REPUBLIC OF LITHUANIA

State Nuclear Power
Safety Inspectorate (VATESI)

NUCLEAR ENERGY IN LITHUANIA: NUCLEAR SAFETY

Annual Report 2006

Vilnius 2007

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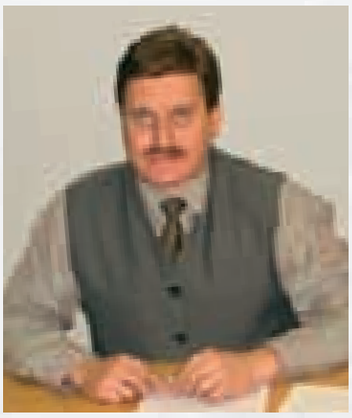


In 2006, dynamic changes took place in the field of nuclear energy not only in Lithuania but also worldwide. The international community has been discussing the renaissance of nuclear energy in an increasingly active manner. Some countries are reviewing their energy policy and proclaim their willingness to retain and continue developing nuclear energy. In 2006, 435 nuclear reactors were operational in the world with a combined capacity of 367 GW(e). Two new reactors started generating electricity, whereas eight were decommissioned. The power of nuclear reactors thus totaled 806 MW(e). Construction goes on of six new reactors with an overall power of 3590 MW(e). The growing demand for uranium in global markets is indicative of the growth prospects of nuclear energy: over the last four years the price of uranium per kilogram skyrocketed from USD 25 to 112. Numerous countries, such as China, India, Japan, Pakistan, the Russian Federation and South Korea, announced their intentions to construct new nuclear power plants, whereas the USA is planning to construct some 25 new reactors. Some countries are already extending the service life of their operational nuclear power facilities or are intensely updating them with a view to increasing capacity, as this is the most economical means to increase electricity generation.

The year 2006 was a time of important decisions for Lithuania's nuclear energy. The documents signed by the prime ministers and energy companies of the Baltic States regarding construction of a new nuclear power plant have obligated to prepare for the construction in a timely and adequate manner. VATESI, in its turn, must take the necessary steps to properly prepare for assessing the safety justification documents of a new power unit, and, later on, for assessing the design, construction and licensing, on time. VATESI must engage and train skilled inspectors and specialists in nuclear safety assessment, as well as ensure proper functioning of state regulation and supervision.

In 2006, VATESI was successfully carrying out its mission of protecting the population and environment against harmful effects of nuclear and radiation events and accidents. Not a single event of higher than level 1 on the International Nuclear Event Scale (INES) was recorded at the Ignalina NPP, not a single employee received exposure exceeding the set limits, and not a single case of impermissible effects on the population or environment was identified. VATESI was performing state nuclear safety supervision of the operational Unit 2 at the INPP, was controlling the progress in implementation of safety improvement measures in it, was assessing the decommissioning projects of the shut down Unit 1, and gave permission to commission the facility for burning the partially spent fuel from Unit 1 in Unit 2, and to finally shut down Unit 1. While designing storage facilities and repositories for radioactive waste including spent nuclear fuel, and selecting sites for these, considerable attention was paid to the issues of safety assurance. Unfortunately, not all the work at the Ignalina NPP was done on time and properly. During VATESI inspections a necessity of maintaining good safety culture, effective management of personnel, emergency preparedness, quality management and addressing other issues was emphasized. In accordance with the requirements of the Treaty on Non-Proliferation of Nuclear Weapons and Safeguards Agreement with the IAEA, VATESI performed state regulation and supervision of nuclear power facilities and accounting and control of nuclear materials. Issues of physical protection and export control were also being paid considerable attention. The rising threat of nuclear terrorism demands more efforts in ensuring supervision of peaceful use of nuclear materials and physical protection of nuclear facilities.

VATESI took an active part in international activities of nuclear safety and radiation protection. In 2006, an IAEA OSART (Operational Safety Review Team) mission took place at the Ignalina NPP. During the mission experts gave a favorable assessment of the current operational safety at the INPP in terms of international operational safety standards. The Inspectorate's specialists took a more active part in activities of Western European Nuclear Regulators' Association (WENRA) and its working teams, as well as in those of the divisions of the EC. VATESI experts were on the staff of two IAEA safety standard committees, and participated in regional and national projects of technical cooperation. VATESI was striving to efficiently use the funds allocated by the European Commission as support for nuclear safety and supervision of its assurance at the Ignalina NPP in the course of its decommissioning.

Head of VATESI **Gytis MAKSIMOVAS**

1. VATESI OBJECTIVES AND STRUCTURE

Establishment of the system of nuclear safety, whose objective consists in ensuring that the level of safety requirements set by the Republic of Lithuania meets international standards began after the country regained independence. The State Nuclear Power Safety Inspectorate set up on October 18, 1991, by the resolution of the Government fulfills these functions of regulation by the state. The Head of VATESI is appointed and discharged by the Prime Minister of Lithuania. VATESI is independent of other institutions and is answerable for its activities to the Government of the Republic of Lithuania.

The Ignalina NPP that is operating two reactors of the RBMK type, each with a design capacity of 1500 MW, came under the jurisdiction of Lithuania in 1991, when the state regained its independence. Lithuania thus became the world's 31st country to use nuclear energy for generating electricity. It pledged itself, while operating the Ignalina NPP, not to cause nuclear threat to mankind or the environment, and to use nuclear materials and technologies for peaceful purposes only.

To address nuclear safety issues functions were clearly divided between the operating and supervising institutions. In Lithuania it is the Ignalina Nuclear Power Plant State Company that has been granted the status of the operating organization. VATESI sets national nuclear safety standards, controls compliance with these at nuclear power facilities, other enterprises and organizations engaged in nuclear activities, takes appropriate enforcement measures, and, in case of flagrant violations of requirements, is entitled to suspend or discontinue altogether operation of the nuclear power facility.

An extremely important function of VATESI is to issue, after analyzing the documents submitted in accordance with the set procedure and examining the state of installations or a facility, licenses for nuclear activities, to establish the conditions of their validity and to control how the conditions are complied with.

VATESI issues, specifies and approves documentation pertaining to nuclear energy in accordance with the set procedure and supervises compliance with the standard requirements that ensure nuclear power safety.

In accordance with the Law on Nuclear Energy of the Republic of Lithuania, the Convention on Nuclear Safety, and recommendations of the International Atomic Energy Agency, the system of regulation of nuclear safety in the country is being continuously upgraded.

VATESI consists of five principal divisions:

Nuclear Material Control Division organizes state accounting and control of nuclear substances, sets the rules of accounting, supervises the physical protection of nuclear materials and nuclear facilities, participates in controlling export, import, and transit of commodities used in nuclear activities, cooperates with the IAEA and other international organizations and counterparts in other countries in the area of accounting and control of nuclear materials, maintains contacts with the Comprehensive Nuclear Test Ban Organization, and coordinates the activities of Lithuanian governmental institutions related with this Organization.

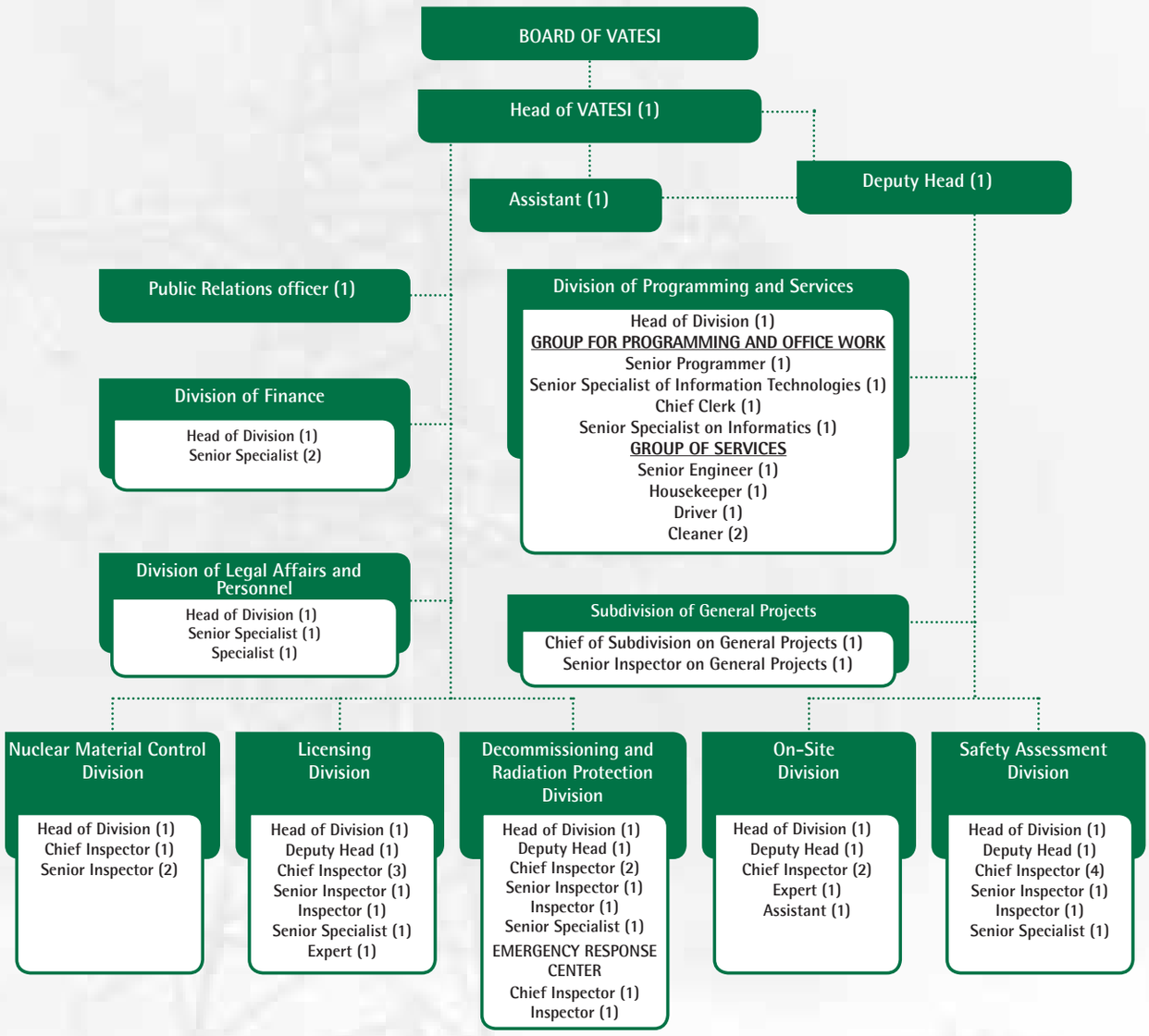
Decommissioning and Radiation Protection Division performs state regulation of the radioactive waste manament, decommissioning and emergency preparedness of nuclear power facilities, and controls radiation protection at nuclear power facilities.

Licensing Division sets the conditions for licensing Ignalina NPP and its safety systems, develops rules and regulations that govern INPP safety, assesses the reliability of the components, plant and systems of the nuclear power plant, establishes the operation conditions for the INPP, and elaborates other conditions for licensing other nuclear activities.

On-Site Division at INPP carries out direct supervision at INPP, inspects safety systems, controls personnel training, technological processes and repairs.

Safety Assessment Division assesses design decisions, produces reviews of safety analysis reports, checks the adequacy of the computer software used for safety assessment, and analyzes the physical issues of the reactors.

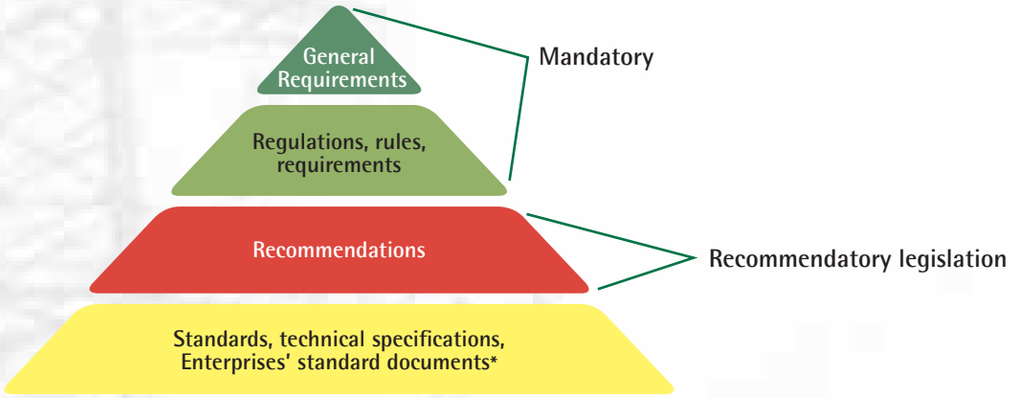
VATESI also has divisions that carry out information, legal and financial activities, and provide economic services. In all, VATESI had 53 employees in 2006, including three doctors of sciences. 48 specialists have higher education diplomas, 4 are studying at universities. Most of VATESI specialists are young. There are 13 in the 20-30 years category, 15 are between 31 and 40 years old, 15 and 6 fall into the 41-50 and 51-60 categories, respectively, another four are between 61 and 70 years old (as of April 17, 2007).



2. ADMINISTRATIVE REGULATION BY VATESI

In compliance with the *Law on Nuclear Energy of the Republic of Lithuania*, the provisions approved by resolution No. 1014 by the Lithuanian Government, dated July 1, 2002, and other legal documents VATESI performs public administration in the area of nuclear energy. One of the key areas of administration is regulation, i.e. setting nuclear safety requirements through rules, regulations and other legislation. In accordance with Article 4, part 2, of the *Law on Nuclear Energy*, safety standards and regulations are mandatory to all legal and natural persons.

Hierarchical diagram of VATESI legislation



** The documents become mandatory after an organization chooses them and advises VATESI about it.*

In 2006, Head of VATESI approved General requirements for analysis of seismic impact on nuclear power facilities (P-2006-01). On December 18, 2006, the Head of VATESI set up a team for perfecting legislation governing nuclear safety. The main objective of the team consists in assessing the currently valid legal and standard technical documents in the field of nuclear safety, and drawing up a plan of perfecting these. The currently valid legislation governing nuclear safety needs to be assessed in terms of suitability for designing, constructing and, later on, operating a new nuclear power facility.

3. STRATEGIC PLANNING AND FINANCIAL ACTIVITY

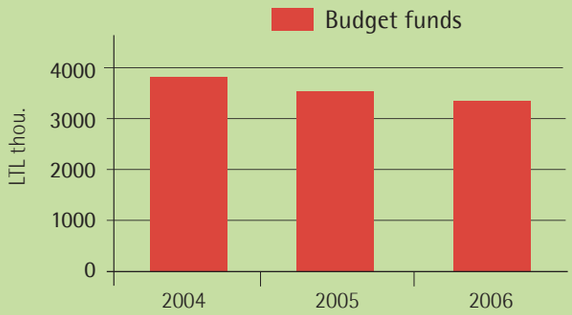
VATESI activities are long-term and continuous. Priorities set by the Government of the Republic of Lithuania are always taken into consideration when planning them.

A single strategic objective, i.e. assuring a high level of safety of nuclear power facilities, was set in the 2006–2008 strategic plan of VATESI activities for implementing its mission. To assess whether or not the strategic objective has been attained, a single effect criterion has been set: nuclear safety improvement defined as the absence of level two and upwards unusual events on the INES scale. To date, the Ignalina NPP has been operated in a safe and reliable manner (Figs. 3 and 4, page 17).

A single program, *04 Public and Internal Administration of Nuclear Safety*, was being implemented in 2006 with a view to achieving the strategic objective. The program was developed considering the functions of VATESI in the field of state regulation and supervision of nuclear safety. Three objectives were set for implementing the program: controlling compliance with nuclear safety standards and licensing conditions at nuclear power facilities; upgrading the systems of nuclear safety assurance and licensing at nuclear power facilities with international practice taken into consideration; conducting and enhancing internal administration. Whilst implementing the objectives the probability of events and accidents at nuclear power facilities will be reduced, the quality of failure and accident prevention measures will improve, the probability of errors or delays in making decisions will be reduced, and the quality of VATESI internal administration will improve.

The program is being implemented with funds from the state budget. In accordance with the *Law on approving the financial indicators of the state budget and municipality budgets* No. X-433 (*Valstybės žinios*, 2005, No. 150-5462), VATESI was allocated LTL 4,430,000 from the state budget in 2006. LTL 3,310,400 was spent for implementing the program. The funds from the state budget were used in an economical manner when implementing the program in 2006, and the articles of economic classification confirmed in cost estimates were adhered to. Therefore in many cases actual expenses were less than planned.

Allocation of budget funds, years 2004-2006



4. VATESI QUALITY MANAGEMENT

The decision to establish VATESI quality management system (QMS) was made on October 5, 2000, by order No. 21 of Head of VATESI. The implementation of VATESI quality management system is aimed at:

- Enhancing the efficiency of the Inspectorate's management;
- Optimizing the planning and use of the Inspectorate's resources;
- Assuring adequate licensing, safety assessment and supervision of nuclear power facilities;
- Assuring efficiency and control of the ongoing EU support projects;
- Assuring adequate training of VATESI staff;
- Assuring efficient management and use of information.

In 2006, due to changes in requirements and with a view to defining more accurately the set procedure, VATESI QMS Level 2 document *The Procedure for Managing EU Support Projects*, 3rd edition, was finalized and approved.

At present VATESI QMS comprises the following principal documents of Levels 1 and 2:

1. VATESI Mission.
2. VATESI Quality Manual (KU-I-01).
3. Safety assessment procedure (KU-II-0I).
4. Provisions for strategic planning of VATESI activities (KU-II-02).
5. Provisions for preparation of nuclear safety regulatory documents (KU-II-03).
6. Provisions for the training of VATESI staff (KU-II-04).
7. Provisions for governing public information (KU-II-05).
8. Procedure of VATESI inspection activities (KU-II-06).
9. Licensing procedure (KU-II-07).
10. Rules of financial control (KU-II-08).
11. EU support projects management procedure (KU-II-09).
12. VATESI internal procedure for coordinating EU matters (KU-II-10).
13. VATESI procedure for management of ingoing and outgoing documents. (KU-II-11).
14. Manual for assessing equipment qualification results of important to safety systems and elements of the Ignalina NPP (KU-II-12).
15. Accounting policy (KU-II-13).

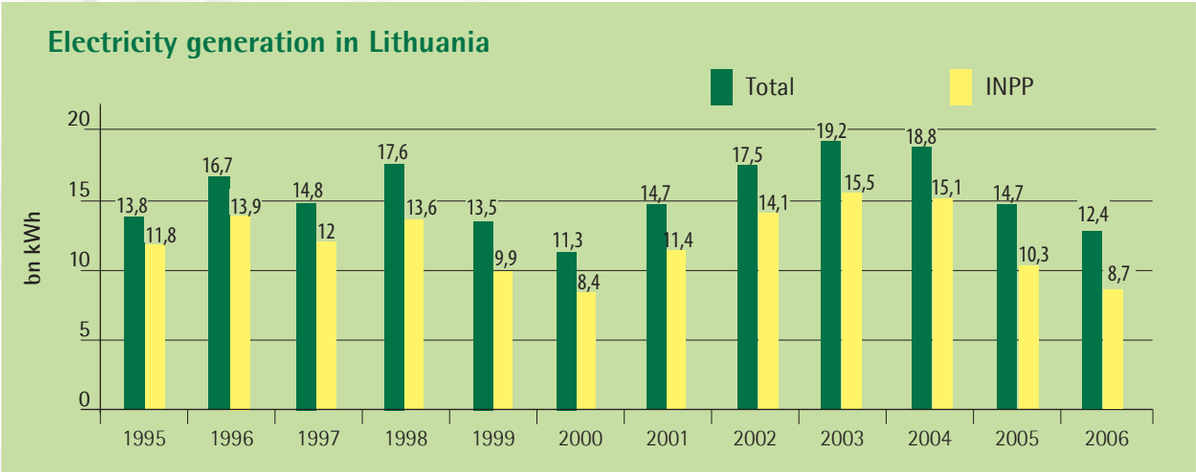
The list of VATESI QMS Level 3 documents is given in Appendix IV of Quality Manual. These documents set forth detailed requirements for carrying out specific tasks or activities.

In 2007 VATESI QMS is to be further enhanced by developing new and updating the already approved quality management documents.

5. TECHNICAL AND ECONOMIC INDICATORS OF IGNALINA NPP

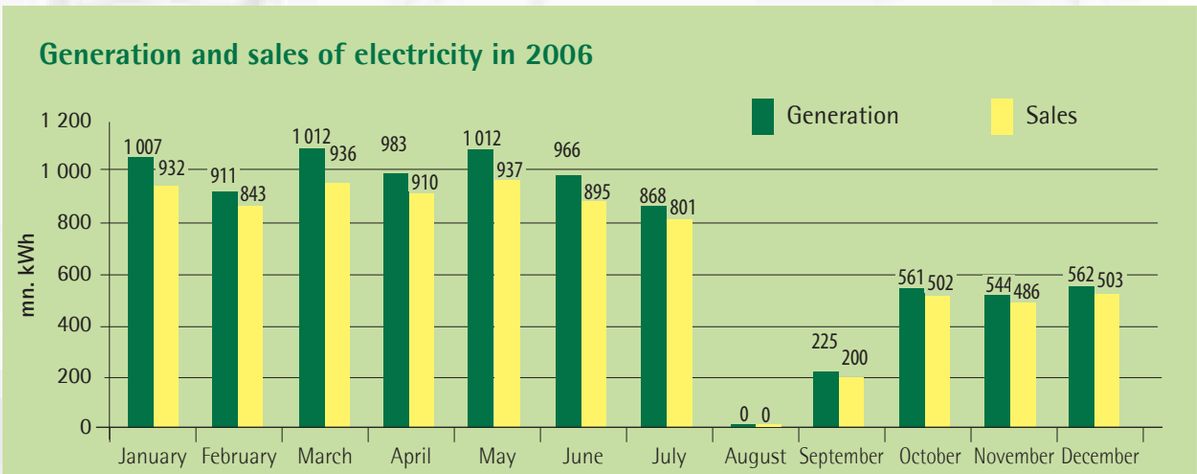
As of January 1, 2007, Ignalina NPP produced since the beginning of its operation 276.5 bn. kWh of electricity, 136.9 bn. kWh and 139.6 bn. kWh by Units 1 and 2, respectively.

The Ignalina NPP supplied in 2006 69.6% of electricity produced throughout Lithuania.



Since the commissioning, 251.6 bn. kWh has been sold to consumers.

In 2006, the Ignalina NPP produced 8,561.2 mn. kWh of electricity, or 1,686.2 mn. kWh less than in 2005.



7,944.6 mn. kWh was sold to AB Lietuvos energija in 2006, of which 5,966.4 mn. kWh was consumed in the domestic market, and 1,978.2 mn. kWh was exported to other countries. The exports decreased almost twice (3,908.7 mn. kWh was exported abroad in 2005).

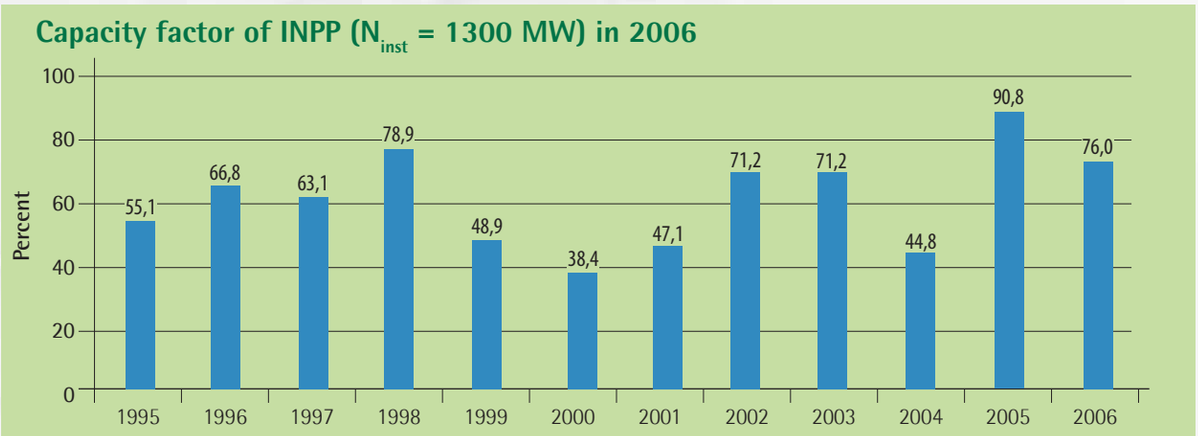
A high level of loading accounted for the stability of technical and economic indicators at INPP in 2006. There were virtually no dispatchers' limitations in 2006. However, 1,254.8 mn. kWh was not generated due to a break-down of TG-3.

8.17% of the electricity generated was consumed for producing electric power and heat (7.68% in 2005).

The capacity factor of the INPP was 76.0% in 2006.

The amount of electricity not generated because of plant deficiencies (emergency outings and capacity reduction) in 2006 was only 14.2 mn. kWh.

In accordance with IAEA rules, capability factors, the use of gross capacity and the amount of electricity that was not generated have been calculated for the Unit's gross capacity of 1300 MW.



Electricity that was not generated

($N_{unit\ inst.}$ = 1300 MW)

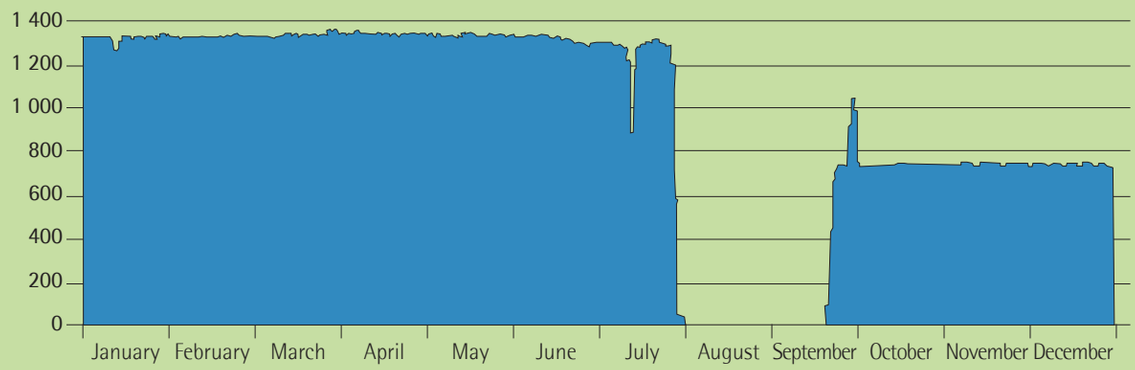
INDICATOR	mn. kWh
Annual maintenance	1,714.7
Plant deficiencies (emergency outing due to repairs of TG-3)	1,254.8
Other plant deficiencies	14.2
Use of thermal energy in heat generation facility	103.2
Total not generated	1,408.6

Indicators of Unit 2 Operation in 2006

	Item	Unit	Reactor	TG-3	TG-4
1.	Gross capacity, MW	1500 (el.)	4 800 (thermal)	750 (el.)	750 (el.)
2.	Licensed gross capacity, MW	1300 (el.)	4 200 (thermal)	750 (el.)	750 (el.)
3.	Gross electricity generation, GWh	8,651.2	-	3,453.6	5,197.6
4.	Net electricity generation, GWh	7,944.6	-	-	-
5.	INPP needs, %	8.17	-	-	-
6.	Relative heat consumption per kWh	2850 kcal	-	-	-
7.	Average load, MW	1149 (el.)	3514 (thermal)	685	691
8.	On-line hours	7527	7584	5045	7527
9.	Time availability factor, %	85.9	86.5	57.6	85.9

10.	Number of outages, of which • For annual maintenance • Unplanned • Reserve	2 2 0 0	2 2 0 0	3 1 2 0	2 2 0 0
11.	Number of startups	2	2	2	2
12.	Number of unplanned automatic scrams	-	1	-	-
13.	Capability factor, %	73.8	86.6	57.6	85.9
14.	Load factor N_{inst} = 1500 MW	78.7	75.8	81.1	76.3

Unit 2 load in 2006



Reasons for emergency outing or capacity reduction

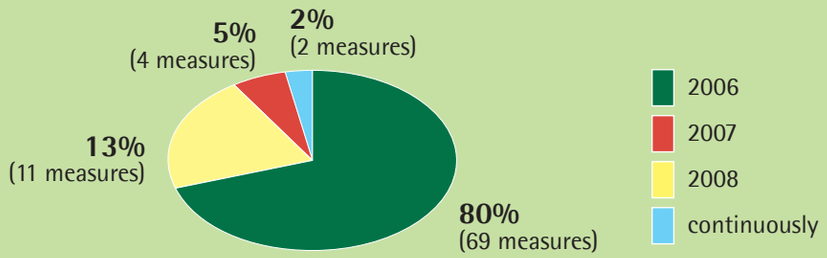
No.	Date	Initial event
1	Jan. 13, 2006	Automatic Unit capacity reduction when AP-4 was activated after earthing protection tripped MCP (2YD13D01)
2	July 12, 2006	Capacity of Unit 2 decreased when generator protection tripped TG-3 when РЗР-1М relay was being replaced
3	July 29 – September 18, 2006	Annual maintenance of Unit 2
4	September 17, 2006	Unit 2 reactor stopped when following startup after annual maintenance AA signal formed in two zones of internal zone of sensors and set two of protection was activated
5	September 27, 2006	TG-3 tripped in the 24 kV net when earthing protection was activated

6. IMPLEMENTING SAFETY IMPROVEMENT PROGRAM (SIP-3) AT IGNALINA NPP

Safety improving at the Ignalina NPP is the key objective and a continuous process. Implementation started in 1997 of INPP Safety Improvement Program 2 (SIP-2) that is updated and reviewed on an annual basis. The aim of the program was to constantly improve safety of Units 1 and 2 through upgrading of systems and procedures important to safety with the operational experience of the Ignalina NPP and organizations of foreign countries taken into consideration. In 2005, a new, SIP-3, program was prepared.

In 2006, the Ignalina NPP continued SIP-3 program that is updated every year to take into account recommendations of *The Safety Case for Single Operating Power Unit 2 of INPP* and *The Safety Analysis Report of INPP Unit 2*, technical decisions by the INPP, statements, plans of measures, modifications, implementation of recommendations of fire hazard analysis and other measures.

Fig 1. **Measures of SIP-3/2006 (86 in all) by the time of implementation**



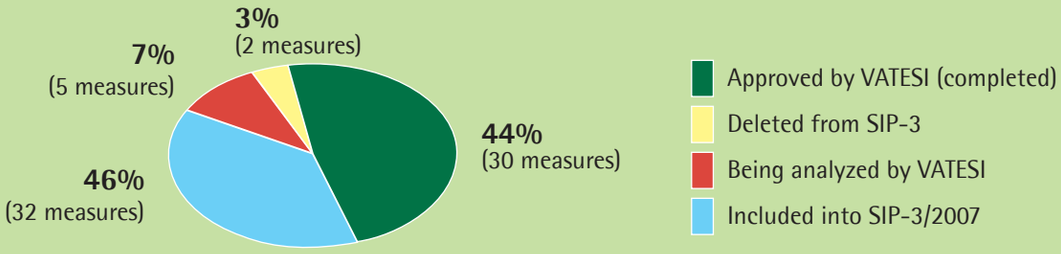
In December 2005, the Ignalina NPP submitted for VATESI approval SIP-3/2006 program. The program was approved on March 8, 2006. The program comprised 86 measures, 69 of which were to be implemented in 2006, 11 in 2007, 2 in 2008, and 4 were to be implemented continuously (Fig. 1). Also, measures that had not been implemented in 2005 were included in SIP-3/2006.

Fresh fuel assemblies in the spent fuel pond hall.

In order to implement safety upgrading measures on time and in an adequate manner, VATESI has been controlling implementation of the Safety Improvement Program by the Ignalina NPP. Each year Head of VATESI approves an order regarding implementation control of the work related to the SIP. It is stated in the order that VATESI specialists bear responsibility for comprehensive analysis and assessment of the documents submitted by the Ignalina NPP concerning specific measures of SIP-3. Having completed the work envisaged in the program, the INPP advises VATESI about it and submits documents that confirm accomplishment of measures. In addition to that, meetings were held between managers and specialists of the INPP and VATESI at which the issues of SIP implementation were discussed.

Out of the 69 measures planned to be implemented in 2006, the Ignalina NPP accomplished and obtained VATESI approval for 30. Thirty-seven measures were not accomplished on time. At the request of the INPP, 32 of these were included in SIP-3/2007 program. Due to technical and economic reasons a decision was taken to delete 2 measures from the program. The Ignalina NPP suggests deleting the remaining 5 measures from the program, but VATESI specialists object to it. These issues will be addressed when the Safety Improvement Program for 2007 is coordinated (Fig. 2).

Fig. 2. **Implementation of SIP-3 in 2006 (69 measures were planned)**

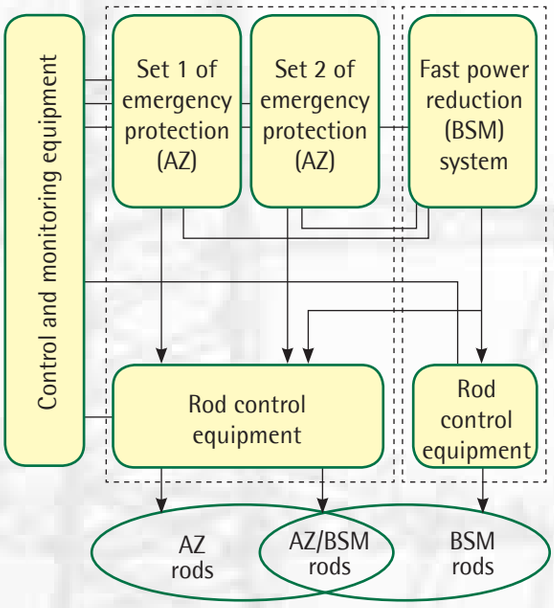


In 2006, the following major INPP safety improvement measures were implemented and approved:

- Installation of a facility for burning partially spent fuel from Unit 1 in Unit 2;
- Designing a cementation facility for sludge and ion exchange resins, purchasing and installing the equipment;
- Replacing continuous power supply set 1500 in Unit 2;
- Updating the system of automatic monitoring of radiation safety in Unit 2 (Gorbach system);
- Elimination of leaks in the Accident Confinement System;
- Implementation in in AZ-1 set one a protection signal flow reduction in group distribution header;
- Preparation and implementation of the Technical Specification of INPP Unit 1.

7. INSTALLATION OF A DIVERSE SHUTDOWN SYSTEM (DSS) AT INPP UNIT 2

Shutdown systems of INPP Unit 2



For two successive years two sufficiently redundant protection systems independent of each other and based on different principles ensured the safety of its single operational Unit 2 (in October 2004, a permit was issued for trial commercial operation of emergency protection sets 1 and 2, and the fast power reduction system). In 2006, the set measures were continued regarding adaption of the SDS for industrial operation.

In the previous stages of the DSS introduction, i.e. when analyzing the preliminary safety justification, it was established that in case of certain initial events protection systems would be actuated from different technological parameters and with a corresponding delay. Therefore it was recommended to conduct comprehensive analysis and to submit proposals for rectifying the situation. The INPP submitted to VATESI technical specifications as regards installing into set one of emergency protection a protection signal in the event of flow reduction in distribution headers. After the documents were analyzed, the specifications were approved. VATESI analyzed and approved the documents of the modification's technical design and testing program submitted by the INPP. The modification was completed during the annual outage of 2006. A VATESI inspection conducted in September did not reveal any non-compliances related to introduction of the system.

Another important area of the work done in 2006 is related to control of design, manufacture and introduction of 49 actuators (servo drives)[1] of new design for reactor control rods of emergency protection and fast power reduction system (AZ/BSM). After the new servo drives are installed, the risk of common cause failures will be reduced even more. In all, there are 211 control rods in the reactor. When the servo drives of new design have been installed, electric circuits of emergency rods operation will be separated from their control circuits during normal operation. Mechanical elements of servo drives intended for normal operation only will be separated from the elements operating in both, normal and reactor shutdown mode. Furthermore, performance of rods will be ensured during potential failures of the engine, reduction gear, or the failure or inadvertent activation of other elements. Also, after the work has been completed, the recommendation regarding introduction of a DSS in reactors of RBMK type given in the safety analysis for INPP Unit 1 of 1997 will be accomplished.

A currently used servo drive of reactor control rods.

Four servo drives of new design were manufactured in 2005 and tested in the plant. Their operation was also tested in the operational unit.

In 2006, VATESI analyzed the preliminary and final safety justification reports. Working meetings were held to discuss technical issues. Specialists from the INPP and technical support organizations assisting VATESI whose work is funded in accordance with the EU support agreement took part at the meetings.

As has already been mentioned, after the new servo drives are introduced installation of the second diverse shutdown system will be completed. Requirements of the latest standards were taken into consideration when designing and installing the system. Higher reliability of diversified and reserved systems was thus ensured. In accordance with the said requirements the documents justifying the safety of the new servo drives must contain detailed information that would make it possible to check the installations for compliance with the requirements:

[1] A CPS drive is a device intended for changing the position of a CPS rod (see the photo above).

- The new servo drives must be certified in accordance with the requirements of relevant technical standards, and must have very high individual parameters of reliability;
- If necessary, the reactor will be reliably shut down, with 24 BSM (Fast Power Reduction) and 49 AZ/FAS (Fast Acting Scram) drives and rods used.
- The control rods and servo drives of the two systems, (i) FAS and AZ/BSM and (ii) BSM are sufficiently diversified to eliminate any failures due to which both systems would not shut down the reactor when this is necessary.

An AZ/BSM servo drive of new design.

A review of the preliminary safety justification showed that compliance with the above requirements has not been sufficiently justified in the report. The information contained in the safety justification and the system description does not make it possible to make the decision regarding the compliance of the design. Therefore it was recommended to supplement the safety justification report accordingly. The major comments made when generalizing the review results were as follows:

- The analysis of the types of failures and their consequences is insufficient as not all the failures were analyzed and the list of failures is not comprehensive;
- The reliability analysis was not based on the material of analysis of failure types and consequences as well as sufficiently based data. The results of the reliability analysis do not indicate that 49 new servo drives are reliable;
- A number of modifications were introduced in the design of the servo drives.

In view of the above comments and the request submitted by the INPP to be issued a permit for installing the main shipment of AZ/BSM drives, VATESI recommended installing only a part of the drives during the annual outage of 2006. It was also emphasized that the efficiency of the AZ system (24 FAS and 49 AZ/BSM control rods) in shutting the reactor down, given that several of the servo drives of new design may fail to activate, needs to be discussed in the safety justification. The number of the drives that fail to activate must be based on rational assumptions regarding the reliability of the servo drives of new design and should not exceed the success criterion identified by physical and neutron calculations.

Taking into consideration these conclusions by VATESI, the INPP submitted a supplementary safety justification concerning installation of 25 AZ/BSM drives. Having analyzed the submitted material, VATESI approved the report and, later on, 25 servo drives of new design were installed. The remaining 24 pieces are to be installed during the annual outage of 2007.

8. SUPERVISION OF OPERATION SAFETY AT IGNALINA NPP

Supervision by the State Nuclear Safety Inspectorate (VATESI) is being carried out through:

- Controlling of compliance by the personnel of organizations, enterprises and institutions, in the course of carrying out their official duties, with requirements of technical standards;
- Controlling whether or not systems, elements and plant of nuclear power facilities meet the requirements of technical standards through ensuring supervision at all stages of design, operation, and closure.

The principal task of the Inspectorate is to ensure that state regulation and supervision of nuclear and radiation safety at the Ignalina NPP is carried out. Therefore the main activities of all divisions of VATESI are aimed at achieving this task.

Working place of a hot chamber operator.

The On-Site Division of VATESI at the Ignalina NPP, while closely cooperating with other divisions of VATESI, is carrying

out supervision of INPP operation and activities associated with it. The On-Site Division of VATESI is its structural unit that is continuously working at the Ignalina nuclear power facility.

VATESI is carrying out supervision in accordance with the laws of the Republic of Lithuania, resolutions of the Government of the Republic of Lithuania, and nuclear safety standards (NUSS).

Supervision by VATESI is focused on control/preventive efforts, i.e. prevention of violation of NUSS requirements at all stages of licensed activities of the facility under control.

The areas of control/preventive work of VATESI:

- Systematic checks on compliance with NUSS requirements at all the stages of operation of nuclear power facilities.
- Issuing licenses for designing, constructing, manufacturing, adjusting, and repairing safety-related systems of nuclear power facilities, and supervision of compliance with license conditions.
- State supervision of registration and operation of pressurized components and airtight compartments of the Accident Confinement System.
- Approval of permits for operating pressurized components and piping at the Ignalina NPP.
- Control of the personnel training and examination of their knowledge.
- Participation at examining the knowledge of senior and technical staff of facilities under control.
- Control of investigations of the causes of accidents and incidents as well as failures of safety-related systems at the plant; control of implementation of corrective measures.

Inspections at INPP were conducted in accordance with a plan approved in advance. The results were recorded in reports, with requirements laid down to INPP management to eliminate the revealed deficiencies. Based on that, appropriate administrative and technical measures, including long-term, were developed and implemented. Also, in accordance with the schedule technical inspections were carried out of pressurized vessels and piping, official reports were drawn up and entries made in passports.

The inspectors of the VATESI On-Site Division took part in the work of the panel that examined the knowledge of operational staff of the Ignalina NPP. In 2006, the inspectors of the On-Site Division examined the knowledge of 223 high- and medium-level specialists of the INPP.

Fresh fuel assemblies prior to unloading from basket.

In 2006, INPP Unit 2 was started up once. Prior to it comprehensive examination of the unit was carried out, with appropriate authorizations being issued for each stage of starting up. The control was conducted through direct participation in examination of the plant.

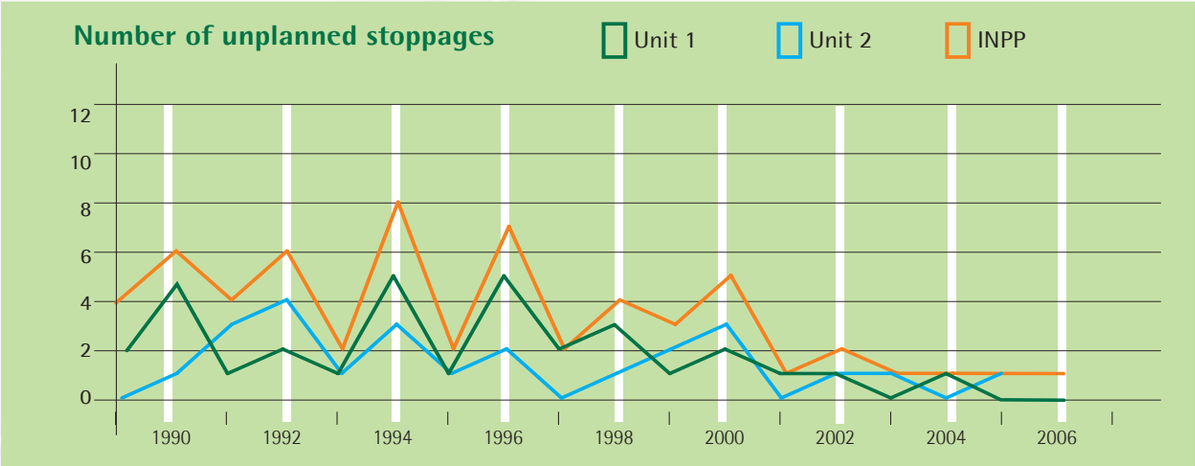
In accordance with technical specification requirements, inspectors of the On-Site Division during operation and repairs of INPP Units controlled execution of operations posing nuclear hazard, including identification of subcriticality of the nuclear reactors after shutting it down, and testing efficiency of fast-acting scram rods. In addition to that, control of measurements of physical-dynamical parameters of INPP Unit 2 reactor was carried out prior to shutting it for annual outage and after loading in accordance with an approved program into the core nuclear fuel of a new type containing erbium poison (7 checks).

VATESI, when supervising operation safety of INPP, in 2006 reviewed and analyzed 21 technical decisions regarding modifications of safety-related systems.

VATESI specialists considering the compliance of the modified systems with design requirements and the results of checks on preparation for operation as well as the development of technical documentation and the personnel training, took decisions regarding the possibility of operating the systems.

In spite of shortcomings that still occur the results of INPP in terms of safety in the year 2006 are viewed positively. No cases were recorded of violations of conditions and limits of safe operation or unacceptable exposure of the personnel. The collective exposure dose somewhat increased in comparison with 2005, however, it did not exceed the planned collective dose of 5410 men mSv.

The number of unplanned shutdowns of nuclear power units is one of the most informative indicators of safe operation. In 2006, Unit 2 was not stopped a single time for an unplanned outage, and once in 2005. The fact allows to conclude that safety improvement measures that are being implemented at INPP over the recent years, including upgrading of safety culture and quality assurance system, have been efficient and adequate.



9. INSPECTION

Inspections are checks of the organization's being inspected compliance with the valid nuclear safety requirements. They are conducted in all stages of a nuclear power facility's life, i.e. when selecting a site, designing, constructing, reconstructing, operating and decommissioning it.

In 2006, VATESI specialists conducted 98 inspections, of which 44 were planned and 54 unplanned.

Planned inspections

Every December VATESI specialists, having assessed the gained experience of inspection activities, having analyzed the experience of organizations operating nuclear power facilities, the results of safety improvement program's analysis and other documents, plan inspections for the coming year. Forty-four out of the 47 inspections planned in accordance with the plan of inspections approved by VATESI Head for 2006, were conducted (Fig. 1). The following inspections were not carried out: Water level measurement in drum separators, target inspection of Unit 1 servicing compliance with nuclear safety requirements, and a check on application of emergency instructions, updating of the full-scope training simulator and the training process of operational personnel. The decision was taken not to conduct the first two after the results of INPP operation were assessed, whereas the third one was not carried out due to a delay in updating the full-scope training simulator at the Ignalina NPP. It is to take place in 2007.

Conducting inspection in spent fuel pond hall.

Fig. 1. **Performance of scheduled inspections by VATESI in 2006**

In the course of inspections VATESI specialists checked the following safety-related systems:

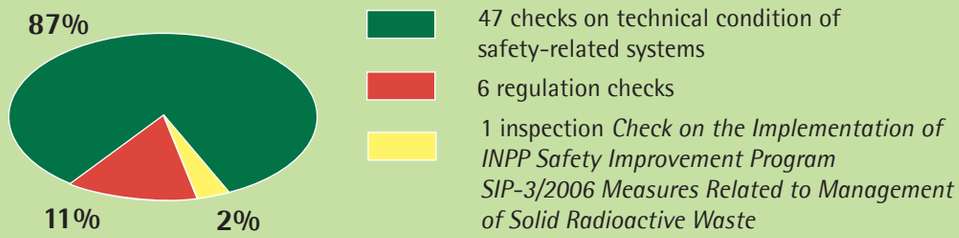
- Stand-by power supply
- Reactor emergency cooling
- Service water supply
- Intermediate circuit and others.

A check was also made on the Ignalina NPP preparation for testing the facility for burning fuel from Unit 1 in the reactor of Unit 2 and for operating the storage of solidified liquid waste and cementation facility. An inspection was performed to find out how activities are conducted at the INPP related to procurement of goods, work and services, how spent nuclear fuel and radioactive waste are managed. A check was conducted on introduction of modifications at the storage facility of the INPP and the Maišiagala Storage Facility, on assurance of physical protection, accounting and control of nuclear materials at nuclear power facilities, on the use of operational experience and emergency preparedness.

Unplanned inspections

In 2006, VATESI specialists performed 54 unplanned inspections. Forty-seven checks of the technical condition of the INPP safety systems were conducted, 6 control room operation inspections and the inspection *Check on the Implementation of INPP Safety Improvement Program SIP-3/2006 Measures Related to Management of Solid Radioactive Waste*; *Check on the Implementation of the EC Recommendations in Accordance with Article 35 of EURATOM Agreement* (Fig. 2).

Fig. 2. **Performance of unscheduled inspections by VATESI**

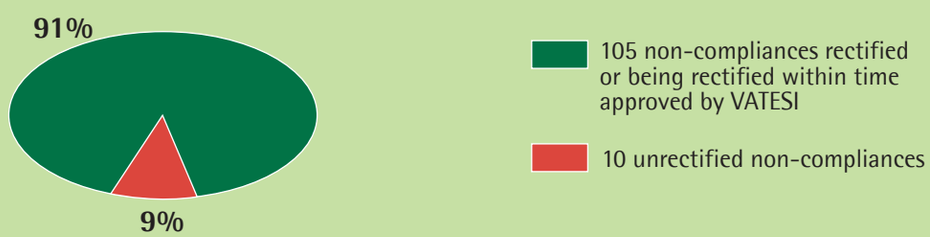


Control of non-compliances revealed in the course of inspections

Non-compliances discovered in the course of an inspection are put down in an inspection statement. The statement is submitted to the inspected organization so that it prepares and submits to VATESI the measures of rectification of the non-compliances.

In late 2006, VATESI specialists conducted analysis of rectification of non-compliances. 115 non-compliances were to be rectified in accordance with the plan of measures drawn up by VATESI; 105 of these were rectified or are being put right within time approved by VATESI (Fig. 3).

Fig. 3. **Rectification in 2006 of non-compliances revealed by VATESI**



IAEA training course in issues of inspection performance

VATESI proposed to the IAEA in 2005 arranging in Lithuania a training course in inspection issues. The IAEA approved the proposal.

The course was held in Vilnius on October 23-27, 2006. It was funded by the IAEA and VATESI. Nuclear energy experts from the Czech Republic, Germany and the United Kingdom delivered lectures and conducted practical training during the event. Representatives of Armenia, Croatia, the Czech Republic, Hungary, Romania, Russia, Slovakia, Slovenia and Ukraine, as well as 9 VATESI specialists and one specialist from the Radiation Protection Center improved their skills in inspection activities.

During the training course experts shared experience in planning and carrying out inspections, discussed the types of inspections and their efficiency. Representatives of foreign countries and Lithuania took an active part in asking questions and sharing practical knowledge from their personal inspection experience.

Training of young inspectors is one of VATESI's top priorities for the future, given the plans of construction of a new nuclear power plant. Therefore training courses of this kind help young specialists to join the ranks of nuclear community and to learn international practice and experience.

Participants of IAEA training course in issues of inspection performance held on October 23-27, 2006.

10. ASSESSMENT OF THE USE OF OPERATIONAL EXPERIENCE

Efficient use of operational experience is an important part of all organizations operating nuclear power facilities in terms of operational safety improvement. To ensure an adequate level of a nuclear power facility's safety and to continue improving it, the organization's own experience, as well as the experience of other institutions and industries, especially in the field of nuclear energy, needs to be analyzed in a systematic manner. Such analysis of operational experience is also necessary in order to prevent accidents, incidents, non-compliances, and their recurrence.

Operational experience consists of information about events, defects, precursors of accidents and events, the so-called almost events, their trends, drawbacks or good practice, reports on analysis of safety indicators, self-study reports (reports of quality assurance audits, reports of independent experts and missions, documented good practice, etc.), as well as other information which, when properly used, would improve the safety of a nuclear power facility. It comprises human activity, organizational and technological aspects.

To analyze the reports on unusual events at the Ignalina NPP and other nuclear power facilities of Lithuania and with a view to applying international experience in NPP operation and industrial experience, VATESI has a permanent Commission of Unusual Events Analysis. In 2006, 11 sittings of the Commission were held in which 18 reports on unusual events at the Ignalina NPP were analyzed, as well as the information received from the Incident Reporting System of IAEA/NEA and other sources. Eight letters with comments regarding the INPP reports and with recommendations to perform additional analysis taking into consideration operational experience at other NPPs were prepared on the basis of the performed analysis.

In 2006, Unit 2 at the INPP was stopped for unplanned reasons once, on September 17, when the Unit was started up following its annual outage.

In 2006, 19 unusual events were recorded, 5, 11 and 3 in Unit 1, Unit 2 and common facilities of the INPP, respectively (Figs. 1 and 2).

In accordance with the International Nuclear Event Scale (INES), 12 of the total of the 19 events of 2006 were out of the scale, and another 6 were rated as level 0. One event that occurred at the Ignalina NPP in March, when a fuel channel dropped in the central hall of Unit 1 during a transportation operation, was evaluated as level 1 by an independent panel convened at VATESI's insistence (Figs. 3 and 4).

Most of the events (11) in 2006 were caused by the personnel errors, and another 8 by malfunctioning of equipment.

Not a single event was due to deficient procedures (Figs. 5 and 6). The main causes of events due to the personnel errors: failure to comply with the requirements of instructions and procedures; formal attitude towards work and inadequate coordination of operations performed jointly by several divisions. At VATESI's insistence, the INPP introduced in 2006 an additional procedure to analyze events caused by the personnel's wrong actions.

The system of safety indicators at a nuclear power facility is an integral part of operational experience assessment. Introduction and upgrading of the system of safety indicators was continued at the Ignalina NPP in 2006. Introduction of an automated system of computing the indicators began in 2006. Beginning with 2007, only automated computation will be used.

Safety indicators should not be used for assessing safety at the INPP separately from other means of safety assessment, as they are identified conventionally and thus describe the indicators' condition quantitatively only and are used for analyzing trends. Analysis of trends in changes of safety indicators and results of other means of safety assessment show the safety level of INPP Unit 2 to be acceptable (Figs. 7-9).

A special inspection was carried out in late 2006 to check the calculation of safety indicators introduced at the Ignalina NPP and the use of data to calculate these. The inspection commission stated considerable progress made in introducing and upgrading the system of safety indicators.

Fig 1. **Unusual events in 1996–2006**

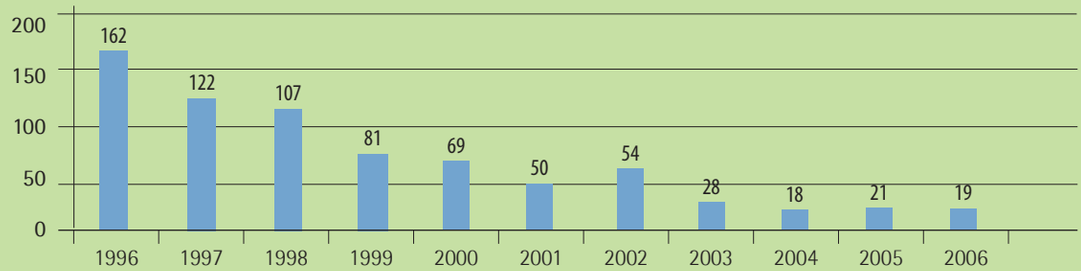


Fig. 2. **Distribution of unusual events by NPP facilities**

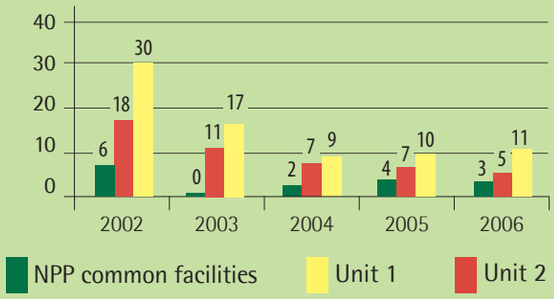


Fig. 3. **Distribution of events in 2006 on the INES scale**

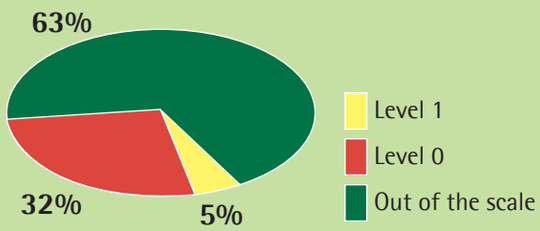


Fig. 4. **Distribution of events in 1996–2006 on the INES scale**

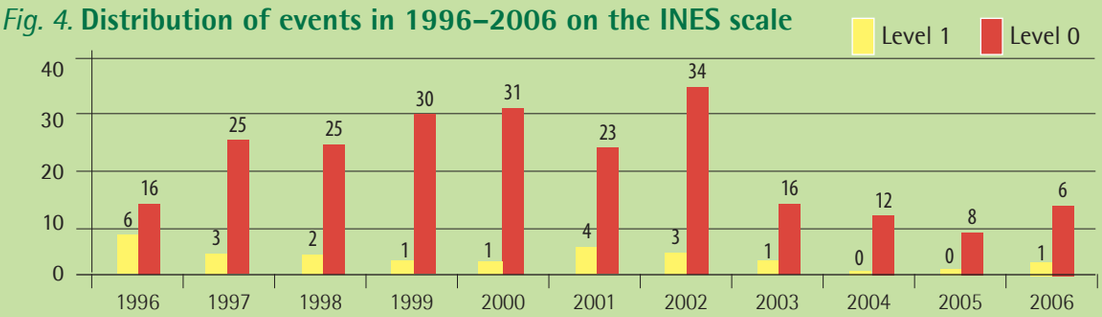


Fig. 5. **Distribution of events by cause in 2006**

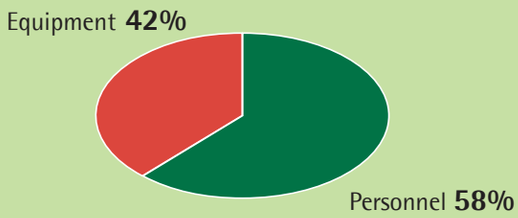


Fig. 6. **Distribution of events by cause in 2000– 2006**

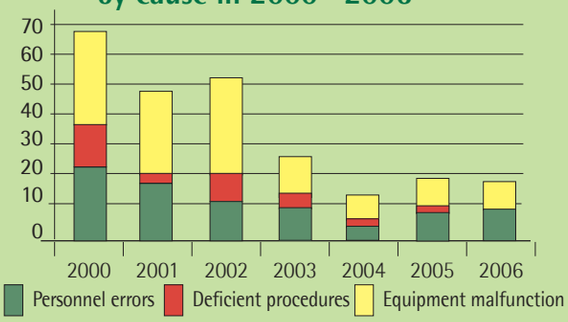


Fig. 7. **Trends of changes in principal safety indicators in 2006**

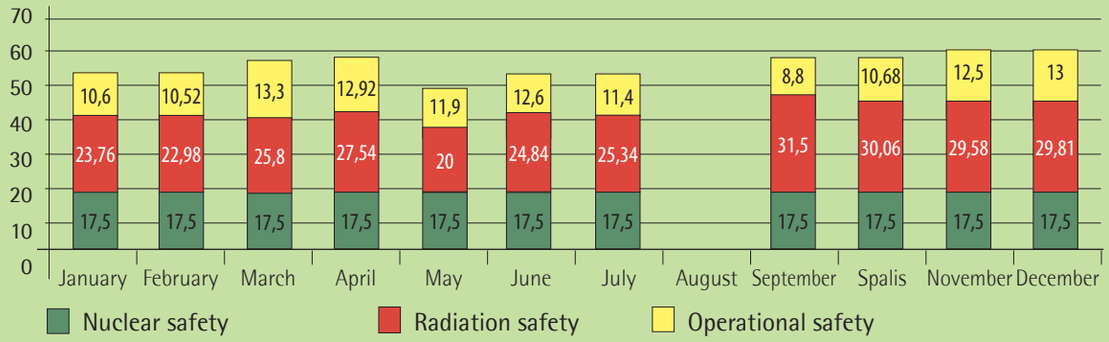


Fig. 8. **Trends of changes in special radiation safety indicators in 2006**

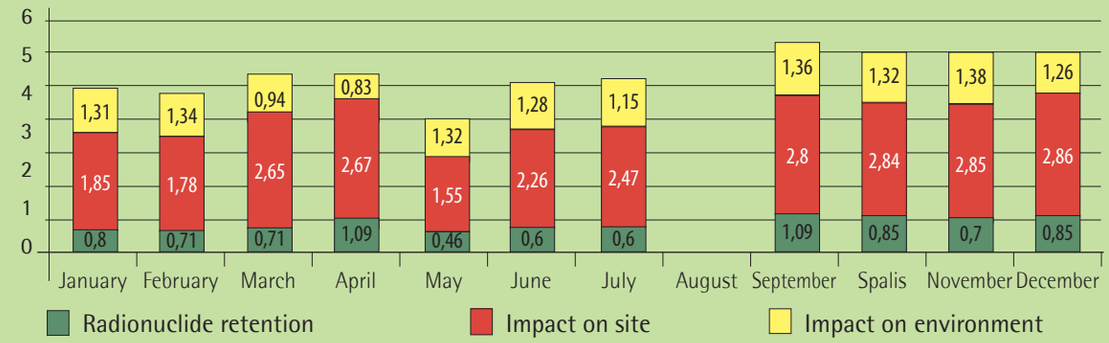
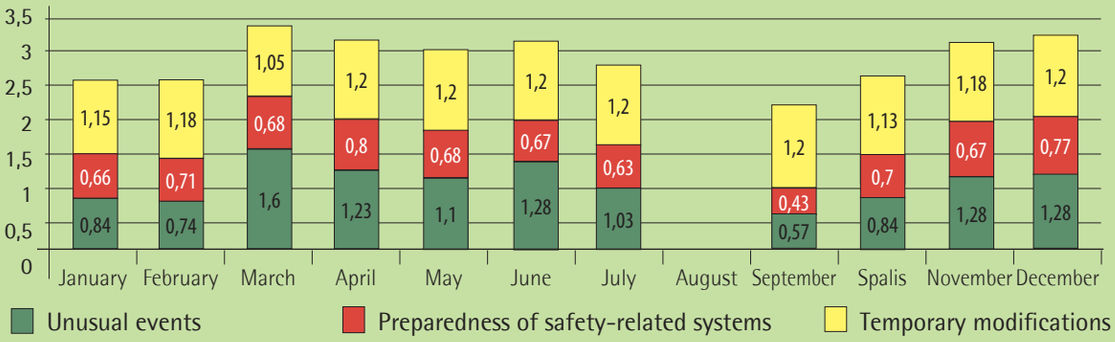


Fig. 9. **Trends of changes in special operational safety indicators in 2006**



11. SAFETY CULTURE AT IGNALINA NPP

Safety culture is that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance.

IAEA publication *Safety Culture* **(INSAG-4), p. 1.**

In accordance with Article 27 of the *Law on Nuclear Energy of the Republic of Lithuania*, VATESI is obligated to ensure that enterprises issued with its license, including the Ignalina NPP, ensure adequate safety culture. Therefore the following requirements were laid down in *The Requirements for the Organization Operating the Nuclear Power Plant* approved by VATESI on March 15, 1995:

- Safety assurance must have top priority over all other issues addressed by the organization that operates the NPP (para. 1.4).
- A key obligation of the organization that operates the NPP is to form the safety culture of managers of all levels and the NPP personnel through fostering a sense of personal responsibility for the NPP safety (para. 2.3).
- To ensure the NPP safety, the organization that operates the NPP must create an atmosphere among its staff in which safety is understood as a vital matter of personal responsibility of all the personnel (para 2.10).
- The organization that operates the NPP bears full responsibility for (...) timely introduction of safety improvement measures (para. 14.1).

To assess safety culture at the Ignalina NPP, VATESI analyzes quarterly safety culture reports by the INPP, the safety culture indicators presented in them and the principal safety culture trends calculated from these. The trends of safety culture indicators at the INPP in 2006 are shown in Table.

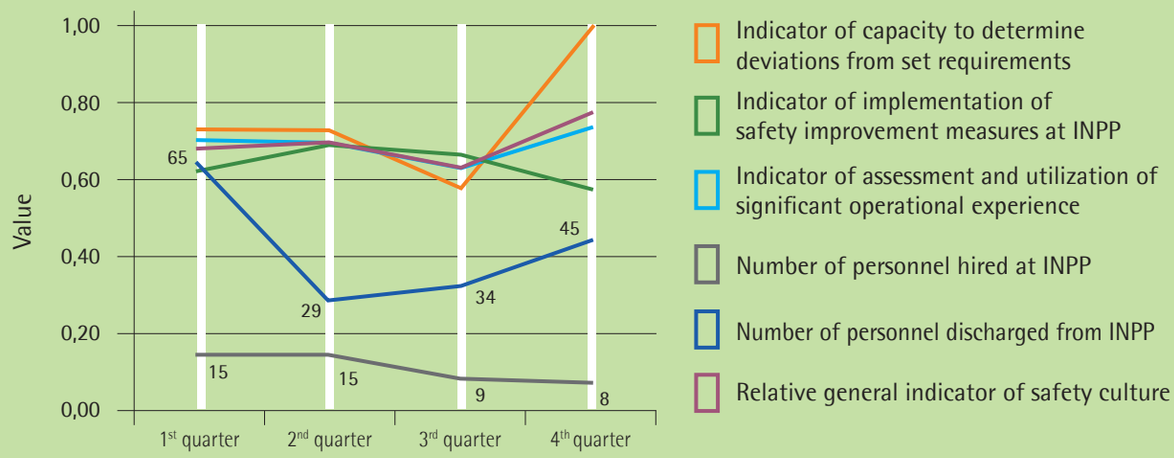
trends of safety culture indicators at the INPP in 2006

Safety culture indicator		Max. positive value	Quarter of 2006				Annual trend of change
Code	Short description		I	II	III	IV	
$И_{1.1}$	Training process at INPP	1	1	0.93	1	1	+
$И_{1.2}$	External training process	1	1	1	1	1	+
$И_{2}$	Implementation of Safety Committee's recommendations	1	0.5	0.67	1	0.4	-
$И_{3.1}$	Implementation of corrective measures developed on the basis of audit results	1	0.24	0.29	0	0.31	-
$И_{3.2}$	Implementation of corrective measures based on inspection results	1	0.71	0.84	0.7	0.63	-
$И_{4}$	Coefficient of recurrence of events	1	1	1	1	1	+
$И_{5.1}$	Coefficient of events due to personnel error	1	0.39	0.5	0.5	1	=
$И_{5.2}$	Coefficient of encouraging / punitive measures	1	1	1.0	0.85	1	+
$И_{6.1}$	Coefficient of implementation of proposals submitted to management by personnel	1	0.6	0.5	0	1	=
$И_{6.2}$	Coefficient of implementation of personnel's proposals regarding modifications	1	1	1	1	1	=
$И_{6.3}$	Taking into account personnel's proposals to use own and operational experience	1	0.14	0.2	0	0.21	-
$И_{К Б}$	Relative safety culture indicator	Target: not less than 60%	68.9%	72%	64.1%	77.7%	+

It can be seen from the data in Table 1 that the INPP has achieved the set target of maintaining the relative safety culture indicator at the minimum level of 60% (by the end of the year it was as high as 77.7%). However, the following areas of safety culture assurance need improvement: implementation of recommendations by the Safety Committee, implementation of audit results, involvement of the personnel in assessing operational experience and improving safety at the NPP.

Fig. 1 shows the trends of changes in the principal safety culture indicators in 2006, as well as the data on personnel hired at and dismissed from the INPP. VATESI believes the fluctuations of the principal safety culture indicators to reflect the efforts of the INPP managers to ensure safety culture. The presented data shows that the decrease in the INPP personnel in 2006 did not have considerable negative effect on the capability of identifying deviations from the set requirements of upgrading safety at the INPP and significant requirements of operational experience assessment, as the corresponding indicators were as high as 60% and upwards. Given considerable fluctuations in safety culture indicators, the INPP management should as early as possible conduct a direct survey of the personnel, give the personnel an opportunity to openly and without fear express their personal views on the working environment in their respective divisions, on the managers' efforts in ensuring safe and reliable work, as well as on important opportunities of managing and safety upgrading.

Fig. 1. **Generalized safety culture indicators and personnel changes at the INPP in 2006**



VATESI is of the opinion that the Ignalina NPP in the future should pay more attention to timely implementation of safety improvement measures and to getting the personnel involved in safety upgrading activity. The above-mentioned personnel survey and implementation of the resultant conclusions would contribute to that.

In order to set safety culture requirements given the fact that the closure of the Ignalina NPP has begun, VATESI continued in 2006 producing the *Manual on Safety Culture Issues while Shutting down the Ignalina NPP*. The document is to be completed and approved in 2007. The measures proposed by the Western European experts who participated in the PHARE project *Support to VATESI for safety culture and organisational issues specific to pre shutdown phase of Ignalina NPP* (No. 5812.04.01; the project was successfully implemented in 2004-5), as well as other guidelines, in VATESI's opinion, important in ensuring the personnel's proper attitude towards the NPP's safety during its shutdown will be presented in the document. The abovementioned recommendatory document will encourage the heads of all INPP divisions to more flexibly apply the principles of safety culture formation and management methods in assessing, developing and enhancing safety culture.

A brief summary of the main chapters of the *Manual on Safety Culture Issues while Shutting down the Ignalina NPP* is given below.

Safety culture issues important during the INPP decommissioning. Managers' role in dealing with the following safety culture issues important in the course of the NPP decommissioning is accentuated in this chapter:

- Managers' commitment in assuring safety. Although the service life of the INPP is soon to come to an end, it is important that the managers' actions, communication with specialists and their personal example comply with the modern notion of professionalism and efficient management of personnel throughout the decommissioning period;
- Assuring the personnel's proper motivation during this complicated period of the INPP service life;
- Smooth planning and implementation of changes in organizational structure, with reliability and efficiency of technological systems, the knowledge of INPP systems, as well as continuity and upgrading of set management measures ensured;

- Relieving the personnel's uncertainty about their future by planning activities in such a manner that the personnel have the best opportunities to participate in the decommissioning;
- Exchange of information among all the services and divisions and efficient cooperation with the contractors involved in order to address in a concerted and optimum manner issues important to the NPP safety that occur on a daily basis or for the first time;
- Management of human resources and know-how as an issue of safety culture is important during the NPP decommissioning because while reducing the personnel it is mandatory to retain good knowledge of the nuclear power facility, which would be quite a challenge if two few specialists responsible for important safety work and its control remained at the INPP;
- It should be borne in mind for adequate supervision of the NPP safety during the decommissioning that part of the facility's components will function in increasingly changing work environment, and their use will also change more and more. Therefore it is necessary to thoroughly check their reliability rather than take for granted reliable functioning of the components at earlier stages of operation.

Addressing safety culture issues in practice. Examples when the above-mentioned issues of safety culture were dealt with properly will be presented in this chapter, with great emphasis laid on a systematic approach comprising aspects of organization, technologies applied, and the human factor in the course of NPP decommissioning.

In the remaining chapters of the document advanced methods of managing an organization and the personnel are recommended that should be more widely applied when assessing safety culture at the Ignalina NPP. Simultaneously, the issues of safety culture enhancement and other issues related to work should be dealt with accordingly. Special publications by the IAEA on issues of safety culture formation, assessment and improvement are also recommended there.

12. SAFETY ASSESSMENT AT IGNALINA NPP

Safety assessment is a major function of VATESI in carrying out supervision of nuclear safety and radiation protection in nuclear power facilities. The objective of safety assessment is to analyze throughout all the stages of nuclear facilities' service life the documents submitted by the operating organizations and the information gained during inspections conducted with a view to ascertaining that:

- The available information makes it possible to determine the safety of the facility or proposed activity;
- The information submitted is accurate and sufficient to confirm that the set nuclear safety requirements are being complied with;
- Technical and organizational decisions, new ones in particular, are based on experience or tests and ensure the required level of safety.

To coordinate the activities of nuclear safety assessment and to fulfill the functions of nuclear safety supervision in certain areas, the Safety Assessment Division was set up at VATESI in 1996. At present it has on its staff specialists in reactor physics, mathematical simulation and analysis of transients and accidents, assessment of operational safety and industrial experience, instrumentation and control systems, and probabilistic safety assessment.

Work on safety assessment and the results achieved by the specialists of the Safety Assessment Division in 2006 are described in more detail in the chapters *Installation of a Diverse Shutdown System (DSS) at Ignalina NPP Unit 2, Assessment of the Use of Operational Experience, Analysis and Upgrading of Reactors' Physical Properties, Analysis of Design-Basis and Beyond-Design-Basis Accidents, Probabilistic Safety Assessment (PSA), The Project of Utilization of INPP Unit 1 Fuel in Unit 2 and The Program of Harmonization of WENRA Safety Requirements.*

Relatively few specialists in nuclear safety are on the staff of VATESI, therefore Lithuanian Technical Support Organizations (TSOs) have an important role to play. They include the Lithuanian Energy Institute (LEI), the Institute of Physics (FI), Kaunas University of Technology (KTU), and other institutions. Without their assistance VATESI would find it impossible to adequately carry out some important tasks. Part of the work is being done with the assistance from the support projects of the EU and the UK. Of extreme importance is assistance from the IAEA that helps to address issues related with the staff training and familiarizing with the most recent international experience in the area of safety assessment.

13. ANALYSIS AND UPGRADING OF REACTORS' PHYSICAL PROPERTIES

Since 1995, upgrading of neutron-physical properties of INPP reactors has been carried out along two main lines, viz. through introduction of higher enrichment fuel with burnable neutron absorbers, and the introduction of control rods of new design.

In 1997, the design uranium oxide fuel of 2 percent enrichment was replaced with uranium oxide fuel of 2.4 percent enrichment containing burnable erbium poison. Later on, the enrichment was increased to 2.6 percent. During

the second half of 2005 they started loading into INPP Unit 2 a pilot batch of uranium-erbium fuel of 2.8 percent enrichment. Afterwards this fuel was used on a regular basis. Introduction of uranium-erbium fuel has made it possible to give up additional neutron absorbers that maintain steam reactivity coefficient within safe limits, as the absorber is in the fuel proper. Therefore, with nuclear safety characteristics remaining the same or even improving, the reactor core structure is optimized and thus economic indicators are considerably improved. The transition to uranium-erbium fuel and withdrawal of additional absorbers from the core has been gradual. As a result, average burnup of the unloaded spent nuclear fuel increases noticeably, and the amount of fuel consumed decreases. Furthermore, it has become possible to use fuel brought from Unit 1 (see Chapter 16).

The control rods of the new design are introduced with a view to reducing the reactivity effect related to the voiding of the cooling circuit of the Control and Protection System in the event of a potential accident. By 2004, most of the manual control rods of the old design (131 and 127 at Units 1 and 2, respectively) were replaced with those of type sb. 2477. The planned replacement has been completed. A pilot batch (4 control rods) of even more advanced control rods of the so-called cluster type was installed in Unit 2 in 2004. In 2005–6, another 45 rods were installed. Another 12 rods of this type are to be installed in 2007.

The modification of the reactor core greatly improves certain safety-related characteristics: the reactivity effects of voiding of the Primary Circuit and of the cooling circuit of the Control and Protection System decreases, the neutron flux becomes more uniform, and as a result the reactor becomes easier to operate and more proof against potential accidents.

The new fuel is being introduced, additional absorbers are being given up, and new control rods are being installed simultaneously. This is a challenging task, therefore it is necessary to plan and forecast changes in neutron-physical properties in a thorough and detailed manner.

Specialists of the Nuclear Installations Safety Laboratory (NISL) of the Lithuanian Energy Institute (LEI), and the Institute of Physics (FI) have been rendering considerable support to VATESI in analyzing the programs of switching over to the new fuel and the use of control rods of the new design. To enhance the competence of specialists of VATESI TSOs in this area, the project by the Department of Trade and Industry of Great Britain of nuclear safety program of support to VATESI *L16 Reactor core integrity surveillance* was started in 2005.

INPP Unit 1 has been shut down. The fuel is being removed from it and part of it will be used in the reactor of Unit 2 (see Chapter 16). The fuel is being unloaded in compliance with a safety case and program of work approved by VATESI. In the course of unloading, physical properties of Unit 1 reactor are being monitored. The process will continue until all nuclear fuel has been removed from it.

Progress in modification of INPP reactor core (data as of the end of the year)

Power unit	Year	Part of fuel in the core				ANA	Average burn-up MWd/ FA	Control rods of new design, pcs.	
		2 percent	Uranium-erbium						
			2.4 percent	2.6 percent	2.8 percent			sb. 2477	CRO
Unit 1	2004	5%	35%	60%	0%	1	1320	131	0
Unit 2	1995	94%	6%	0%	0%	53	851	24	0
	1996	81%	19%	0%	0%	41	919	48	0
	1997	54%	46%	0%	0%	17	1038	71	0
	1998	36%	64%	0%	0%	5	1148	71	0
	1999	12%	88%	0%	0%	8	1247	96	0
	2000	9%	91%	0%	0%	4	1247	96	0
	2001	6%	91%	3%	0%	4	1229	96	0
	2002	7%	69%	24%	0%	4	1248	127	0
	2003	8%	44%	48%	0%	4	1294	127	0
	2004	8%	33%	60%	0%	4	1308	127	4
	2005	6%	8%	79%	7%	2	1378	103	28
	2006	4%	3%	79%	14%	2	1429	82	49

Note: ANA – additional neutron absorbers; CRO – cluster regulating organ (rod)

14. ANALYSIS OF DESIGN-BASIS AND BEYOND-DESIGN-BASIS ACCIDENTS

In 2006, specialists of the Accident Analysis Group of the Safety Assessment Division of VATESI were intensely mastering state-of-the-art deterministic safety analysis and assessment technologies. They extended their knowledge of physical, chemical and thermohydraulic processes taking place in nuclear fuel, the reactor core, the Main Circulation Circuit (MCC), the Accident Confinement System ACS) and spent nuclear fuel storage ponds in case of beyond-design-basis accidents. Control was performed of implementation by the Ignalina NPP of analytical measures of design-basis and beyond-design-basis accidents within the framework of SIP-3/2006 program.

In 2006, specialists of the Accident Analysis Group of the Safety Assessment Division participated in the following events:

- Seminar and training on scaling, uncertainty and 3d coupled code calculations in nuclear technology held in Barcelona on January 22 – February 4.
- The IAEA regional meeting *Management of safety assessment activities in regulating institutions*, held in Ljubljana on February 13-17. A representative of AAG of SAD delivered report *International Regulatory Review Team at VATESI. Implementation of its recommendations and proposals.*
- The IAEA regional working meeting *Application of deterministic safety analysis*, held in Ljubljana on April 9-14.
- The IAEA regional working meeting D*evelopment and implementation of severe accident management programs at nuclear power plants*, held at the Leningrad NPP on April 24-28. A representative of AAG of SAD delivered report *Preparing a manual for management of beyond-design-basis accidents at the Ignalina NPP. VATESI stand.*
- The IAEA training course *Assessment of NPP safety as support in decision making*, held in Madrid on June 4-17.
- The IAEA regional workshop *Issues of nuclear safety at a NPP with RBMK reactors* held on October 9-13 in Visaginas. A representative of AAG of SAD delivered report *Requirements for analysis of probable operational events and design-basis accidents at the Ignalina NPP.*
- The meeting W116 arranged by the GRS on the issues of harmonization of standard documents held in St Petersburg on December 11-14. A representative of AAG of SAD delivered report *Requirements for analysis of probable operational events and design-basis accidents at the Ignalina NPP.*

After the information learnt at the above workshops and working meetings was assessed, it was used in 2006 for improving nuclear safety regulating documents governing analysis and management of probable operational events, as well as design-basis and beyond-design-basis accidents: *Requirements for analysis of probable operational events at the Ignalina NPP, Recommendations for analysis of probable operational events at the Ignalina NPP*, etc. The documents were also modified to take into account the comments by the LEI and the INPP, as well as recommendations submitted in 2006 by the Reactor Harmonization Working Group (RHWG) of WENRA. While modifying the documents efforts were made to take into account the results of the review and harmonization studies being conducted of other EU countries' standard documents related to accident analysis. In 2006, the instructions were prepared and approved for the specialists of the VATESI Emergency Response Center. The responsibility of the ERC specialists and the actions they must take when gathering information about emergency situation or accident at the Ignalina NPP, when analyzing its progress or forecasting its effects are defined in the document.

Data on source functions prepared within the framework of the previously implemented PHARE project LI 01.18.03 is used in the instructions. The instructions will be used if a design-basis accident occurs at the Ignalina NPP.

A workshop was held on May 15, 2006, at VATESI in which D'Auria, professor from Pisa University, delivered a report. He spoke on the results of the accomplished EU TACIS project related to mathematical modeling of design-basis and beyond-design- basis accidents in RBMK reactors. The focus of attention was a single scenario of an RBMK accident, blockage of coolant flow in a fuel channel. It should be noted that some of the project results considerably differ from the results of previously conducted studies of RBMK reactors. Say, it was determined that the Doppler effect that manifests itself in uranium fuel (the increase in resonance capture reaction rate in fuel with increase in fuel temperature) is considerably higher and can make up for increase in reactor core reactivity as a result of coolant loss. A proposal of TACIS project regarding a modification of RBMK reactors, a system of individual monitoring of fuel channels, was discussed at the workshop.

In 2006, the Ignalina NPP produced manuals for management of beyond-design-basis accidents and their safety cases. In the management manuals strategies are set due to be used in order to ensure reactor cooling, pressure reduction in reactor cavity, management of the Accident Confinement System, reduction of emission of nuclear decay products, and management of the states of SNF ponds following a BDB accident at the Ignalina NPP. The documents

Presentation of the results of beyond-design-basis accident in RBMK analysis at VATESI. Participants of the workshop held on May 15, specialists from the FI, INPP, LEI, VGTU and VATESI.

were submitted to VATESI for review on September 29. Specialists of the TSO consortium (FI, KTU, VGTU, ITECHA) have been assisting VATESI in assessing the manuals of BDB accident management and their safety cases. Serco Assurance, the UK, has also been rendering technical and scientific assistance to VATESI and its TSOs in reviewing documents on management of BDB accidents in accordance with DTI project NSP/03-L8. On October 27, a meeting was held at VATESI with the head of the project B. Turland. On December 1, a confidentiality agreement was signed between VATESI and Serco Assurance in accordance with which the documents on BDB accident were handed over to the INPP. Based on this material, specialists from Serco Assurance will arrange a workshop on the issues of BDB accident assessment. The comments of VATESI and its TSOs regarding documentation of BDB accident management at the INPP will be discussed at the workshop. The event is planned for March of 2007.

The initial meeting on the PHARE project No. 5812.04.02 *Support to VATESI and its TSOs in assessment of beyond design basis accidents for RBMK-1500 reactors* was held at VATESI on January 11-13, 2006. Whilst implementing the project, an independent study is to be made of the behavior of fuel matrix, fuel assemblies, the Main Circulation Circuit, the ACS and spent nuclear fuel ponds in the event of BDB accidents at the Ignalina NPP. The principal objectives of the project are as follows:

- To perform independent analysis of several scenarios of BDB accidents.
- To accumulate and take over technical scientific knowledge of BDB accidents in RBMK reactors.
- To prepare data on source functions for the instructions to specialists from VATESI ERC in case of BDB accidents.

The work on the project is being done by LEI, FI, IRSN, GRS and RISKAUDIT. A technical meeting of the project was held at the Institute of Physics on November 7-8. representatives of GRS, IRSN, LEI, FI and VATESI participated at the meeting. Intermediate results of the project were reviewed at the meeting and the guidelines of further implementation of the project were discussed. Critical comments were expressed by VATESI as regards the material presented at the meeting. On November 15, VATESI submitted GRS a request regarding purchase of TESPA-ROD, COCOSYS, ATHLET-CD and ASTEC codes.

In 2006, control was being carried out of implementation by the INPP of analytical measures of DB and BDB accident processes in accordance with SIP-3/2006 program. A meeting to discuss VATESI comments regarding implementation of SIP-3 analytical measures was held on June 14. VATESI approved technical specifications of the INPP produced in the course of implementation of analysis measures of SIP-3/2006 DB accidents. Implementation of SIP-3/2006 analytical measures related to DB and BDB accidents was checked during VATESI inspection performed at the INPP on December 19. Compliance by the INPP with nuclear safety requirements in implementing safety analysis measures was inspected. An inspection statement was drawn up based on the information obtained in the course of inspection. The Ignalina NPP was obligated to put right the non-compliances with safety requirements identified by the inspection.

15. PROBABILISTIC SAFETY ASSESSMENT (PSA)

The risk posed by nuclear facilities can be assessed quantitatively with the use of probabilistic safety assessment (PSA). While performing this kind of analysis the effect on the risk of the systems designated to protect facilities against accidents and to mitigate the impacts of accidents that did occur, as well as on the risk of auxiliary safety systems is assessed. Information obtained in the course of PSA can be used both when designing nuclear facilities and operating them.

The results of PSA can be widely used when addressing licensing, safety management, and other issues relating to nuclear power facilities. PSA can be used alongside deterministic methods, and the principles of the two must complement each other. The main advantage of PSA consists in that it helps to identify the main risk factors and to compare the ways of reducing risks. PSA is based on a consistent and integrated safety model of a nuclear facility. Therefore PSA together with deterministic methods is one of the tools in making decisions related to safety. Changes in design and engineering decisions or the choice of one or another decision can be assessed by a common criterion, quantitative risk assessment resulting from PSA. The uncertainties in these decisions can also be determined through PSA.

In 2003, implementation of the project funded by the Department of Trade and Industry of the UK began in accordance with which four regulatory documents in the area of PSA were drawn up in early 2005: *Requirements for risk assessment and management at nuclear power facilities, Recommendations regarding level 1 probabilistic safety assessment at nuclear power plants, Recommendations regarding level 2 probabilistic safety assessment at nuclear power plants with RBMK-1500 type reactors,* and *Recommendations regarding risk management with the use of probabilistic safety assessment.*

Requirements for risk assessment and management at nuclear power facilities are meant for defining minimal requirements for risk assessment and management when using PSA technologies. The document was drawn up based on the world's best practices with IAEA recommendations taken into consideration. The requirements set forth in it must be followed for conducting PSA at nuclear facilities as well as for producing safety analysis reports, in licensing process, when introducing modifications or planning repairs, and in other cases. The document defines the objectives of PSA level 1 and level 2 objectives and scopes, and sets the requirements for PSA documentation, as well as for the management and updating of PSA model. In addition to that, the principal criteria and the key areas of PSA application are identified in the document.

The main objective of *Recommendations regarding level 1 probabilistic safety assessment at nuclear power plants* consists in describing methods acceptable to VATESI used to perform level 1 PSA at nuclear facilities (this level is meant for assessing events that determine identified conditions of damage to a facility). The scope and the level of detail of PSA depend on the way it is to be applied. However, the minimal level of detail is necessary to ensure that design dependencies (e.g. those of auxiliary systems or human errors) have been taken into account and that PSA models are adequate for a nuclear facility that is being designed or operated.

Recommendations regarding level 2 probabilistic safety assessment at nuclear power plants with RBMK-1500 type reactors set forth the main methods of level 2 PSA applicable to nuclear reactors of RBMK type. The scope of PSA more often than not depends on the purpose the results will serve for. When performing PSA, the most important dependencies (those of auxiliary systems, containment, human errors, etc.) must be taken into account, and PSA model must be adequate for the nuclear facility in question.

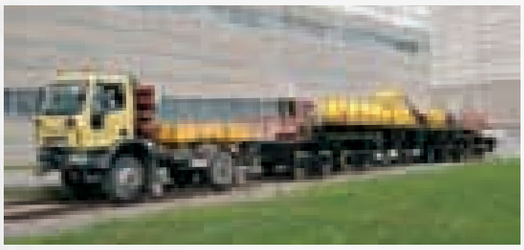
The document *Recommendations regarding risk management with the use of probabilistic safety assessment* describes the methods applicable at NPPs for identifying major vulnerabilities and for efficiently managing risks in view of operation hazards posed by changes in equipment or procedures at a NPP. VATESI specialists will review all these draft documents. Before they are approved, their texts will be given to the main users (INPP, TSOs) so that they can submit their comments. After the four documents have been approved, a system will be created at VATESI offering a legal basis for risk management and for taking integrated decisions. If necessary, more detailed recommendatory documents can also be drawn up that would describe individual areas of PSA application.

In late 2006, two reports were submitted to VATESI on implementation of recommendations of IPSART missions aimed at improving the quality of PSA: on the procedure of quality assurance in performing PSA and on inclusion of a diverse reactor shutdown system into the INPP PSA model. The documents are currently being analyzed. In 2005, *The updated procedure for PSA implementation* was also modified by the INPP. In late 2005 an inspection was conducted to check implementation of the procedure's provisions. It was established in the course of the inspection that the new procedure was being implemented. Some minor shortcomings were revealed in documentation management, but these were put right soon after the inspection. A follow-up inspection of compliance with the provisions of the procedure was performed in 2006. This time no non-compliances were found.

16. THE PROJECT ON RE-USE OF INPP UNIT 1 FUEL IN UNIT 2

A large part of partially burnt fuel that remained in the reactor after shutting the Ignalina NPP Unit 1 is still suitable for use, therefore the project on transporting fuel from Unit 1 and using it in Unit 2 was implemented.

In accordance with the project, a set of equipment was constructed with which fuel assemblies after being removed from Unit 1 and checked, are taken in a special transport container to Unit 2 and loaded into the reactor. The project will not only allow Ignalina NPP to save some 500 new fuel assemblies, but will also considerably facilitate dealing with the problem of spent nuclear fuel storage, as smaller amounts of very-high-level radioactive waste will be generated.



Tracker and transporter with a set of in-site transport container prepared for fuel transportation from Unit 1 to Unit 2.

In 2005–6, VATESI specialists jointly with experts from TSOs reviewed the safety case submitted by the Ignalina NPP for the fuel transportation facility and the relevant documents of the detail design. VATESI, having taken into account the results of the review and the facility's testing, issued in November of 2006 a license for operating the facility. In late 2006, 66 spent nuclear fuel assemblies were transported by means of the set of equipment from Unit 1 reactor. Twenty-eight of these were loaded into the reactor of Unit 2.

17. VATESI ACTIVITIES IN DECOMMISSIONING IGNALINA NPP

VATESI has been supervising decommissioning of the Ignalina NPP, i.e. licensing this activity as well as analyzing and approving projects in which all decommissioning operations are laid down. The Ignalina NPP must show in the licensing documents that dismantling of equipment and installations, decontamination of premises and equipment as well as other decommissioning operations will be performed safely, that all radioactive wastes will be properly managed, stored and disposed of.

Central hall, INPP Unit 2.

In 2004, VATESI and the Ignalina NPP agreed as to what documents would have to be analyzed in order to grant Unit 1 the status of a finally shutdown facility. In June of 2006, VATESI approved *Unit 1 final shutdown and defueling phase decommissioning project* and its safety analysis report. Analysis was performed of INPP Unit 1 systems, with their configuration and working parameters determined, systems and components that are no longer necessary and that can be isolated before the time comes to dismantle them were identified. The safety analysis report produced on the basis of operational safety justification of Unit 1 assesses the safety of the new configuration. VATESI also arranged nuclear safety review of the project. The review's conclusions were submitted to the Ministry of Environment, and the latter arranged a complex state expertise of the project. In late 2006, having analyzed the last of the submitted documents, VATESI granted this status to the INPP Unit 1 and gave permission to carry out operations envisaged in *Unit 1 final shutdown and defueling phase decommissioning project.*

The Ignalina NPP will perform operations of dismantling equipment and installations by implementing individual projects of dismantling and decontamination described in the final plan of the Ignalina NPP decommissioning. The projects and their safety cases must also be coordinated with VATESI. In 2006, VATESI specialists analyzed and approved the technical specification of project B9-1, and expressed comments regarding the technical specification of project B9-0. The two technical projects will comprise preparations for dismantling and decontamination operations in the turbine hall of INPP Unit 1 (B9-1) and in the compartments of building 117 (B9-0). In the course of the project implementation

technical and safety justification documents will be produced intended for licensing of operations and purchasing equipment necessary for dismantling. The systems and installations no longer necessary in terms of nuclear safety or operation will be decontaminated and dismantled in the turbine hall of INPP Unit 1. As a result, room will be prepared for managing other waste generated during the decommissioning. In building 117 the reactor emergency cooling systems will be decontaminated and dismantled. Therefore while implementing the project a decision will have to be made on the ways of dismantling this large-size plant and on what additional equipment will have to be purchased.

In 2006, VATESI specialists analyzed and expressed their comments on *Preliminary acceptance criteria for radioactive waste disposal in a repository for very-low-level radioactive waste, Assessment of sites preliminarily selected for disposal of very-low-level radioactive waste, Technical specification of design for constructing a repository for very-low-level radioactive waste, The environmental impact assessment report on a near-surface repository for short-lived low- and intermediate-level radioactive waste*, as well as comments concerning construction of a near-surface repository and reconstructing a storage facility of bituminized waste into a repository. *The general program of radiological characterization, The contents of the safety analysis report on a facility for managing and storing solid radioactive waste*, and the program of the facility's environmental impact assessment were approved. Experts from the PHARE project *Support to VATESI and Lithuanian TSOs in licensing activities related to decommissioning of Ignalina NPP* assisted in assessing the projects.

As part of the PHARE project *Support to VATESI and Lithuanian TSOs in licensing activities related to decommissioning of Ignalina NPP* the brochure *Decommissioning of the Ignalina Nuclear Power Plant: safety requirements, projects, radioactive waste management* was published in Lithuanian and English. The publication contains information about the Ignalina NPP and VATESI preparedness for decommissioning, decommissioning projects and requirements set to these are discussed compliance with which ensures safe decommissioning. Radioactive waste and its management stir public interest and raise numerous questions. Therefore considerable attention is given in the publication to modernization of radioactive waste management. Information is presented on the already installed new cementation facility, a storage facility for spent nuclear fuel that is planned to be constructed, and repositories for short-lived very-low, low- and intermediate-level radioactive waste. Brief information is also given about the possibilities of managing long-lived radioactive waste (for the publication in English visit VATESI website http://www.vatesi.lt/en/documents/brosiura-en.pdf).

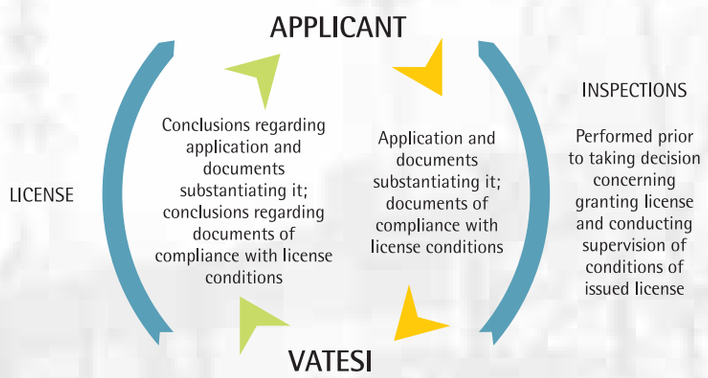
In late 2006, VATESI jointly with the IAEA arranged in Lithuania the regional workshop *Regulation of NPP decommissioning.* Representatives of institutions that control decommissioning from the Czech Republic, Hungary, Romania, Slovakia, Slovenia, Ukraine and other countries took part at the workshop. The main objective of the event was to strengthen capabilities of these institutions in licensing and supervising decommissioning activities. Considerable attention was given to IAEA requirements for the decommissioning of NPPs: planning of decommissioning, safety assessment, funding, implementation and its control, as well as giving up control. While carrying out practical assignments issues were analyzed related to the production of the final decommissioning plan for the Ignalina NPP, the strategy of radioactive waste management, the safety analysis reports and the requirements for canceling a decommissioning license. The discussions that took place during the workshop gave the specialists from different countries a great opportunity to share experience in decommissioning and radioactive waste management.

18. LICENSING ACTIVITIES

Licensing is a continuous process consisting of stages during which the applicant's preparedness to carry out the activity being licensed, the level of nuclear safety assurance, the personnel skills and other important aspects of safety assurance are assessed. The stages of licensing are as follows:

1) submission of application;
2) analysis of application documents;
3) the applicant's inspection;
4) making a decision regarding granting of license;
5) granting of license;
6) supervision of licensed activity.

Licensing process



In 2005, VATESI conducted supervision of compliance with previously issued licenses' conditions and continued licensing activity related to licensing of storage facilities for solidified liquid radioactive and spent nuclear fuel, and for the Maišiagala radioactive waste storage facility.

From 1996 to the end of 2003 VATESI issued enterprises 58 licenses of type one (or permits to foreign companies) to provide services and carry out operations in the field of nuclear energy. Based on the IAEA recommendations, VATESI initiated amendments to the Law on Nuclear Energy and beginning with 2004 gave up the practice of licensing contractors.

Supervision of conditions of issued licenses

Licenses issued by VATESI*

License No.	Licensee	Area of activity
12/99(P)	Ignalina NPP	Operating INPP Unit 1
3/2000(P)	Ignalina NPP	Operating interim spent nuclear fuel storage facility of dry type at INPP
2/2003	Ignalina NPP	Constructing at INPP storage facility and cementation facility for solidified liquid radioactive waste at Ignalina NPP
1/2004	AB *Lietuvos geležinkeliai*	Transporting nuclear material
2/2004	Ignalina NPP	Operating INPP Unit 2
1/2006	Ignalina NPP	Operating storage facility for solidified liquid radioactive waste at Ignalina NPP
2/2006	Radioactive Waste Management Agency (RATA)	Conducting supervision of the closed Maišiagala storage facility of radioactive waste

Note: The issued licenses of type one not included in the Table.

Unit 2 at Ignalina NPP

INPP Unit 2 is being operated in accordance with license No. 2/2004, issued on September 15, 2004. In compliance with the license conditions, work was continued on implementing the measures defined in the safety improvement program based on results of SAR-2 and other analyses; work, modifications and annual outage were planned, inspections and tests conducted.

In accordance with *The regulations governing granting of permits for startup of power units following annual outage or short shutdowns* approved by VATESI Head, prior to the annual outage of 2006, a list of safety improvement measures in INPP Unit 2 during the 2006 annual outage was received from the Ignalina NPP on July 27, 2006, as well as the implementation schedule. On July 29, 2006, INPP Unit 2 was shut down for the annual outage. During the annual outage VATESI monitored execution of work in safety-related systems. VATESI specialists analyzed 74 sets of documents submitted in accordance with the plan of safety improvement measures for the 2006 annual outage of INPP Unit 2, the most important of these being:

- Report on work done in safety-related systems during the annual outage, including the modifications made;
- Report on planned work not done during the annual outage in safety-related systems, the causes of failure to do the work and the proof that the Unit's safety will be ensured;
- Report on implementation of the in-service inspection program of metal of instalations and pipings of INPP Unit;
- Report to prove that non-compliances that were identified during VATESI inspections and that had to be rectified prior to the Unit startup after the annual outage were put right;
- Report on the results of tests of the Accident Confinement System;

- Report on work that must be done in the INPP Unit in accordance with the SIP prior to the end of the annual outage, with measures that were not completed indicated. The causes of failure to complete these must be substantiated and new deadlines of their implementation approved with VATESI;
- Cartogram of reactor loading;
- A copy of statement on compliance of the Unit reactor installation's parameters with the data of its passport;
- Report on the results of pressure tube-graphite gap measurement, its assessment and forecast of changes in the reactor;
- Report on behavior and effects of oxide sediments on the internal surface of fuel channels;
- Report on the results of checks on irradiated fuel assemblies;
- Report on the results of diagnostics and replacement of ball-type flow-rate meters in fuel channels;
- Report on progress in the use of higher enrichment fuel with burnable absorbers and reactor control rods of new design;
- Information about the Unit status for operation in terms of physical protection;
- Information about the Unit status for operation in terms of fire safety.

In addition to the work described above, specialists of VATESI On-Site Division participated in tests of safety-related systems. The results were recorded in statements and entered into the systems' passports. Having analyzed the documents submitted by the Ignalina NPP and taken into consideration the conclusions by the On-Site Division, VATESI decided on September 15, 2006, to issue permit No. 4/2006-09-15 for starting up Unit 2 following the annual outage.

Unit 1 at Ignalina NPP

INPP Unit 1 is being operated in accordance with license No. 12/99(P), issued on July 29, 2004. The Unit was shut down on December 31, 2004, and it will no longer be used for generating electricity. The organization operating the Ignalina NPP took this decision on the basis of the resolution No. 1491 by the Government of the Republic of Lithuania, dated November 25, 2004.

VATESI jointly with experts from the EU support project performed a review of Unit 1 final shutdown defueling phase decommissioning project and its safety analysis report, and approved these in mid-2006. At the same time, in accordance with the provisions of The Law on Nuclear Energy, VATESI arranged a nuclear safety expertise of the said documents. The expertise conclusions were submitted to the Ministry of Environment. Having received and analyzed the missing documents, VATESI in late 2006 granted Unit 1 the status of a finally shutdown facility and gave permission to carry out work in accordance with the above-mentioned project.

In early 2006, the Ignalina NPP submitted to VATESI for approval draft technological specification for defueling Unit 1 reactor. VATESI specialists analyzed the document and expressed their comments. Some of the issues could not be solved through correspondence, therefore a meeting of INPP and VATESI specialists was held at the Ignalina NPP in October of 2006. At the meeting an agreement was reached on the ways of dealing with the issues. VATESI approved the technological specification in November of 2006.

Spent nuclear fuel storage facility of Ignalina NPP

The spent nuclear fuel storage facility of the Ignalina NPP is being operated in accordance with license No. 3/2000(P) issued on July 27, 2004.

In 2006, the Ignalina NPP approached VATESI with a request to change the license condition in order to permit storage of additional 18 CONSTOR casks in the facility. The Ignalina NPP attached to its application safety justification documents for this modification. Having analyzed these, VATESI took a favorable decision on November 27, 2006.

VATESI specialists conduct inspections at the spent nuclear fuel storage facility of the INPP on an annual basis. The results of the inspections as well as quarterly reports from the Ignalina NPP allow to maintain that the storage facility is being operated in compliance with the requirements of valid standard documents and that the facility's safety is ensured.

Transport of nuclear material

In accordance with license No. 1/2004 issued by VATESI, AB Lietuvos geležinkeliai in 2006 twice transported fresh nuclear fuel intended for the Ignalina NPP. No violations or incidents occurred. The level of radiation of the cargo transported along public roads did not exceed the permissible levels.

VATESI specialists analyzed the documents of the decision by the Ignalina NPP *Regarding storage of U-235 fuel pellets of 2% and 4% enrichment* and submitted their comments. In late 2006, an application was received from the

Ignalina NPP concerning multilateral approval for a fresh fuel package and shipment certificate RU/102/B(U)F-96T. After the application was analyzed, the Ignalina NPP was demanded to submit additional documents.

In 2006, the draft EU directive regarding supervision and control of radioactive waste and spent nuclear fuel transportation were analyzed. A VATESI representative took part in the 43rd meeting of the standing working group on issues of radioactive material transportation held in Luxemburg. A VATESI representative also took place at two technical meetings of the IAEA in Vienna, *Review of draft of the transport security guidance* and *Denial of shipment of radioactive materials.*

In 2006, VATESI approved 23 applications for shipment of radioactive materials and radioactive wastes containing nuclear materials of non-nuclear commodities.

VATESI specialists analyzed the draft regulation for multilateral approval of the certificate of the compliance of the package design for shipment of radioactive materials and wastes prepared by the Radiation Protection Center and submitted recommendations and comments.

Licensing completed in 2006 and licenses issued

In 2006, VATESI issued two licenses, for operating the storage facility of cemented liquid radioactive waste, and for supervising the Maišiagala storage facility of radioactive waste.

Licensing storage facility for solidified liquid radioactive waste

As early as in 1996 the Ignalina NPP initiated the project of construction of a cementation and storage facilities for liquid radioactive waste so that the liquid radioactive waste being stored on the Ignalina NPP site was processed and managed in compliance with modern requirements. Having analyzed the documents of the application for constructing the said facilities, VATESI granted in mid-2003 a license for constructing a storage facility for solidified liquid radioactive waste and a cementation facility. Following the completion of construction work and the so called cold and hot tests, the Ignalina NPP submitted VATESI in late 2005 a license application for operating the storage facility for cemented liquid radioactive waste and its safety justification. Having analyzed the documents, VATESI specialists presented their comments. In early December 2005, the Ignalina NPP answered the comments and submitted amended documents. Prior to taking the decision to issue the license, VATESI specialists in early 2006 conducted an inspection at the Ignalina NPP and checked the technical documentation related to the facility, the personnel's preparedness and the constructed facility. After the results of the inspection and of the document analysis were assessed, on March 10, 2006, the Ignalina NPP was issued license No. 1/2006 that entitles the NPP to operate the facility for storage of solidified liquid radioactive waste. The conditions of the license for Unit 2 were also supplemented after assessing the modification as a result of which the cementation facility was designed and constructed.

Whilst implementing the license conditions, the Ignalina NPP in late 2006 submitted a report on the results of operational control and compliance with the license conditions. VATESI is planning to perform an inspection in 2007 to check the operation of the solidified radioactive waste storage and cementation facility.

Licensing the closed storage facility at Maišiagala

In May 2004, the Radioactive Waste Management Agency (RATA) submitted VATESI an application that would entitle the former to carry out supervision of the closed radioactive waste storage facility at Maišiagala with a schedule of document presentation and safety justification documents attached. Specialists of VATESI and TSO's analyzed the documents and presented their comments in late August 2005. Having analyzed the received replies and the changes made in the documents, VATESI decided on May 26, 2006, to grant RATA license No. 2/2006 to carry out supervision of the closed radioactive waste storage facility at Maišiagala. In accordance with one of the license conditions, RATA was to implement safety improvement measures envisaged in the safety analysis report, viz. to cover the storage facility with an impervious membrane and to improve the condition of the fence surrounding the storage facility's site. In late 2006, RATA submitted VATESI documents confirming that the measures had been implemented.

ANALYZING APPLICATION DOCUMENTS

Licensing a new facility for spent nuclear fuel

The facility's licensing began in June of 2005 and was continued in 2006. The licensing work was carried out in accordance with a schedule of document presentation submitted by the Ignalina NPP and coordinated with VATESI. As some of the documents were not produced on time, the Ignalina NPP corrected the schedule and submitted it to VATESI. VATESI will take the decision whether or not to grant a license to design and construct a storage facility for spent nuclear fuel only after it receives and analyzes all the documents.

19. ACCOUNTING FOR AND CONTROL OF NUCLEAR MATERIALS, APPLICATION OF SAFEGUARDS

A positive conclusion regarding Lithuania was reiterated in the IAEA safeguards implementation report for 2005 issued in the second quarter of 2006. For a third successive year it was declared that nuclear material had been used for peaceful purposes only ant that no undeclared nuclear activities had been found.

The IAEA can draw this conclusion by examining nuclear materials, nuclear facilities and a country's overall activities in the area of the use of nuclear energy in accordance with the Application of IAEA Safeguards and its Protocol Additional.

Four planned inspections of IAEA safeguards took place at the Ignalina NPP and the spent nuclear fuel storage facility of dry type: a physical inventory verification in March, during which inspectors from the European Commission also participated, and quarterly inspections in June, September and December. In the course of inspections IAEA inspectors selected part of the entire fresh nuclear fuel in the storage facility of fresh fuel and in the NPP's Units in accordance with the sampling plan. Identification numbers of assemblies were examined and, in the course of the physical inventory verification, non-destructive analysis measurements were also made (Fig. 1).

Fig. 1. ***Checking assemblies of fresh fuel by the method of non-destructive analysis***

IAEA inspectors, while examining spent fuel assemblies in the INPP Units, with the use of probabilistic statistical methodology, performed verification measurements of selected assemblies and replaced seals selected in accordance with the sampling plan.

The placement and numbers of storage casks were examined in the spent nuclear fuel storage of dry type. IAEA inspectors replaced seals selected in accordance with probabilistic statistical methodology and sealed newly brought casks.

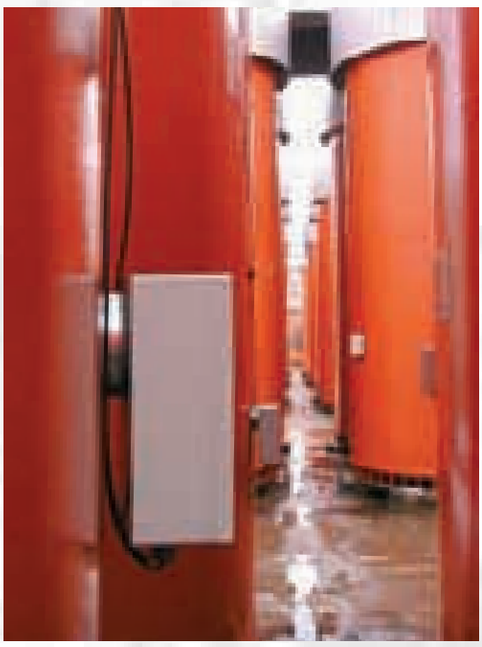


Fig. 2. ***A COBRA seal on a protective cask of spent nuclear fuel.***

The inspection results showed that the INPP properly managed the accounting of nuclear fuel assemblies and correctly declared their amount.

In accordance with the Protocol Additional, a country complying with its provisions must submit by May 15 of every year a renewed declaration for the previous calendar year. VATESI collected and generalized by May 15 information about activities in the field of the use of nuclear energy in Lithuania and through the Permanent Mission of the Republic of Lithuania at the International Organizations in Vienna sent the prepared report to the IAEA. In compliance with the Protocol Additional following each quarter of a year reports were also sent on export from Lithuania of equipment and technologies under control.

In June, IAEA inspectors in accordance with the Protocol Additional requested and were permitted a comlementary access to the IAEA site in order to check whether no undeclared activities related to the use of nuclear energy were taking place.

In August, a comlementary access was conducted at the Institute of Physics.

In March EC inspectors implementing the EURATOM safeguards performed inspection at the Institute of Physics.

A summary of inspection activities by the IAEA, the EC and VATESI in 2006 is presented in Tables below together with data of two previous years and nuclear material accounting for comparison.

Table 1. **Summary of the IAEA, EC and VATESI inspection activities in Lithuania in 2006**

Item	2004	2005	2006
Total number of IAEA inspectors and technicians' working days in Lithuania	178	188	156
Number of EC inspectors' working days in Lithuania	20	8	8
Number of working days at facilities of VATESI inspectors engaged in the area of safeguards	25	25	20
Number of IAEA inspectors designated to conduct inspections in Lithuania	325	324	332
Number of EC inspectors designated to conduct inspections in Lithuania	191	190	181
Number of VATESI inspectors engaged in the area of IAEA safeguards	2	2	1

Table 2. **Data of nuclear materials accounting**

Item	2004	2005	2006
Number of reports	24	25	19
Number of entries	19,380	18,924	18,469
Amount of depleted uranium (tonnes)	20.3	20.9	21.1
Amount of enriched uranium (tonnes)	2211	2272	2291
Amount of U^{235} (tonnes)	27.7	28.5	28.2
Amount of plutonium (tonnes)	7.2	7.4	7.7

An IAEA regional technical meeting on the issues of the Protocol Additional was held in Vilnius on August 28–September 1, 2006. Some 40 representatives of European countries, the European Commission and IAEA participated at the meeting. Aspects of IAEA safeguards application were discussed at the meeting with emphasis laid on the peculiarities in the EU and the relation with the EURATOM safeguards applied by the EC.

Physical protection of nuclear materials and nuclear facilities

To strengthen international and national nuclear security, preparations were being made in 2006 for ratifying amendments to *The Convention on the Physical Protection of Nuclear Material*. To this end, the legislation governing physical protection was reviewed and updating priorities were identified.

Another step forward was taken in 2006 to ensure protection of nuclear material in Lithuania when a provision that obligates to identify design threat during transportation of nuclear material was added to the Law on Nuclear Energy.

In 2006, VATESI performed two inspections of physical protection assessment at the Ignalina NPP and one at the Maišiagala storage facility. During one of these rectification of deficiencies identified by previous inspections was examined at the INPP. In order to check compliance with *General requirements for physical protection of nuclear power facilities and nuclear materials* approved by the Head of VATESI on June 13, 2005, a control inspection of entry to the physical protection area was performed at the Ignalina NPP. Several non-compliances with the valid requirements of physical protection were revealed during the inspection, and the INPP was obligated to put them right. The identified drawbacks, however, pose no danger to safe operation of the nuclear power facility.

Considerable attention in 2006 was paid to updating the systems of physical protection at the Maišiagala storage facility.

As the threat of international terrorism persists, several technical meetings were arranged under the auspices of the IAEA in 2006, during which various documents were discussed on providing support to the IAEA Member States in enhancing their nuclear security systems. VATESI specialists also took an active part in this activity.

VATESI, aiming to improve physical protection and the skills of specialists of Lithuania's institutions working in this area, jointly with IAEA experts arranged a workshop in Lithuania, on October 24-26 on the subject of the threat of an inside enemy. Several Lithuanian specialists improved their skills in other international events arranged with support from the IAEA.

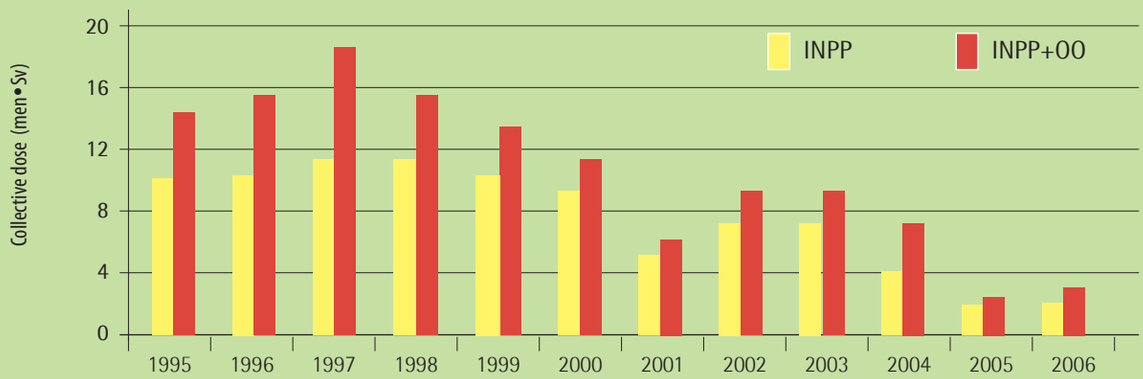
20. RADIATION PROTECTION OF NUCLEAR POWER FACILITIES

VATESI is the principal state institution in carrying out the functions of control and supervision of nuclear power facilities and performing state regulation of nuclear safety and radiation protection in nuclear energy. Therefore even before a license is issued for designing, constructing and operating a nuclear power facility (a nuclear power plant, a facility for managing or storing radioactive waste) it is necessary to ascertain that the facility will be operated in a safe manner. The main objective of radiation protection is to ensure protection of the population and environment against hazards that a nuclear power facility may pose. The requirements for a nuclear power facility are intended to ensure that the effects of ionizing radiation to the population and environment do not exceed the set limits during normal operation and even in case of accidents. Hence, VATESI is controlling compliance with license conditions and requirements set in safety regulations and standards during operation of the said facilities. It is compliance with these requirements and the use of relevant technologies and measures that help protect the population and environment from negative effects of ionizing radiation.

The Ignalina NPP is the largest nuclear power facility in Lithuania. The results of the occupational exposure control, monitoring of radiological impact to the population and environment show that the Ignalina NPP is being operated safely.

Since the beginning of operation the Ignalina NPP has been conducting occupational exposure control of its own personnel and that of contractors' organizations. In 2006, individual dosimetric control was applied to 4005 persons, including 2492 of INPP personnel. Distribution of external exposure collective doses in 1984-2006 is shown in Fig. 1.

Fig. 1. **Annual collective doses of INPP and other organizations (OO) personnel**



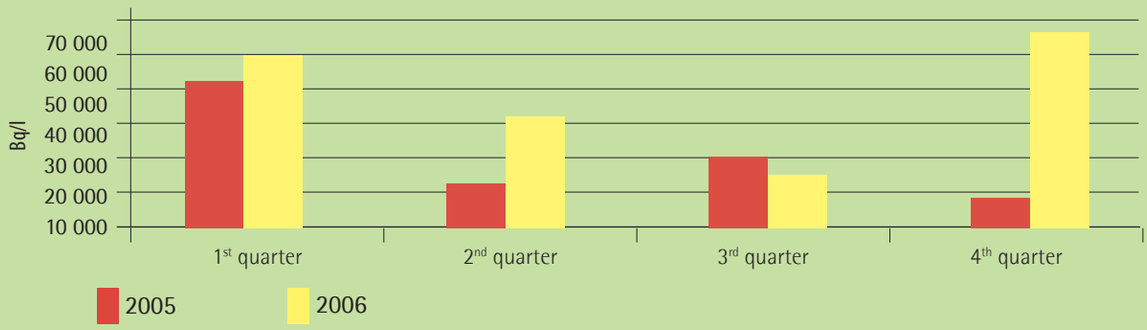
After Unit 1 was shut down, the collective personnel's exposure dose decreased in 2005-6. The largest collective dose is received during annual outage. Therefore the duration of this work is very important. In 2006, the annual collective dose of INPP and contractor organizations' personnel was 63% of the planned annual dose. In the course of the annual outage in Unit 2 the collective dose was 68.6% of the personnel's overall exposure dose. The mean individual dose of the INPP and contractors' organizations in 2006 was 0.85 mSv. Of all the personnel of the INPP, an employee of the reactor department was subjected to the largest dose (16.96 mSv). The largest individual dose received by an employee of contractors' organizations was 17.36 mSv. These doses did not exceed the set limit of 20 mSv.

To protect the environment and at the same time all the population, releases from the Ignalina NPP into the atmosphere and water bodies are restricted. In the course of radiation monitoring conducted at the Ignalina NPP releases were found to be very much below permissible levels. In 2006, emissions of inert gases into the atmosphere were 0.18%, those of radioactive aerosols 0.14%, and those of ^{131}I 2.28% of the permissible level set in the technological regulations. The total emission of radionuclides together with the water flowing into Lake Drūkšiai was 11.6% of the set limit. Evaluation of the dose received by the critical group of population in 2006 showed that the received dose resulting from releases into the atmosphere was several hundred and into the water several dozens times lower than the dose set in the standard document LAND 42-2001. The established dose rate in the sanitary protection and monitoring zones ranged from 0.06 to 0.16μSv/h, i.e. was the same as the natural background radiation.

The Maišiagala storage facility of radioactive waste is another nuclear power facility of Lithuania in which radioactive waste collected before 1989 from industrial enterprises, medical and scientific institutions is being stored. Just as in other nuclear power facilities, it must be ensured that the impacts of the radioactive waste on the environment and population are as negligible as possible.

Since 1994 radiological monitoring of the facility has been conducted, with exposure doses and environmental pollution being observed on a continuous basis. Tritium (3H) is the most important radionuclide at the Maišiagala storage facility. It accounts for more than 70% of the overall activity. The maximum activity of tritium in observation wells of the Maišiagala storage facility by quarter of 2005-6 is presented in Fig. 2. The measured values do not exceed the set limits.

Fig. 2. **Maximum values of tritium volumic activity in observation wells of the Maišiagala repository in 2005-6**



In order to reduce the possibility of radionuclides entering the environment even more, additional protection barriers that prevent ingress of water into the facility were installed in the storage facility with assistance from an international project, and the monitoring system was updated. The storage facility was covered with a high-density polythene membrane that prevents water from percolating from above. The possibility of radionuclide leaching from the facility is thus limited. Two additional observation wells were installed from which samples are taken on a regular basis and their radionuclide composition is determined. To find out whether or not toxic materials migrate from the storage facility, not only radionuclide composition but also chemical composition of samples will be analyzed in accordance with the updated program of monitoring. It will be possible to determine the efficiency of the additional barriers and their compliance with the set requirements when sufficient data is collected in accordance with the new program of monitoring.

21. RADIOACTIVE WASTE MANAGEMENT

After the Law of the Republic of Lithuania was passed on Radioactive Waste Management on May 20, 1999, much more attention is being given to the disposal of this kind of waste in our country and especially at the Ignalina NPP, the facility that generates most of it. The key principle of radioactive waste management is to manage it in such a manner that it poses no danger to the public and the environment and does not become an additional burden to future generations. This principle is followed in managing radioactive waste in Lithuania too.

Considerable amounts of solid radioactive waste generates from the operation of Ignalina NPP. The volumes of this type of waste accumulated by 2007 are summed up in the table below.

Amount of waste, m^3	Group 1 combustible	Group 1 incomb.	Group 2 combustible	Group 2 incomb.	Group 3	Total
Accumulated as of January 1, 2007	11,197	7878	2064	2651	789	24,579

In accordance with the condition 27 of the license issued for operating Unit 2 at the Ignalina NPP on September 15, 2004, the Ignalina NPP was to develop and approve with VATESI by July 1, 2006, the methodology of analysis of radioactive installations, systems and emergency situations. In 2006, VATESI submitted its comments and later on approved the document. The ways of systematizing, generalizing and analyzing information about radioactive waste facilities, their systems and potential emergency situations of the facilities at the Ignalina NPP are laid down in the document. The methodology will be used for producing the documents of safety analysis of radioactive waste management facilities.

The following projects were implemented at the Ignalina NPP in 2006 within the framework of the safety improvement program SIP-3/2006 in managing radioactive waste at the Ignalina NPP:

- Preservation of the filled sections of the storage facility of solid radioactive waste (building 157/1) with a view to preventing ingress of water into the sections and subsequent transfer of radionuclides with water into groundwater;
- Updating of the system of sorting and measuring of industrial waste in order to separate non-radioactive waste;
- Painting of the traveling gantry crane of the solid radioactive waste storage facility (building 157/1);
- Upgrading section 8 of solid radioactive waste storage facility (building 157/1) with a view to using it as an intermediate solid radioactive waste facility;
- Installing a cementation facility of pulps and spent ion-exchange resins, purchasing and assembling equipment.

In 2002, the Ignalina NPP produced and coordinated with institutions concerned a project on cementation of spent ion exchange resins and pearlite filters. VATESI specialists reviewed the preliminary SAR of the project aided by the SIP/RISKAUDIT consortium and Technical Support Organizations in accordance with the PHARE Project *Support to VATESI and Lithuanian TSOs in licensing activities related to decommissioning of Ignalina NPP*. VATESI issued a license for construction of the necessary facilities in 2003. In 2004, the storage and cementation facilities were constructed, and the final safety analysis report was produced, reviewed by VATESI specialists. On January 5-6, 2006, VATESI conducted an inspection to check the preparation for operating the facility for cementation and the cemented waste storage facility. On March 10, 2006, a license was issued for operating the storage facility for cemented liquid radioactive waste.

The Radioactive Waste Management Strategy approved by the Government of the Republic of Lithuania on February 6, 2002, provides for conducting investigations and submitting recommendations on constructing a near-surface repository for short-lived low- and intermediate-level radioactive waste. The Radioactive Waste Management Agency (RATA) is responsible for implementation of this measure. In 2004, RATA produced an environmental impact assessment program and a report for the RW repository. VATESI specialists reviewed the documents and submitted their comments. Based on the results of the report a decision will be made regarding the repository site in Lithuania. In 2005, *The program of engineering-geological studies of the site in Stabatiškė village of Visaginas Municipality proposed for a radioactive waste repository* was drafted. VATESI specialists reviewed the document and submitted their comments. The site is new, it was not analyzed in the environmental impact assessment report. The analysis of the supplemented report will be completed in early 2007. Then the decision will be made regarding the site for the repository.

On May 20, 2004, RATA submitted VATESI an application for a license for supervision of the Radioactive Waste Disposal Facility of Radon Type situated in Bartkuškis forest near Maišiagala. It was stated in the conclusions of the safety analysis report that the facility did not comply with criteria for a repository as it could not ensure long-term safety. In accordance with the provision of Article 16 of the Law on Radioactive Waste a decision was taken to license the facility as a storage facility. On May 26, 2006, VATESI, having approved the safety analysis report, issued a license for post-closure surveillance of the radioactive waste storage facility at Maišiagala.

In 2006, the Ignalina NPP submitted technical specification of a repository for very-low-level radioactive waste. VATESI analyzed it and expressed their comments. The repository is to be commissioned in 2009.

By the end of 2006, 20 CASTOR RBMK-1500 and 60 CONSTOR RBMK-1500 casks with spent nuclear fuel were transported from SNF storage ponds of INPP to the interim nuclear fuel storage of dry type (SNFS). On November 27, 2006, VATESI changed the conditions of the license for operating the SNFS and allowed to store another 18 CONSTOR casks there.

22. EMERGENCY PREPAREDNESS

International commitments

VATESI, whilst implementing the provisions of *The Convention on Early Notification of a Nuclear Accident* and the European Council Decision on Community arrangements for the early exchange of information in the event of a radiological emergency 87/600/Euratom, maintained close ties with the IAEA and emergency preparedness divisions of the EC.

In recent years the IAEA issued a new document *EPR-RANET IAEA Response Assistance Network*. This publication replaced the ERNET document *Emergency Response Network* issued in 2000 and updated in 2002. The publications are intended for practical implementation of *The Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency*. The countries that join the Assistance Convention are expected to envisage their capacities to help other countries should a nuclear or radiological accident occur there. In the recently published document the concept of this net was radically reviewed, and the functions of coordination transferred from the national level to international. The organizational structure of the network and the requirements for registration and participation in the network were changed. After the document came into force on May 1, 2006, the IAEA asked the Convention member countries to register their capacities in the

new network. On the other hand, EPR-RANET appendices in which the plan of assistance provision actions is drawn up, registration instructions are laid down and technical requirements for national reaction capacities are described was only issued in December. Therefore countries' registration in the RANET network will begin in 2007 only.

The draft of another important document produced by the IAEA *The Code of Conduct on the International Emergency Management System for Nuclear and Radiological Incidents and Emergencies* was discussed at the technical meeting held in Vienna in December. The main objective of the document is to help countries to implement the provisions of *The Convention on Early Notification of a Nuclear Accident.* In comparison with the Convention, the document would be much easier to change, and the field of its application is widened. It comprises incidents and radioactive releases to which the Convention is not applied. During the technical meeting numerous discussions were held and a lot of work was done in groups. A new draft document was prepared. However, some unsolved issues still remained. It was stated in the meeting's conclusions that the IAEA secretariat will prepare and submit to Member Countries for discussion the final draft proposals regarding the ways to address the remaining issues.

A meeting of authorized EU member institutions of the ECURIE system of urgent exchange of information about critical radiological situations of the European Union took place in Luxembourg in February. The aim of the meeting was to present information about the state of the ECURIE system and development prospects.

In the IAEA official system of early notification about radiological accidents (ENAC) information was presented in 2006 on two events, one of which had radiological consequences. On July 6, 2006, France's notification was announced to the effect that in one of its oncological hospitals from May 2004 to May 2005 due to inadequate skills of the personnel patients used to receive an increased dose of radiation. Burns appeared in sixteen patients treated as a result of exposure, and one of the patients died. Also, information was announced by Slovakia's authorized institution to the effect that on September 9, 2006, a box of safe type containing an Ir-192 radioactive source was stolen from a car adapted for carrying radioactive sources. In addition to these events VATESI received through official channels information by the public health agency of the United Kingdom about the widely commented event related to A. Litvinenko's poisoning with radioactive polonium.

Emergency preparedness of nuclear power facilities

The draft new version of the Ignalina NPP emergency preparedness plan was submitted to VATESI specialists for review. At two stages of coordination all the issues were solved that had not satisfied VATESI. However, the final plan will only be approved after it is coordinated with other institutions concerned. So far the plan does not comply with the requirements of the Fire and Rescue Department under the Ministry of Interior.

The inspection of emergency preparedness of the INPP was postponed to the end of the year as it was hoped that the process of coordination and approval of the delayed INPP emergency preparedness plan would be completed by then. Unfortunately, the validity of the plan was extended for another year, therefore inspection was limited to a check on implementation of the plan of correction measures of the INPP emergency preparedness inspection performed in July 2005. It was stated in the inspection's conclusions that the INPP was avoiding responsibility for radiation protection of the personnel of contracting organizations and that the working documentation in the Protected Emergency Response Center was managed in a negligent manner. The inspection commission noted that plans of correction measures are only aimed at putting right a specific drawback, which does not help to radically improve a faulty system, and that internal control of INPP emergency preparedness was insufficient. Concern was also expressed regarding the INPP emergency preparedness system that was basically not improving.

In accordance with its license conditions, the Radioactive Waste Management Agency conducted on December 20, 2006, an emergency preparedness exercise at the Maišiagala radioactive waste repository. This was the first exercise at this facility, therefore VATESI representatives took part in it as observers. Although the facility is relatively safe from the viewpoint of potential accidents, it should be noted that RATA specialists were very active. The exercise participants took practical actions in accordance with emergency procedures, although abundant snow and sharp wind were quite an obstacle. Certain drawbacks of planning, available equipment and experience were revealed during the exercise. However, they will be readily put right in the nearest future.

Emergency preparedness of VATESI

Part of computer soft- and hardware was updated at VATESI Emergency Response Center in 2006. Certain changes in systems and procedures were also made with a view to improving the system of duty.

The training program of VATESI Emergency Response Center specialists was continued. After the duty system was updated, all duty personnel of VATESI were trained to use it. Afterwards, as usual, the skills of the duty personnel are refreshed through weekly communication tests. In addition to the tests, the duty personnel participated in 8 international communication tests and exercises in exchange of information that were arranged by the IAEA, EC and the Council of the Baltic Sea States (CBSS) without announcing the time in advance. Some of the events were held after working hours.

Other specialists of the VATESI Emergency Response Center were given an opportunity to test their preparedness in common exercises held in 2006. The Fire and Rescue Department under the Ministry of Interior held on May 24-25 table-top exercise *The actions of state and municipality institutions in organizing protection of the population in the event of a radiation accident at the Ignalina Nuclear Power Plant.* VATESI and another 17 institutions took part in the exercise. The objective of the exercise was to improve preparedness of institutions, services and divisions managing extreme situations to react to and organize effective actions on mitigation of the effects, radiation reconnaissance and evacuation of the population in the event of a radiation accident at the Ignalina NPP. Since the accident causes and technical details in accordance with the exercise's scenario and rules were more or less ignored, and the Ignalina NPP was not represented in the event, VATESI was not able to imitate on a full scale the work of the ERC. On the other hand, the twelve specialists of the VATESI ERC, who took part in the exercise, were given plenty of time to delve into certain specific issues.

A second exercise with participation of VATESI ERC was held on October 4. The event was organized by the EC and imitated the national exercise FALKEN that was being held at that time in Sweden. In accordance with the exercise scenario, an accident occurred in Unit 1 of the Ringhals NPP in Sweden as a result of which radioactive substances leaked into the atmosphere. VATESI set the following tasks: to check the ERC capability to exchange information in accordance with *The Convention on Early Notification* and ECURIE procedures, to familiarize VATESI specialists that are not yet involved in activities of the ERC with work there, and to refresh the working skills of the ERC personnel. It was stated in the exercise report that all the objectives set for the exercise were attained. A plan of correction measures was drawn up in view of minor deficiencies that had been noted.

VATESI specialists had an opportunity to apply the considerable experience of exercises they gained not only by participating in exercises but also by taking part in their organization. Say, on May 18, the MODEM specialized exercise of the IAEA working group International Assistance was held. VATESI specialists produced the scenario for the exercise and provided information during its course. In the exercise countries participating in the project forecast spread of radioactive transfers with the use of different codes and exchanged computation results among themselves. On day one of the abovementioned table-top exercise *The actions of state and municipality institutions in organizing protection of the population in the event of a radiation accident at the Ignalina Nuclear Power Plant*, when emergency centers of municipalities were training, a VATESI representative was on the judges' team.

23. CONTRIBUTION OF LITHUANIAN SCIENCE TO IMPROVEMENT OF NUCLEAR SAFETY, COORDINATION OF ACTIVITIES OF TECHNICAL SUPPORT ORGANIZATIONS

In 2006, VATESI continued successful cooperation with the Institute of Physics (FI); the Nuclear Installations Safety Laboratory (NISL), the Laboratory of Nuclear Engineering Problems (LNEP) and the Materials Research and Testing Laboratory (MRTL) of the Lithuanian Energy Institute (LEI); the Department of Thermal and Nuclear Energy (DTNE), the Institute of Energy Technologies (IET), the Strength and Fracture Mechanics Center (SFMC) of Kaunas University of Technology (KTU); Materials Strength Department (MSD), the Institute of Welding and Material Research Problems (IWMRP), the Laboratory of Strength Mechanics (LSM), the Laboratory of Numerical Simulation (LNS) and the Department of Labor and Fire Safety (DLFS) of Vilnius Gediminas Technical University (VGTU); the State Institute of Information Technologies (SIIT); UAB ITECHA, and other organizations.

The main areas of co-operation between VATESI and Lithuania's technical support organizations (TSOs) are as follows:

- INPP safety analysis and justification.
- Expert services provided for VATESI.
- Development of new normative documents and review of the valid safety normative documents.
- Participation in various international projects.

The Coordination Council of VATESI TSOs has been set up with a view to using more efficiently the country's scientific and technological potential for solving nuclear energy safety issues and coordinating technical support by TSOs. The Coordination Council has on its staff two representatives from the Institute of Physics, Kaunas University of Technology, the Lithuanian Energy Institute, Vilnius Gediminas University of Technology, and one from the State Institute of Information Technologies (SIIT) and UAB ITECHA. A VATESI observer participates at the Council's sittings. Vidmantas Remeikis, Director of the Institute of Physics, was elected Chairman of the TSO CC at the sitting of May 23. During the same meeting the Institute of Chemistry was added to the list of VATESI TSOs.

The Institute of Physics (FI) in 2006 was implementing the program funded from the state budget *Radionuclide dynamics and balance in an ecosystem's components, and nuclear spectrometry development in material research and radiation safety*, the programs funded by the Lithuanian State Science and Studies Foundation *The studies of radioactive waste generation, its spread, impacts on the environment and humans, and their applications, Harmful*

effects of ionizing radiation on biomolecular systems, Assessment of exposure to ionizing radiation of test plants of Lake Drūkšiai, the project *A study of nuclide composition and developing a method for assessing decommissioning waste in building G1* ordered by the Ignalina NPP and funded by the Lithuanian State Science and Studies Foundation, the program funded by the Metrology Service *Developing metrology of ionizing radiation. I. Creating a state standard of a radionuclide activity unit* and the joint Lithuanian-French project funded by the Ministry of Education and Science *Waste characterization following reactor decommissioning.* Specialists of the Institute of Physics also participated in EU projects funded by PHARE, *Support to VATESI and its TSOs in assessing beyond-design-basis accidents of RBMK-1500 reactors, Support to VATESI and Lithuanian TSOs in the area of Ignalina NPP decommissioning licensing* and *Safety assessment and upgrading at Maišiagala radioactive waste storage facility.* In addition to the above activities, the FI was engaged in the following tasks related to nuclear and radiation safety:

- Conducting a review of documents in relation to the project being implemented at the INPP *Safety case of Burning Fuel of INPP Unit 1 in the Reactor of Unit 2* (jointly with specialists from KTU and VGTU).
- Review of the beyond-design-basis accident analysis documents by the Ignalina NPP (jointly with specialists from KTU and VGTU).
- Drawing up the program of radiological studies of INPP plant and equipment (jointly with the LEI).
- Studies of properties of the NPP long-lived radioactive waste important for disposal (ordered by RATA).
- Radiological studies of air within the zone of direct impact of the Ignalina NPP (ordered by the Environmental Protection Agency).
- Radiological studies of air in the town of Vilnius (ordered by the Environmental Protection Agency).
- Analysis of radiological consequences of design-basis accidents at the Ignalina NPP (ordered by LEI).
- Technical support in licensing the integrity monitoring of the Ignalina NPP reactor core (ordered by *Serco Assurance*, the UK).
- Measuring radionuclides in water samples (ordered by CRIIRAD, France).

One of the main lines of activity of the **Nuclear Installations Safety Laboratory (NISL)** of the Lithuanian Energy Institute **(LEI)** in 2006 was related to safe operation of the Ignalina NPP.

In 2006, the NISL of the LEI finisheded work jointly with INPP within the framework of agreement *Burning fuel of Ignalina NPP Unit 1 in Unit 2.* In the course of the project implementation the on-site transport container for spent fuel transportation, its transporter, guide shielding shafts, moving biological shielding, grab and other equipment, ensuring safe and reliable nuclear fuel transportation from Ignalina NPP Unit 1 to Unit 2 reactor, were developed, designed and manufactured. This is a technology first developed in the history of operation of nuclear reactors. The following safety upgrading and justification work was done in 2006:

- Rejection of sensors based on results of the 2005 diagnostics in Unit 2,
- The assessment of probability of graphite-pressure tube gap closure in individual reactor cells in INPP Unit 2 and forecast of gap changes.
- Investigation of the parameters of hydride cracking and preparation of the realization of the analysis of 'leak before break' concept for the pipings of fuel channels with TMO-2,
- Development of a set of equipment intended for picking of spent fuel debris in the hot cells of Ignalina NPP.
- The system of control of air-tightness of the coating of thermal elements of irradiated fuel assemblies following a prolonged storage.
- Probabilistic analysis of the INPP safety.
- Analysis of radiation consequences of design-basis accidents in Ignalina NPP Unit 2 after loading uranium-erbium fuel of 2.8% enrichment.

NISL is one of TSOs that has maintained close contact with VATESI for many years. In 2006, its specialists performed review of INPP documents related to the configuration of the reactor core, changes in and control of physical characteristics, as well as other issues of reactor physics and storage and management of radioactive waste. They also analyzed documents concerning common- cause failures of safety-related systems and their components at the Ignalina NPP. During review independent computations were made based on which the conclusions were drawn.

In 2006, the project *Preparing instructions for managing beyond-design-basis accidents at the Ignalina NPP* was completed in cooperation with Jacobsen Engineering Ltd (the UK), Volian Enterprises and SCIENTECH (the USA). A joint project with German State Nuclear Reactor Safety Consulting Association (GRS) aimed at analyzing the Accident Confinement System at the INPP was completed. The efficiency of retention of radionuclides in the ACS compartments and the hydrogen distribution in the event of a beyond-design-basis accident were analyzed in the course of the project. In 2006, a report on the data of fuel spent in the RBMK-1500 reactor of the Ignalina NPP was prepared to the order of *Gesellschaft für Nuklear - Service mbH (GNS).* In the report data was systematized on characteristics of spent fuel assemblies at the INPP. Verification computations were made jointly with Serco Assurance (the UK) in continuation of the project *Technical support in licensing the Ignalina NPP* with a view to ascertain the suitability of the developed method for constructing macroscopic cross-sections of two groups of materials in RBMK-1500 reactor. The aim of the work is to provide the relevant software to VATESI.

In 2006, specialists of the NISL assisted or participated in implementing the following projects:

- Research of the impact of linear power criteria violation on fuel element during transients in the reactor core.
- Analysis of the impact of uncertainty and sensitivity parameters on the modeling results of transients.
- The PHARE project *Support to VATESI for important tasks relevant to the licensing activities of Ignalina Nuclear Power Plant.*

The NISL completed in 2006 three top priority projects supported by the Lithuanian State Science and Studies Foundation, *The Methodology of analysis of beyond-design-basis accidents at the Ignalina NPP Units 1 and 2, The effects of external events on safety of the Ignalina NPP and other nuclear facilities,* and *The studies in the process of aging of RBMK fuel channels and identification of safe operation criteria.*

Employees of NISL went on taking an active part in the EU Sixth Framework Program SARNET network, intended for phenomenology of severe accidents and integration of European research on their management, in NULIFE competence network, in Fifth Framework NESC III project, ISP-47 and activities of IRIS projects. It should be noted that NISL scientists continued research in one of the largest international research programs PFEBUS FP intended for safety of water-cooled nuclear reactors and research in severe accidents, as well as in the new promising thermonuclear energy program that is the focus of great interest *The economic benefits of review of the evacuation zone and protection measures around NPPs with innovative low- and medium-capacity reactors in the regions where reactors are used for generating electricity and heat.*

The **Laboratory of Nuclear Engineering Problems (LNEP, LEI)** in 2006 implemented or participated in implementation of the following projects:

- Designing and construction of an interim storage facility of dry type for spent nuclear fuel assemblies from INPP Units 1 and 2. In 2006, the LNEP specialists produced the Environmental Impact Assessment Report and a preliminary Safety Analysis Report;
- Preparing the program of radiological research of INPP plant and equipment;
- Preparing preliminary criteria of waste acceptance into a repository of landfill type;
- The PHARE project *Safety assessment and upgrading of Maišiagala radioactive waste repository.* LNEP specialists produced the Safety Analysis Report and developed a database in which all the information is accumulated on radioactive wastes stored at the Maišiagala repository, and performed comprehensive analysis of nuclide composition;
- Studies and application of radioactive waste generation, scattering, impact on the environment and humans (funded by the Lithuanian State Science and Studies Foundation);
- The concept and safety of an intermediate-depth repository for long-lived radioactive waste;
- Analysis of INPP Unit 1 decommissioning and radioactive waste management;
- The new facility for managing and storing solid radioactive waste at the Ignalina NPP (the 2006-8 project). The Laboratory's specialists are producing the facility's environmental impact assessment and safety analysis reports;
- The environmental impact assessment of the reconstruction of the bituminized radioactive waste storage facility (building 158) into a repository.

LNEP specialists participated in the research program coordinated by the IAEA *The use of numerical models in geological characterization and safety assessment of deep geological repository sites* and in the activities of the Technical Group on Decommissioning (TEGDE) of the IAEA and in the organizing committee developing an international data base on irradiated graphite.

Specialists of the LNEP in 2006 participated in the Sixth Framework Programs of the EC, SAPIERR (Support Action: Pilot Initiative for European Regional Repositories) and FUNMIG (Fundamental Processes of Radionuclide Migration)

Specialists of the **Materials Research and Testing Laboratory (MRTL)** in 2006 continued *The study of degradation induced by hydrogen in the zirconium coating of fuel cells* which is being implemented within the framework of the research project coordinated by the IAEA *Slow hydrogen-induced cracking of fuel cell zirconium-based alloy.* The aim of the study is to develop harmonious experimental methodologies for measuring the rate of slow hydrogen-induced cracking in fuel cell piping of zirconium-based alloy that would make it possible to exchange similar results among different laboratories. The MRTL jointly with NISL in this field of research participated in the project of the Lithuanian State Science and Studies Foundation *The studies in the process of aging of RBMK fuel channels and identification of safe operation criteria* completed in 2006.

In 2006, the MRTL jointly with NISL in accordance with a contract with the INPP conducted the study *Investigation of the parameters of hydride cracking and preparation of the realization of the analysis of 'leak before break' concept for the pipings of fuel channels with TMO-2.*

In 2006, the MRTL in accordance with a contract with the INPP conducted the study *Justification of the resource of a control rod of the control and protection system in INPP Unit 1.* The condition was studied of the CPS rods of the Unit whose operation was discontinued.

Thermonuclear power research was commenced within the framework of the FUSION (thermonuclear synthesis) program *Study of wolfram coatings used in reactors of thermonuclear synthesis.*

The divisions of **Kaunas University of Technology (KTU)** in 2006 rendered expert services to VATESI. The DTNE,

IET and SMFC checked implementation of measures envisaged in items 19, 34 and 35 of SIP2/2004 program related to recommendations given in the safety case of the Accident Confinement System (ACS). They also participated in final work and in discussing with the Ignalina NPP the results of reviews performed in 2005.

The Institute of Energy Technologies and the Department of Thermal and Nuclear Energy (DTNE) of KTU took part in preparatory work and training sessions for future reviews and analysis of severe accident management and transition to fuel containing erbium.

In late 2006, the SFMC started a safety assessment review and verification computations of Du-300 pipes with cracked welds left for further operation.

Scientists from the KTU and FI were involved in PHARE project LT2003/5825.02 *Support to VATESI and Lithuanian TSOs in licensing activities related to decommissioning of Ignalina NPP.*

Specialists from **Vilnius Gediminas Technical University (VGTU)** jointly with the KTU and FI performed review of documents related to burning fuel from Unit 1 in Unit 2 of the Ignalina NPP. The work was done by specialists from the Materials Strength Department (MSD), together with their colleagues from the Department of Steel and Timber Structures, the Department of Labor and Fire Safety (DLFS), the Laboratory of Numerical Simulation (LNS), and the Laboratory of Strength Mechanics(LSM). The fire protection measures proposed in the project were analyzed, as well as the decisions regarding modification of buildings, strength, reliability and testing methodology of installations (protection shafts, stands, lifting machinery, etc.).

The Laboratory of Numerical Simulation (LNS), the Materials Strength Department (MSD), and the Laboratory of Strength Mechanics(LSM) jointly with the LEI participated in the project funded by the Lithuanian State Science and Studies Foundation *Developing methodology of analyzing beyond-design-basis accidents at the Ignalina NPP Units 1 and 2.* Scientists of VGTU and the Institute of Geology and Geography produced methodology of determining design seismic effects on the site of the Ignalina NPP in which the latest information on the seismogenic condition of the INPP region and its peculiarities is assessed.

Specialists of the Materials Strength Department and the Laboratory of Nuclear Hydrophysics participated in the PHARE project *Support to VATESI and its TSOs in assessment of beyond-design-basis accidents for RBMK-1500 reactors.*

Specialists of the Institute of Welding and Material Research Problems (IWMRP VGTU) continued research on the subject *Review of documents related to analysis of BDBAs at INPP.* A group of VGTU experts jointly with scientists from the FI are analyzing the procedures for managing beyond-design-basis accidents at the Ignalina NPP.

In 2006, VGTU specialists performed expert review of the document *Analysis of residual stresses in welds, TASpd-1145-72099.*

Experts from **UAB ITECHA** in 2006:

- Continued review begun in 2005 by participating in project 2004/016-925-05-01.01 *Support to VATESI in assessing and licensing the design of new servo drives and their commissioning in INPP Unit 2.*
- Participated in the project *Review of documents related to BDBAs at the Ignalina NPP* (under subcontractor agreement with the FI).

The activities of the **State Institute of Information Technologies (SIIT)** in 2006 were mostly related to practical tasks of Ignalina NPP safety improvement. SIIT experts implemented the following safety improvement projects and their safety cases:

- Modernization of AKRB-06 and GORBACH radiation monitoring system.
- Justification of service life extension of continuous power supply unit ABP-1500 in INPP Unit 1.
- Developing a safety code for the diverse shutdown system AZ/BSM for INPP Unit 2.
- The system for detecting coolant leaks in the reinforced compartment of INPP Unit 2.
- Designing the erection of lower water communication compartments of exhaust ventilation 2WZ56 of bypass piping in INPP Unit 2.

24. TRAINING AND IMPROVING SKILLS OF VATESI SPECIALISTS

Fifty-two employees, 17 women and 35 men, were working with VATESI as of late 2006, 38 of them were civil servants.

Two specialists were accepted to civil service with the Licensing Division and one as the head of VATESI in 2006. Five employees left VATESI.

In 2006, 39 VATESI employees improved their skills at different training events in Lithuania and abroad.

VATESI employees, and nuclear safety specialists in particular, enjoy excellent opportunities for improving skills and making use of the support provided by international organizations, EU institutions and foreign countries. The IAEA is the main international organization providing assistance in extension of knowledge of specialists in nuclear power. Thirteen VATESI specialists took part at 21 training events related to regulation of nuclear safety arranged by the IAEA in 2006. Five training events were arranged with support from the EU; 5 VATESI specialists improved their skills there.

After Lithuania decided to construct a new nuclear power plant the training of VATESI employees, and new ones in particular, becomes a task of great importance. VATESI needs to assess experience of other countries constructing nuclear power facilities, especially that of Finland, and without delay to start preparing for construction of a new NPP, and planning hiring and training specialists in nuclear energy. New specialists and those working now will have to be purposefully prepared for supervision of construction of a new power unit. They should be given an opportunity to have in-service training in countries that have experience in construction of new nuclear reactors. The organization operating Lithuania's new NPP and VATESI will have to work with large international companies, to master new cooperation methods and to use the best international practice.

25. PUBLIC INFORMATION

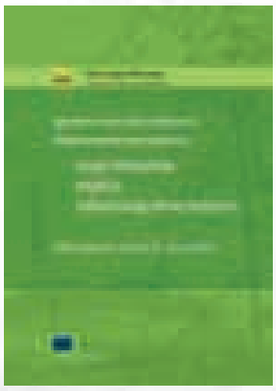
In 2006, as in previous years, discussions on construction of a new nuclear power plant in Lithuania were the focus of attention of the public and media. These discussions were continuously covered by the media. Numerous topical publications appeared in the country's press, and the issues were analyzed in radio and TV programs. Radioactive waste management and the decommissioning of the Ignalina NPP also received considerable attention on the part of the media and public.

Visit of the Prime Minister of the Republic of Lithuania Gediminas Kirkilas to VATESI. December 19, 2006.

The European Union provided substantial support for the Ignalina NPP decommissioning through PHARE projects aimed at upgrading nuclear safety. In 2006, as part of the PHARE project No. 2003/5825.02 *Support to VATESI and Lithuanian TSOs in licensing activities related to decommissioning of Ignalina NPP,* with the assistance from the staff of the Decommissioning and Radiation Protection Division of VATESI, the publication *Decommissioning of the Ignalina Nuclear Power Plant: safety requirements, projects, radioactive waste management* was prepared and issued in October. The aim of the publication was to inform the public about the most important projects of the INPP decommissioning and radioactive waste management. It also contained information about the principal work of this PHARE project done in the course of implementation of three of its stages: production of legal documents, review of documents submitted by the Ignalina NPP and the Radioactive Waste Management Agency (RATA), and enhancement of VATESI and Lithuanian TSOs (The Institute of Physics and Kaunas Technological University).

The work envisaged for the project stages was completed in November of 2006. The brochure *Decommissioning of the Ignalina Nuclear Power Plant: safety requirements, projects, radioactive waste management* was published in Lithuanian and English. It is circulated in different events, conferences and is also available at the Information Division of the Ignalina NPP. The electronic version of the publication in English is obtainable from the VATESI website at http://www.vatesi.lt/dokumentai/brosiura-eng.pdf.

Renewal of VATESI website **(http://www.vatesi.lt)** is about to be completed. An updated version of the website will come into use shortly. It will considerably facilitate the search for topical information on nuclear energy safety issues.



The press conference *How we shall improve nuclear safety in Lithuania* was held at VATESI on May 26, 2006. During the event journalists were informed about coordination of the lines of nuclear safety assurance as well as about accounting for implementation of *The Joint Convention on Safe Management of Spent Fuel and Radioactive Waste.* An **IAEA regional technical meeting on issues of implementation of the Protocol Additional** was held in Vilnius on August 28–September 1. Representatives of the IAEA, the European Commission and European countries participated in the meeting. General issues were discussed in the event, and countries shared their national experience in the subject area.

Gediminas Kirkilas, the Prime Minister of the Republic of Lithuania, visited VATESI on December 19, 2006. During the visit the Prime Minister was thoroughly informed about the Inspectorate's activities. The most topical issues related to the construction of a new nuclear power plant were discussed. The prime minister visited the Emergency Response Center of VATESI and displayed active interest in its work.

Information about VATESI events, important meetings and specialists' visits was published and updated on the VATESI website on a weekly basis. Reports on VATESI activities were produced and submitted to the Council of the Baltic Sea States.

The year 2006 witnessed active participation in training sessions and exercises of the Emergency Response Center of VATESI.

26. NUCLEAR SAFETY REGULATION IN THE EUROPEAN UNION

The Convention on Nuclear Safety and the national law of the Convention member countries unequivocally attach complete responsibility for ensuring nuclear safety to organizations operating nuclear power facilities. Every country, while complying with international agreements and national legislation, must develop the necessary infrastructure of nuclear safety regulation, set mandatory nuclear safety requirements, standards and rules, assess nuclear safety of NPPs and other nuclear power facilities operational in the country, license them, apply the relevant enforcement measures if the requirements are not complied with and the level of nuclear safety starts deteriorating.

The EURATOM treaty provides certain competence to the European Commission in the area of regulation of nuclear energy and nuclear safety essentially related to the health of humans and the environmental protection. The Atomic Questions Group (AQG) of the European Council is the main forum in which the most important issues of nuclear energy are discussed as well as draft guidelines, resolutions, regulations and other documents prepared by the European Commission. Specific nuclear safety problems are of greatest importance at the meetings of the AQG and its Working Party on Nuclear Safety (WPNS). VATESI is represented at the meetings of the said institutions.

In 2006, the following issues directly related to VATESI activities were discussed:

- transportation of radioactive and nuclear material;
- the EU support for nuclear safety improvement in third countries;
- information about WENRA activities in the area of the lines of coordination of nuclear safety regulation;
- draft reports by the subgroups on reactor safety, radioactive waste management safety and decommissioning safety set up by the WPNS on nuclear safety in the EU countries;
- EURATOM safeguards in the area of non-proliferation of nuclear weapons and nuclear material, transition from bilateral (the IAEA – the country) to trilateral (the IAEA – EURATOM – the country) safeguard agreements.

Upon Lithuania joining the EU, a VATESI representative became a full and equal member of the Regulatory Assistance Management Group (RAMG). The Group analyzed projects within the framework of TACIS support program to nuclear safety in Russia, Ukraine, Armenia and other countries, and PHARE support program to Bulgaria and Romania.

For many years working groups functioned under the auspices of the European Commission: the European Group of Concentration on European Regulatory Tasks (CONCERT) and Nuclear Regulators Working Group (NRWG).

In 2004-5 as a result of discussions a decision was made to merge the two groups by setting up a new one, the European Nuclear Regulation Experts Group (ENREG). In 2006, owing to disagreements between the European Commission and nuclear safety regulating institutions of member countries, the efforts to approve a new statute of the group (TOR) ended in failure.

As there was no finally approved statute of the group and a clearly defined mandate for its activities was not known, VATESI did not recommend its representative to the group. The group did not start its activities in 2006.

VATESI remains of the opinion that the best results in assuring nuclear safety can be achieved on the basis of legally binding national requirements complying with the best international practice as well as fundamental nuclear safety requirements and standards of the IAEA, set by EU member countries. VATESI is offering comprehensive assistance to WENRA in activities of coordinating the lines of nuclear safety regulation and is taking an active part in it.

VATESI is preparing or participating in preparation of Lithuania's position regarding documents being discussed in the EU institutions in the field of nuclear energy. In 2006, VATESI prepared positions, coordinated positions submitted by other organizations and 7 times expressed comments on these.

Representatives of the European Commission and the EU chairing country tried to coordinate actions of EU members in preparing the EC's and countries' reports in accordance with *The Joint Convention on Safe Management of Spent Fuel and Radioactive Waste* and arranged sittings of delegations participating in the Convention review meeting. Advance discussion of positions at the meetings of delegations is useful. However, the uncertainty of the competence and responsibility of the European Commission as the member of the Convention sometimes led to unnecessary minor tension in common work.

27. VATESI PARTICIPATION IN ACTIVITIES OF WESTERN EUROPEAN NUCLEAR REGULATORS' ASSOCIATION (WENRA)

Nuclear safety institutions of European Union countries that have NPPs and Switzerland established in 1999 the Western European Nuclear Regulators' Association (WENRA). To achieve its key objective of improving nuclear safety, the Association has been developing cooperation among the heads of Europe's institutions of nuclear safety regulation,

encouraging exchange of experience among the regulators and learning best practice. It has been developing the lines of nuclear safety and its regulation that are worth following, independently assessing nuclear safety and its regulation system in EU candidate countries. All decisions by WENRA are consensus-based. At WENRA meeting held in Paris on March 14, 2003 new aims of the Association activities were approved and new members were accepted. Since then nuclear safety regulation institutions of Belgium, Bulgaria, the Czech Republic, Finland, France, Germany, Hungary, Italy, Lithuania, the Netherlands, Romania, Slovakia, Slovenia, Spain, Sweden and the UK are represented in the Association. WENRA's activities are open, it informs EU institutions about the work done. Representatives of countries that do not have nuclear safety regulating institutions are sometimes invited to its meetings.

Two WENRA meetings, in Madrid and Stockholm, were held in 2006. The focus of attention in 2006 was on harmonization of nuclear safety regulation based on benchmark reference safety levels recommended by WENRA and covering 18 areas (topics) of regulation. In 2006, WENRA produced benchmark reference levels for decommissioning and radioactive waste management. WENRA member countries assess their regulation systems on the basis of these reference levels. The Reactor Harmonization Working Group (RHWG) and the Working Group on Waste and Decommissioning (WGWD) analyze WENRA reference levels and introduce necessary changes. Saulius Švirmickas and Algirdas Vinskas from VATESI have been working with the groups for several years now. It should be noted that WENRA member countries set a goal to finish harmonizing the national nuclear safety assurance approaches by 2010.

WENRA held a workshop in Brussels on February 9, 2006, on issues of harmonization of safety approaches in nuclear safety regulation. A report on reactor safety harmonization was published on WENRA website. Heads of nuclear safety regulating institutions, representatives of the IAEA, specialists from NPPs, representatives of nuclear energy industry, scientists, representatives of the media and public organizations participated at the Brussels workshop. High officials of the European Commission and specialists of atomic energy and nuclear industry also came to the event. The compilers of nuclear safety requirements were invited to express their comments on the harmonization work done by WENRA and the prepared reference levels of nuclear safety. A large group of nuclear energy specialists from Lithuania representing VATESI, the Ignalina NPP and the Ministry of Economy took part at the workshop.

Nuclear safety institutions assisted by NPPs, whist implementing the plan of harmonization work, drew up a preliminary plan of WENRA member countries' nuclear safety harmonization covering both national nuclear safety requirements and compliance with these at nuclear power facilities. VATESI's preliminary plan was presented at the WENRA meeting in Stockholm. The plan is being specified and approved. The necessary measures of harmonization are to be implemented by 2010.

It was stated at WENRA meetings that harmonization working groups have gained considerable experience that in the future should be used to widen the activities and include new areas, say, safety of radioactive waste repositories.

28. WENRA SAFETY REQUIREMENTS HARMONIZATION PROGRAM

Two working groups, the Reactor Harmonization Working Group (RHWG) and the Working Group on Waste and Decommissioning (WGWD) were set up in order to achieve the goals of the Western European Nuclear Regulators' Association (WENRA). VATESI is represented in both.

Activities of the Reactor Harmonization Working Group

The objectives of the Reactor Harmonization Working Group set up in 1999 are as follows:

- To identify major differences in the valid WENRA member countries' requirements for reactor safety;
- If necessary, to propose ways of harmonizing reactor safety.

The working group began its activities by conducting a pilot study within the framework of which six selected areas of reactor safety were analyzed. At the time, six countries participated in the study. In 2002, the pilot study was completed, and the decision was made to continue the work. The RHWG was instructed to identify the key areas of reactor safety that needed harmonization.

Eighteen topic areas of reactor safety were selected. At stage one the benchmark reference levels were identified, and in 2004-5 stage two was commenced. National regulatory documents of each country were compared to the benchmark reference levels. Lithuania joined the effort (in all, 17 countries were represented in the working group). In 2004, reference levels in 8 areas were reviewed, and in 2005 all the remaining ones. Shortcomings were revealed when reviewing national regulatory documents for comparison with the reference levels, therefore all the comments received from countries participating in WENRA activities were carefully analyzed.

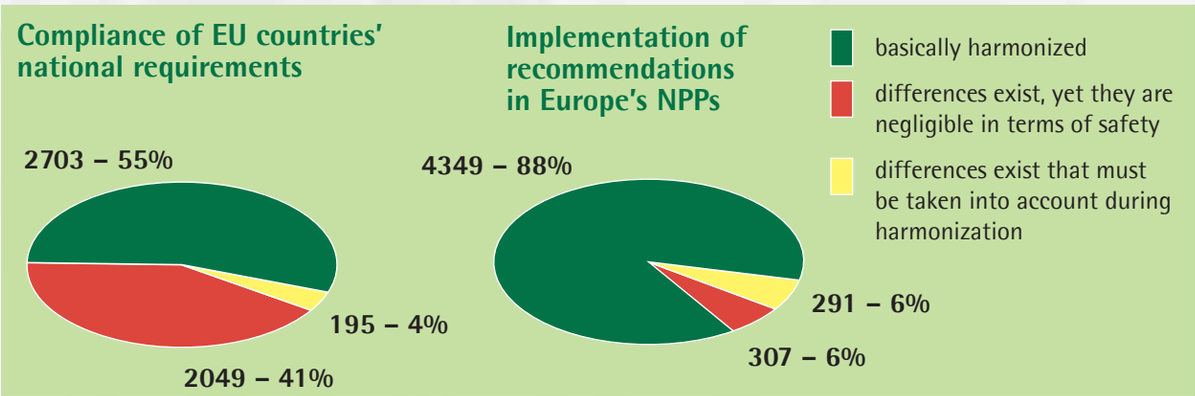
In late 2005, a report of the working group was produced and presented at the main meeting of WENRA. To sum up the results of the study, it can be stated that the bulk of European national requirements have already been brought into line, as the countries participating in the study when developing national requirements more often than not take into consideration international practice, as well as the IAEA standards and recommendations. Implementation of WENRA recommendations at Europe's NPPs has largely been harmonized, too. Thus, although some countries still do not have formalized requirements in certain areas, the operating organizations follow informal requirements that were not taken into account in the study or standards and recommendations set forth by the IAEA.

In 2006, VATESI drew up a preliminary plan for rectifying non-compliances. In accordance with the plan, 8 new documents are to be produced and 4 existing ones supplemented.

In early 2006, WENRA presented a report of the working group. Following the presentation WENRA and its working group received comments and recommendations regarding the benchmark reference levels. Therefore an additional meeting of the working group was held in 2006 to assess the recommendations and comments and to propose a new edition of the benchmark reference levels. By late 2006, the new edition was approved by all member countries and work began on a new version of a plan of actions taking into consideration the alterations made. All countries' plans will be presented at the WENRA meeting due to take place in March of 2007. The implementation of the plan is to be completed in 2010.

Activities of Working Group on Waste and Decommissioning (WGWD)

In late 2001, WGWD launched a project aimed at harmonizing requirements effective in WENRA member countries in the area of decommissioning and operation of radioactive waste storage facilities. The aim of the project is to identify safety reference levels that WENRA members will have to comply with. If necessary, national requirements will be adjusted. Safety reference levels are set considering the currently existing legislations and international recommendations.



In late 2005, the WGWD produced two reports in which it laid down safety reference levels for decommissioning and operation of radioactive waste storage facilities. The information was published on the internet in early 2006 and institutions concerned could express their comments. Comments were received from the IAEA, ENISS (European Nuclear Installations Safety Standards group) and other institutions. In 2006, three WGWD meetings were held, at which the comments were discussed and safety reference levels changed accordingly. At present the WGWD countries are conducting additional analysis of their legislation and submitting proposals concerning harmonization by indicating in what areas of operation of radioactive waste storage facilities changes need to be made so that legislation complies with the safety reference levels.

29. INTERNATIONAL CONVENTIONS, LAWS AND SECONDARY LEGISLATION

Upgrading of nuclear safety remains one of top priorities for Lithuania after it declared in the National Energy Strategy its ambition to construct a new nuclear power plant. To ensure nuclear safety, every country must create effective infrastructure and legal basis.

The key principles and requirements governing nuclear safety are set forth in international conventions. Lithuania has joined the following international agreements and conventions directly related with safe use of nuclear energy:

1. The 1968 Treaty on the Non-Proliferation of Nuclear Weapons. Lithuania joined it by Resolution No. I-1492 of the Seimas on 23 September 1991.

In 1992, **The Agreement between the Lithuanian Government and the IAEA on Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons** was signed, and in 2000, the Seimas ratified **The Protocol Additional to the Agreement between the Lithuanian Government and the IAEA on Application of Safeguards** (Law No. VIII-1578 of 21 March 2000) and **The 1959 Agreement on Privileges and Immunities of the International Atomic Energy Agency** (Law No. IX-78 of 14 December 2000).

2. The 1963 Vienna Convention on Civil Liability in the Field of Nuclear Energy, and **The 1988 Joint Protocol Relating to the Application of the Vienna Convention and Paris Convention.** On 30 November 1993, the Seimas declared these having the force of law in Lithuania (Law No. I-314).

3. The 1986 Convention on Early Notification of a Nuclear Accident. The Government of the Republic of Lithuania joined the Convention on 13 October 1994 (Government Resolution No. 972).

4. The 1979 Convention on Physical Protection of Nuclear Materials. Lithuania joined the Convention on 16 November 1993 (Order of Prime Minister of Lithuania No. 778p).

5. The 1994 Convention on Nuclear Safety. Ratified by the Seimas on 17 October 1995. (Resolution No. I-1063).

6. The Comprehensive Nuclear Test Ban Treaty. Ratified by the Seimas on 28 October 1999 (Law No. I-1372).

7. The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, ratified by the Seimas on 20 July 2000 (Law No. VIII-1882).

8. On 18 December 2003, the Seimas ratified **The 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management** (Law No. IX-1921).

In 1997, the following conventions were signed: **The 1997 Convention on Supplementary Compensation for Nuclear Damage,** and **The Protocol Replacing the Vienna Convention.** These, however, have not been ratified to date.

Amendments to The Convention on Physical Protection of Nuclear Materials were signed in 2005. Lithuania will seek to ratify these in 2007.

Ratification documents of trilateral Agreements between EU member states, the IAEA and EURATOM were approved in 2007. The draft Law on ratification of Agreements has been submitted to the Seimas. After the documents come into force, **The Agreement between the Lithuanian Government and the IAEA on Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons** and **The Protocol Additional to the Agreement between the Lithuanian Government and the IAEA on Application of Safeguards** will lose validity.

National legislature in the field of nuclear safety

The main legal document governing nuclear energy in Lithuania is the **Law on Nuclear Energy** passed by the Seimas in 1996. There are some other laws directly relating to safe operation of nuclear energy, such as the **Law on Radioactive Waste Management**, the **Law on Radiation Protection**, the **Law on Control of Import, Export and Transit of Strategic Commodities**, the **Law on Civil Protection**, the **Law on Construction**, etc.

After Lithuania started planning and carrying out preparatory operations of Ignalina NPP decommissioning, the following laws were passed related to the decommissioning:

- **The Law of the Republic of Lithuania on Decommissioning of Unit 1 of the State Enterprise Ignalina Nuclear Power Plant (2000).**
- **The Law of the Republic of Lithuania on Decommissioning Fund of the State Enterprise Ignalina Nuclear Power Plant (2001).**
- **The Law of the Republic of Lithuania on Additional Employment and Social Guarantees for the Employees of the State Enterprise Ignalina Nuclear Power Plant (2003).**

Legal regulation of construction of a new nuclear power plant

Work began in late 2006 related to construction of a new nuclear power plant. Working groups were set up to draft the law on construction of a new NPP.

The current legislation governing the use of nuclear energy for peaceful purposes is intended for the Ignalina NPP as a state company. Therefore the legal base in this area needs to be reviewed, a new edition of the **Law on Nuclear Energy** needs to be drafted and other changes in legal documents adopted, as well as new legislation such as the **Law on Nuclear Safety.**

30. REPORTING FOR IMPLEMENTATION OF OBLIGATIONS UNDER THE CONVENTION ON NUCLEAR SAFETY

Lithuania signed the Convention on Nuclear Safety on March 22, 1995, and submitted the ratification papers on June 12, 1996. The Convention came into force on October 24, 1996.

The aims of the Convention on Nuclear Safety are as follows:

- achieving and maintaining a high level of nuclear safety worldwide, by consolidating international measures, including international cooperation as well as technical cooperation related to safety assurance;
- developing and maintaining efficient measures of nuclear installation protection against potential radiological hazard, with a view to protecting humans and the environment from dangerous effects of ionizing radiation, emitted by these installations;
- preventing accidents with radiological impacts, and mitigating their effects if they do occur.

As of May 11, 2006, 65 countries have signed the Convention and 59 joined it.

Meetings of the Contracting Parties under the Convention on Nuclear Safety are held every three years. The third meeting was held in April of 2005, and the fourth one is to take place on April 14, 2008. Lithuania must prepare and submit to the IAEA by September 28, 2007, a national report on implementation of the Convention.

As in previous years, alongside VATESI that is coordinating the work, the Ministry of Environment, the Ministry of Internal Affairs (the Fire and Rescue Department), the Ministry of Health (the Radiation Protection Center), the Ministry of Economy, and the Ignalina NPP will be involved in production of the report.

31. REPORTING FOR IMPLEMENTATION OF OBLIGATIONS UNDER THE JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND SAFETY OF RADIOACTIVE WASTE MANAGEMENT

Lithuania signed the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management on September 30, 1997, and ratified in on December 18, 2003. The Convention came into force in Lithuania on June 14, 2004.

Lithuania like other Contracting Parties in accordance with provisions of the Article 32 of the Convention must submit a report on implementation of obligations undertaken.

In 2005, VATESI coordinated the production of Lithuania's first National Report. VATESI specialists prepared the document jointly with representatives of the Ministry of Health (the Radiation Protection Center), the Ministry of the Environment, the Ministry of Economy (the Radioactive Waste Management Agency), the Ministry of Internal Affairs (Fire and Rescue Department) and the Ignalina NPP in compliance with the provisions of *Guidelines regarding Form and Structure of National Report* approved by Contracting Parties. In its national report Lithuania presented information about the legislation governing spent nuclear fuel and radioactive waste management, the existing facilities, the practice of managing spent nuclear fuel and radioactive waste and the planned safety improvement measures in this area.

In early 2006, the Contracting Parties submitted one another comments and questions. Lithuania was asked 96 questions. VATESI jointly with other institutions that were involved in the production of the report answered the questions.

A delegation of 12 representatives from the institutions that participated in producing the report was appointed by the order of the Prime Minister of the Republic of Lithuania. It represented Lithuania at the second review meeting of the Contracting Parties under the Joint Convention that took place in Vienna on May 15-24, 2006 where the countries' reports were discussed. It was the first time Lithuania participated in an event of this kind. It was in review group 2 together with Austria, Denmark, Estonia, France, Slovakia and Slovenia. Lithuania delivered its national report on May 17. Lithuania was asked additional questions that were answered on the spot. The conclusions of the meeting were favorable: the Republic of Lithuania is complying with its commitments as regards all the items of the Convention.

32. INTERNATIONAL COOPERATION GROUP OF VATESI

The International Cooperation Group on Nuclear Safety (ICG) of VATESI was set up on March 18, 2005, with a view to continuing mutually useful collaboration initiated by the Licensing Assistance Project.

The ICG is a working group in whose activities representatives of VATESI, foreign regulatory institutions, TSOs and other organizations take part on a voluntary basis. The Group's main objectives are as follows:

- Coordinating bilateral and multilateral projects of VATESI.
- Advising VATESI on major issues of nuclear safety.
- Exchanging information and sharing experience in the area of nuclear safety and regulation.

Experts from the Swedish Nuclear Safety Regulatory Authority (SKI), the French Institute of Nuclear Safety and Radiation Protection (IRSN), the German State Nuclear Reactor Safety Consulting Association (GRS), the State Department of the USA (DoS) and other institutions participate in the activities of VATESI ICG.

The then Head of VATESI, S. Kutas, was elected ICG Chairman at the constituent meeting, and SKI expert Per Bystedt his deputy. Head of VATESI Gytis Maksimovas is the incumbent ICG Chairman.

An ICG meeting was held on March 22, 2006. Recommendations regarding managing of beyond-design-basis accidents at the Ignalina NPP, preparation of requirements for transportation of nuclear material, physical protection of nuclear power facilities and nuclear material, the potential problems posed by the EU support projects that are being implemented or planned, as well as other topical issues were discussed at the meeting.

33. INTERNATIONAL TECHNICAL COOPERATION PROJECTS

IAEA regional projects in the area of nuclear safety and nuclear power

In 2006, VATESI coordinated Lithuanian specialists' participation in eight IAEA European regional projects of technical cooperation in the field of nuclear safety and nuclear energy:

- RER/4/025 – Optimization of NPP Performance and Service Life;
- RER/4/027 – Strengthening Capabilities for Nuclear Power Performance and Service Life including Engineering Aspects;
- RER/9/061 – Enhancement of Nuclear Safety Regulatory Effectiveness;
- RER/9/076 – Strengthening Safety and Reliability of Nuclear Fuel and Materials in Nuclear Power Plants;
- RER/9/078 – Safety Assessment and Regulatory Control of Waste Management and Disposal Facilities;
- RER/9/082 – Safety Requirements and Responsibilities for Design Basis Documentation and Configuration Management;
- RER/9/083 – Strengthening Safety Assessment Capabilities and Risk-Informed Decision-Making;
- RER/9/084 – Effectiveness of Regulatory Authorities and Advanced Training in Nuclear Safety.

To this end, a special computer database was developed and used.

In 2006, while engaged in the above projects, Lithuania's representatives participated in 34 events outside the country, including 25 working meetings, 6 training courses and 3 technical meetings. 59 specialists from the Ignalina NPP, VATESI and TSOs took part in the events. They familiarized themselves with state-of-the art practice and requirements set in different areas of nuclear safety assurance and analysis. In addition to that, they got acquainted with their foreign counterparts.

Three events arranged by the IAEA were held in Lithuania in 2006:

- *Safety Issues of RBMK Nuclear Power Plants,* a workshop that took place at the Ignalina NPP on October 9-13.
- Training course *Nuclear Safety Inspection Practices for Regulatory Body* that took place in Vilnius on October 23-27.
- Workshop on the regulatory requirements for the NPP Decommissioning held in Vilnius on November 20-24.

Specialists from Armenia, Croatia, the Czech Republic, Hungary, Kazakhstan, Romania, Russia, Serbia, Slovakia, Slovenia, Ukraine and the IAEA participated in the above-mentioned events.

33 international events have been envisaged for the above-mentioned projects including a number of meetings and courses important and interesting to Lithuanian specialists. Two of the workshops, *Communicating with stakeholders of NPP operating organizations*, RER/4/027, and *Operating Experience Feedback for Regulatory Bodies*, RER/9/084, are planned to take place in Lithuania.

EU support projects

VATESI was preparing, planning or implemented in 2006 five EU support projects. Implementation of three projects was ongoing, one of these was successfully implemented in November of 2006 and two new EU support projects were initiated (Table1).

Table 1. **Project implementation by VATESI by year**

Project No.	2004	2005	2006
LT/2003.5825.02			
2004/016-925-05-01-01			
2003/5812.04.02			
2006/018-183-03-01			
PI/2005/1.1			

In 2006, VATESI initiated two new projects of EU support:

(1) The transition facility *Support to VATESI in safety assessment of Ignalina Nuclear Power Plant (No. 2006/018-183-03-01)*;

(2) Project of the Ignalina program *Support to VATESI in licensing activities related to decommissioning of Ignalina NPP* (No. PI/2005/1.1).

All the EU support projects implemented by VATESI in 2006 with a brief description of their main objectives are given below:

1. **Support to Licensing Activities Related to Decommissioning of Ignalina Nuclear Power Plant to VATESI and Lithuanian TSOs (Stage three), LT/2003.5825.02.**
   The service contract was signed and implementation of the Project began on November 1, 2004. The principal objectives of the Project:
   - Analyzing licensing documents of INPP and RATA submitted to VATESI in relation to INPP decommissioning;
   - Improving capabilities of VATESI and TSOs in activities related to decommissioning;
   - Drafting new quality management and personnel management regulating documents.
2. The transition facility project **Support to VATESI during Review and Licensing New Servo Drives Design and Commissioning at INPP Unit 2, 2004/016-925-01-01.**
   The service contract was signed and its implementation began on November 30, 2005. The project is to be completed by September 30, 2007.
   The principal objectives of the Project:
   - Providing support to VATESI in assessing safety justification documents and licensing the recently installed automatic shutdown system during initial operation, assessing the experience gained and rendering support to VATESI in supervising the necessary changes in the Diverse Shutdown System (DSS).
   - Providing support to VATESI in reviewing and licensing the designing of the new drives of the DSS, and assuring that the rod control drives of the DSS meet the most stringent requirements.
3. **Support to VATESI and its TSOs in Assessment of Beyond Design Basis Accidents for RBMK-1500 Reactors, No.2003/5812.04.02.**
   The service contract of the project was signed and its implementation began on November 30, 2005. The project is to be completed in October of 2006.
   The principal objectives of the project:
   - To assess the amounts of irradiated radionuclides in RBMK-1500 reactor fuel.
   - To analyze the behavior of RBMK-1500 reactor, its fuel rods and the Accident Confinement System, as well as processes taking place in the SNF storage ponds in the event of a beyond-design-basis accident.
   - To draft new procedures for the Emergency Response Center of VATESI.
4. The transition facility project **Support to VATESI in Safety Assessment of Ignalina NPP, No. 2006/018-183-03-01.**
   The description of the project prepared by VATESI in 2006 was approved by the resolution of the European Commission No. K(2006) 3357, dated July 31, 2006. The service contract is to be signed in 2007. The principal objective of the project is to enhance VATESI capabilities and know-how in conducting safety assessment for nuclear power facilities.
5. Project of the Ignalina program **Support to VATESI Licensing Activities Related to the Decommissioning of the Ignalina Nuclear Power Plant (Stage four), No. PI/2005/1.1.**

The description of the project prepared by VATESI in 2006 was approved by the resolution of the European Commission No. K(2005) 5676, dated December 23, 2005. A tender on procurement of services under the project was announced in 2006. The service contract is to be signed in the first quarter of 2007. The project is to be completed in 2008. The principal objectives of the project:

- Continuing support to VATESI in review of documents related to INPP decommissioning;
- Obtaining necessary advice from Western European experts on the issues of NPP decommissioning assessment.

The main results of implementation of above projects in 2006 are summarized in Table 2.

Table 2. **Implementation by VATESI of EU support projects in 2006**

Project	Service contract		Description of results achieved in 2006
	Dates	Value	
Support to VATESI and Lithuanian TSOs in licensing activities related to decommissioning of Ignalina NPP	November 1, 2004 – December 1, 2006	EUR 1, 099, 536	Preparedness of the INPP and VATESI for carrying out INPP decommissioning improved, technical documents of decommissioning stage 1 approved; technical specifications upgraded for repository of INPP very-low-level radioactive waste, assessment of sites suitable for low- and intermediate-level radioactive waste supplemented.
Support to VATESI during Review and Licensing New Servo Drives Design and Commissioning at INPP Unit 2	November 30, 2005 – September 30, 2007	EUR 249, 948	In 2006, the project's main objectives attained. In INPP Unit 2, 25 of envisaged 49 servo drives of reactor CPS were successfully installed and commissioned.
Support to VATESI and its TSOs in Assessment of Beyond-Design-Basis Accidents for RBMK-1500 Reactors	November 30, 2005 – October 30, 2007	EUR 649, 620	Data gathered, numeric models constructed, software was being adapted, analysis performed of selected accident scenarios, accident analysis documentation was being prepared.
Support to VATESI in safety assessment of INPP	(preliminarily 2007–2008)	Service contract to be signed in 2007.	
Support to VATESI in licensing activities related to decommissioning of Ignalina NPP	(preliminarily 2007–2008)	Service contract to be signed in 2007.	

Bilateral cooperation between VATESI and Swedish Nuclear Safety Regulatory Authority (SKI)

The Kingdom of Sweden and its Nuclear Safety Regulatory Authority's (SKI) support to VATESI began in late 1991, just a few months after the Inspectorate was established. The assistance went on until Lithuania joined the EU in 2004. The support greatly contributed to enhancing VATESI competence in conducting state regulation of nuclear safety.

After Lithuania joined the EU a decision was made to the effect that support by SKI should gradually grow into mutually beneficial bilateral collaboration. At the meeting held on May 4-5, 2004, VATESI and SKI shared experience in state regulation of nuclear safety, discussed the most topical issues of nuclear safety and decided to continue the bilateral cooperation.

Cooperation between VATESI and SKI in 2006 was being developed on the basis of the cooperation agreement between the two institutions signed on November 28, 2003, and the plan of cooperation that is being updated on a regular basis. Specific measures are listed in the plan and VATESI and SKI experts are appointed who exchange information on individual areas of nuclear safety regulation.

In 2006, Per Bystedt, a SKI expert, participated in the activities of the International Cooperation Group on Nuclear Safety (ICG) of VATESI. Another SKI expert, Staffan Forsberg, on his visit to VATESI on October 2, 2006, presented important information about the event that occurred in Sweden's Forsmark NPP on July 25, 2006. S. Forsberg participated in the inspection on quality management of the decommissioning activities at the Ignalina NPP that was conducted on October 3-5. On September 21, 2006, SKI expert, Stig Husin, visited VATESI to discuss issues of emergency preparedness of the regulating institutions. A separate plan of cooperation between VATESI and SKI for 2007-8 in the area of emergency preparedness was drawn up.

Cooperation between VATESI and the Department of Trade and Industry (DTI), the UK

The following projects of support to VATESI within the framework of nuclear safety program by the Department of Trade and Industry of the UK were being implemented in 2006:

• DTI Project L16. *Surveillance of Reactor Core Integrity.*

The objective of the project *Surveillance of Reactor Core Integrity* is to make it possible to perform independent calculations of RBMK-1500 neutronics with the new WIMS8 code by Serco Assurance. At DTI's suggestion modification of VATESI's electronic document management system was also included in the project tasks (VATESI had submitted a separate project proposal for this task). Work on the project is due to be completed by April 2007.

• DTI Project NSP/04-L23. *Support to VATESI on Issues of Nuclear Material Transportation.*

The implementation of the DTI-supported project *Support to VATESI on Issues of Nuclear Material Transportation* was in progress during 2006. Under the project, VATESI was to be rendered support in the area of regulation of nuclear material transportation through the fulfilment of tasks established in the project.

Task one of the project ascertained to assess and evaluate the existing Lithuanian transport regulatory framework against international requirements and practice in other EU Member States. correspondence of this framework. Correspondence of this framework to the international regulations, agreements and EU directives was verified and this was also compared to international regulation imposing similar nuclear material transportation requirements in other EU member states. In an effort to identify the limitations, Lithuanian regulation procedures were compared to those of radioactive material transportation in the UK and Germany and to the IAEA legal documents. The meeting of Serco Assurance, VATESI and RPC representatives was held On January 18-19, 2006, over draft report conclusions on task one. Report indicated drawbacks of Lithuanian regulation framework and lack of resources, falling into five clusters:

- Clarification and standardization of definitions
- Clarification of licencing and Competent Authority approval responsibilities
- Appointment of the Competent Authority
- Working agreements and coordination between VATESI and Radiation Protection Centre (RSC).
- Quality assurance and applicants guide

Implementing task two, the approval methodology of the competent Lithuanian institution for package design and shipment of radioactive material was developed, applied as required according to the IAEA Regulations for the Safe Transport of Radioactive Material Safety Requirements No. TS-R-1. On May 3-4, 2006, a meeting between Serco and VATESI representatives was held to discuss draft report conclusions on task two.

In an attempt to define the volume of institutional responsibility of Competent Authority for package design and shipment approval, IAEA Safety Requirements No. TS-R-1 were examined. Whereas Safety Requirements are binding, only negligible divergences from regulations and practices established by them are possible.

The methodology proposed was prepared considering precence of two institutions competent in nuclear and radioactive materials licencing actions (VATESI and RPC). The key matter considered in course of preparation of this methodology is the requirement to describe the materials (fissile or non-fissile) in a precise manner and clearly distinguish materials in accordance with their purpose and derivation (nuclear and non-nuclear purpose materials).

Although currently the amounts of nuclear-purpose material packages and shipments requiring approval issued by the Competent Authority are quite small, the methodology explicates all the aspects of the competent institution's involvement, as defined by the IAEA requirements No. TS-R-1. A diagram guiding prospective applicants in selection of the competent institution to be contacted on commencement of the approval process is included into the methodology. Information requirements provided by the methodology will assist both the competent institution and the applicant in making sure IAEA requirements No. TS-R-1 are met.

LIST OF ABBREVIATIONS

AA-1	- Emergency security
ASS	- Reactor's second shutdown system
AQG	– Atomic Questions Group
ARGOS	– Radiation Monitoring and Radioactive Material Transfer Forecasting System
BDBA	– Beyond-Design-Basis Accident
BNFL	– British Nuclear Fuels Company
CONCERT	– Concentration on European Regulatory Tasks
COREPER	– EC Committee of Permanent Representatives
DSS	– Diverse Reactor Shutdown System
ENAC	– Early Notification and Assistance Conventions
ERC	– Emergency Response Center
ESARDA	– European Safeguards Research and Development Association
FSTS	– Full-Scope Training Simulator
FI	– Institute of Physics
GRS	– German State Nuclear Reactor Safety Consulting Association
IAEA	– International Atomic Energy Agency
INES	– International Nuclear Event Scale
INPP	– Ignalina Nuclear Power Plant
IPPAS	– International Physical Protection Advisory Service
IPSART	– International Probabilistic Safety Assessment Review Team
IRRT	– International Regulatory Review Team
IRSN	– French Institute of Nuclear Safety
KTU	– Kaunas University of Technology
LEI	– Lithuanian Energy Institute
NRC	– U.S. Nuclear Regulatory Commission
NRWG	– Nuclear Regulators Working Group
NSG	– Nuclear Suppliers Group
NUSS	- Nuclear Safety Standards
OECD	– Organisation for Economic Co-operation and Development
OPCW	– Organisation for Prohibition of Chemical Weapons
PSA	– Probabilistic Safety Assessment
RAMG	– Regulatory Assistance Management Group
RATA	– Radioactive Waste Management Agency
RELEX	– Commission for External Relations
RHWG	– Reactor Harmonization Working Group (WENRA)
RSR	– Review of Safety Analysis Report
RW	– Radioactive Waste
SAR	– Safety Analysis Report
SIIT	– State Institute of Information Technologies
SIP-1, SIP-2	– Safety Improvement Programs 1 and 2
SKI	– Swedish Nuclear Safety Regulatory Authority
SNF	– Spent Nuclear Fuel
SNFS	– Interim Spent Nuclear Fuel Storage of Dry Type
TACIS	– Technical Aid to the Commonwealth of Independent States
TSO	– Technical Support Organization
VGTU	– Vilnius Gediminas Technical University
WANO	– World Association of Nuclear Operators
WENRA	– Western European Nuclear Regulators' Association
WGWD	– Working Group on Waste and Decommissioning (WENRA)
WPNS	– Working Party on Nuclear Safety

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