OF NUCLEAR SAFETY IN THE REPUBLIC OF LITHUANIA**
**(VATESI Policy Statement)**

1. Introduction

2. History and Background

3. Considerations for Development and Implementation of the Nuclear Safety Regulatory System in the Republic of Lithuania

4. Nuclear Safety State Regulatory System in the Republic of Lithuania

   A. Safety Principles and Standard of Protection

   B. Responsibility

   C. Licensing

   D. Inspection Program

   E. Enforcement Policy

   F. Nuclear Safety Confirmation

   G. Analysis of Operating Experience and Reporting

   H. Shutdown and Decommissioning

   I. Informing the Public

## 1. Introduction

The Law on Nuclear Energy establishes the legal basis for nuclear safety in the Republic of Lithuania. It assigns the responsibility for safety to the operating organization of a nuclear facility and outlines the tasks of the operator and the regulatory authority.

According to this law, the State Nuclear Power Safety Inspectorate (VATESI) shall implement state regulation of nuclear safety, radiation protection, and accounting for nuclear materials in the sphere of nuclear energy. Rights and obligations of VATESI are described in the VATESI statute, which is approved by the Government. According to its statutory responsibilities VATESI should define regulatory policy, safety evaluation criteria, develop national nuclear safety regulations, and establish emergency response criteria and arrangements. VATESI will conduct its own activities in accordance with internationally accepted nuclear safety regulatory practices with the cooperation of its Technical Support Organizations (TSOs), the IAEA and the regulatory authorities of other countries. This document is a Policy Statement issued by VATESI with the purpose to describe the regulatory philosophy and policies that VATESI will follow in: regulating nuclear facilities in Lithuania, principally the Ignalina Nuclear Power Plant (INPP); cooperating between VATESI, operating organisations and state institutions in the development and implementation of new safety regulatory acts; solving issues related to licensing and change of the license conditions; inspecting nuclear installations in order to supervise the implementation of legal acts, rules, licensing conditions and obligations; using measures of enforcement of norms and regulations; describing criteria of evaluation and use by VATESI of the operational experience.

## 2. History and Background

The first and so far the only nuclear installation in Lithuania, INPP was designed, constructed and commissioned in accordance with the system of safety supervision of the former USSR. Until 1991 INPP was operated under the regulatory supervision of that former system.

VATESI was established in 1991 with the specific responsibility to oversee and regulate the safety of the INPP and other nuclear facilities. As an initial step, VATESI adopted the Norms and Standards, the inspection program, and the practice of annual reauthorization of INPP. In 1994 work was initiated on the preparation of a new safety analysis report for the INPP. This analysis used, as a basis for safety assessment, the requirements which were valid at the time in the Republic of Lithuania and in some cases IAEA NUSS recommendations. A number of non-compliances with the valid rules and IAEA NUSS recommendations have been identified in the SAR. These non-compliances have to be dealt with in the process of the new INPP safety improvement program for 1997-1999.

At the same time, a new regulatory system, adapted to the Lithuanian state conditions, is presently under development.

## 3. Considerations for Development and Implementation of Nuclear Safety State Regulatory System in the Republic of Lithuania

The establishment of a new regulatory system in Lithuania must take into consideration its scientific and technological background as well as its cultural and historical background. The system must be appropriate for the Lithuanian nuclear energy program. Through the contacts that Lithuania has with other countries and international organizations, it will be possible for VATESI to obtain valuable assistance.

## 4. Nuclear Safety State Regulatory System in the Republic of Lithuania

### *A. Safety Principles and Standards of Protection*

In nuclear safety regulation VATESI will use reasonable assurance of adequate protection of public

health and safety. VATESI will rely on the following principles:

- Safety should be assured by relying on multiple safety barriers against serious accidents. There should be at least two barriers, and three where practical.
- The foremost level of protection must be focused on a high level of quality in the conduct of operations, the maintenance of plant equipment, manufacturing of equipment and the engineering support for operations.
- The level of safety at INPP should be steadily improved over time. The need and timing of safety improvements will generally be governed by the amount of added safety protection provided by the improvements.
- The operators of nuclear facilities shall be highly qualified, receive rigorous training, and participate in periodic requalification training.

Guidelines of IAEA recommendations shall be followed in Lithuania.

### *B. Responsibility*

It is the responsibility of the operating organizations of nuclear facilities to ensure adequate and safe operations. It is VATESI's responsibility to oversee the activities at nuclear facilities to assess and confirm that the plant is operated safely.

VATESI has the responsibility for regulating all aspects of nuclear safety at nuclear facilities. Where this responsibility for regulating nuclear safety interfaces with responsibility for other aspects of public safety or aspects which affect nuclear safety, such as fire protection, environmental protection, security and emergency planning, VATESI will develop formal Memoranda of Understanding with the other Lithuanian government agencies to ensure that VATESI nuclear safety responsibilities are clear and undiluted.

VATESI has the responsibility for regulating all aspects of nuclear materials safety and safeguards and regulating nuclear materials transport, storage, and disposal. VATESI is also responsible for establishing and operating the national system of nuclear materials accounting and control. This includes interfacing with international bodies such as the IAEA.

VATESI will develop a system of Lithuanian National Nuclear Regulations and Guidelines based on international practices that are best suited to Lithuania.

It is the intention of VATESI to implement its regulatory responsibilities by issuing regulations governing: the design, construction, operation, and regulatory oversight of nuclear power plants; provisions for nuclear materials safeguards and security; transport of nuclear materials; and the sitting, design, construction, operation, and regulatory oversight of nuclear materials disposal facilities. The process for promulgating such nuclear regulations will be according to the laws of Lithuania and will allow participation and commenting by members of the public and the operating organizations.

### *C. Licensing*

On the basis of safety cases presented by applicants and which contain a safety analysis, VATESI will make decisions on issuing nuclear facility construction operation or decommissioning licenses. Operating licenses will be issued for a fixed term. License conditions could contain a requirement to apply for annual authorization for continued operation. VATESI will perform a systematic examination of the safety analysis carried out by the applicant and of the other documentation submitted in the safety case in support of the license application. The purpose of the safety assessment by VATESI is to confirm safety requirements are met and to confirm no underlying design or operational weaknesses are present. In each licensing decision the basis for the decision will be

presented in a Safety Evaluation Report.

It is the intention of VATESI that operators of nuclear facilities shall, as a condition of license, develop Technical Specifications that define the safety envelope for facility operation. Technical specifications should be approved by VATESI and used as a basis for development of operational and maintenance procedures by the operator. Moreover, for issuance of a license VATESI shall receive from the operator a Quality Assurance (QA) program, a Emergency Preparedness Program, and other documents defined by Lithuanian Law.

### *D. Inspection Program*

VATESI will exercise independent regulatory oversight of nuclear facilities and activities important to nuclear safety through an inspection program conducted by VATESI Inspectors. In order to accomplish this oversight function, VATESI inspectors shall have provisions for unrestricted access to nuclear facilities, documents and records important to safety. VATESI may also organize special inspections by outside parties at its discretion or may require the operating organizations of the nuclear facilities to conduct special inspections which are monitored by VATESI.

### *E. Enforcement Policy*

When VATESI finds that a nuclear facility does not meet a regulation or license condition, it is the policy of VATESI to require the operating organization to bring the facility into compliance with the regulation or license condition. In some cases, this may require the operating organization to submit a written Justification for Continued Operation until the facility can be brought into compliance. VATESI will evaluate the acceptability of a Justification with attention to the risks posed by interim non-compliance to regulations and/or license conditions and the benefits of compensatory actions. VATESI has the authority to take a number of enforcement actions, including administrative, up to ordering shut down of the facility. VATESI may also grant exemptions to regulations for good cause shown.

### *F. Nuclear Safety Confirmation*

It is the responsibility of the operating organization to conduct safety analyses, tests, and research needed to assure facility meets the regulations and license conditions and is safe to operate. If the operating organization should identify a safety issue not previously considered in the safety analysis, or that a safety margin credited in the safety analysis has been degraded, it is their responsibility to take corrective actions and to bring this to VATESI's attention.

VATESI may sponsor its own research and analyses to confirm that adequate safety margins exist at the facility.

### *G. Analysis and Reporting of Operating Experience*

VATESI will require the operators of nuclear facilities to systematically collect and evaluate data from both their own experience and the experience of other similar nuclear facilities. Operators of nuclear facilities will analyze this operational data to determine if any aspects of nuclear facilities operations should be changed, and will submit periodic and event based reports to VATESI documenting experience and lessons learned from that experience.

VATESI will review the operating experience data and lessons learned to determine the need to improve regulations or inspection activities.

### *H. Shutdown and Decommissioning*

VATESI will issue regulations governing the decommissioning and final disposition of nuclear facilities.

The facility operator must seek from VATESI a separate license that authorizes decommissioning activities after final shutdown and cessation of operation. The operator should apply for this license 5 years prior to the envisaged final shutdown.

It is the responsibility of the facility operator to maintain the nuclear facility in a safe condition during all decommissioning activities according to the license conditions.

### *I. Informing the Public*

It shall be VATESI policy to inform the public about radiation and nuclear safety in Lithuanian nuclear facilities and about the activities of VATESI by means of mass media.

**Annex to 10.1.2.**

**INPP SAFETY AND QUALITY ASSURANCE POLICY**

QA-1-003 Version 2

| | | |
|---|---|---|
| Developed<br>A.Dvoretsky | Date<br>2000.02.25 | Page 1 |
| Agreed<br>G.Negrivoda | Date<br>2000.02.25 | Supersedes<br>QA-1-003 Version 1 |
| Approved<br>V.Ševaldin | Date<br>2000.02.25 | Valid until<br>2003.03.25 |

**Clearly realizing that INPP management headed by Director General undertakes overall and official responsibility for plant safety, we declare:**

**The goal of INPP is to become the safest RBMK nuclear power plant and a competitive performer in the industry.**

**To meet the objectives, it is necessary to assure that:**

**Activities at all levels are performed safely, with high level of quality, and plant safety is considered an overriding priority.** Good quality is achieved when all requirements and objectives of the owners are met, and the people of Lithuania believe in the INPP safety.

**INPP personnel clearly understands the requirements and objectives of the INPP owners, VATESI and the public.**

**All employees take an active part in safety and quality improvements**. To ensure such participation every employee must know the INPP objectives, his own functions and be continuously informed about the results of activities performed at INPP.

**INPP personnel is properly qualified to perform their functions in accordance with plant objectives**. A level of every employee's competence shall be improved to strengthen both INPP and the individual.

**All INPP managers exhibit personal activity and leadership.** The main task of every manager is to formulate tasks and requirements facing his department, put them into an assessable form, communicate to all employees, and to provide every employee with a working environment consistent with the tasks to be accomplished.

**All INPP activities are continuously evaluated to improve their quality and efficiency**. The INPP and its personnel must make the use of their experience and that of others to improve the organisation, operations and their competence.

**The INPP and each of its employees are responsible to society**. All laws must be abided by and the safety requirements must be met with a sufficient safety margin.

**Efficient and integrated management and quality assurance program is implementing at INPP.**

If the INPP Director General can answer «YES» to all these items, the plant will operate to the required quality level. If every employee can answer «YES» to all these items, he will perform his job to the required quality level.

To accomplish these tasks, the Director General appoints the Safety and QA Department to head the establishment of the INPP quality assurance system, evaluate its effectiveness and provide the

necessary quality training for personnel.

**Annex 10.1.3.**

**APPROVED**
**INPP Director General**
**.....V.Ševaldin**
**"....." ..... 1999**

INPP DOCUMENT CONTROL POLICY

Proper documents and their appropriate use ensure the accomplishment of the objectives, declared by the INPP safety and quality assurance policy.

To perform the objectives mentioned above, we need:

To establish and to maintain at the high level the Document Control System, which is the component of the INPP Quality Assurance Program;
To perfect the Document Control System continuously, using the best international practice;
To ensure the high quality of existing documents, following the Guides for documents preparation, acceptability conformance and documents surrounding;
To ensure an easy search and ability to use the necessary documents in a right place and in preset time;
To implement high culture of documents processing, that provides the documents usage by personnel in the sphere of its appropriation;

Recording system shall ensure that all measures for safe and proper operation are taken and recorded in accordance with due requirements; bounden quantity of records is provided, necessary conditions for their storage and archive, ability to find and read required records.

The INPP Management recognises the importance of systematic and planned approach to documents processing and declares its adherence to perform the objectives, covered in the present document.

Each employee of INPP must be aware of the aims and objectives of the INPP regarding safety and quality assurance. Each employee of INPP, dealing with the documents, must be aware of the present document in order to achieve stated objectives at his sphere of activity and, if necessary, to introduce some improvements to the Documents Control System.

| Head of Safety and Quality Assurance Department | Head of Secretariat | Head of Production and Engineering Department |
|---|---|---|
| A.Dvoretsky | Z.Tresnickaya | S.Urbonavichus |