



REPUBLIC OF LITHUANIA

State Nuclear Power  
Safety Inspectorate (VATESI)

# NUCLEAR ENERGY IN LITHUANIA: NUCLEAR SAFETY

Annual Report 2007



Vilnius 2008

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In 2007, VATESI was successfully implementing its mission of state regulation and supervision of nuclear and radiation safety at nuclear power installations in order to protect the public and environment against harmful effects of nuclear and radiation events and accidents. Not a single event higher than level one on the International Nuclear Event Scale (INES) was recorded at the Ignalina NPP, not a single employee received a dose exceeding the set limits, no cases of impermissible effects on the population or environment were observed. In comparison with 2006, the Ignalina NPP improved its production indicators by 14 percent. It generated 9,832.9 mn. kWh of electricity, 6,706.2 mn. kWh of which was sold to Lithuanian consumers. The capacity factor was as high as 86.3 percent.



In accordance with the data by the International Atomic Energy Agency (IAEA), nuclear energy generated in 2007 some 15 percent of the total volume of electricity worldwide. 439 nuclear reactors were operational with an overall gross capacity of 372 GW (el). Development of nuclear energy, now often referred to as the Renaissance of nuclear power, has been gaining ever-growing impetus. Three new reactors were integrated into power networks in China, India and Romania in 2007 (34 new reactors are now under construction worldwide). France for the first time since 1991 started building a new 1600-MW (el) reactor at Flamanville. After an almost thirty-year interval four license applications were submitted to the U.S. Nuclear Regulatory Commission (NRC) that expects to receive 21 new applications for construction of 32 reactors by the end of 2009. The development of nuclear power has inevitably affected the uranium price in the world market. In the course of the year it soared to record USD 360 per kg, and in late 2007 it got stable at USD 240 per kg.

In 2007, VATESI conducted state nuclear safety supervision of the operational INPP Unit 2, assessed decommissioning projects of Unit 1 from the viewpoint of nuclear safety, analyzed safety justification documents, performed state regulation and supervision of physical protection of nuclear energy facilities and nuclear materials. In addition to this work, VATESI started preparing for licensing the design of a new NPP. The preparation is going on along three main lines, getting the necessary competence and personnel ready, upgrading the administrative structure of VATESI, and drafting and improving the legislature governing the safety of nuclear energy. VATESI is planning to hire 30 new employees in 2008–2010. The specialists working now and those who will be hired will have to be prepared for licensing the project of the new NPP. To this end, VATESI initiated a cooperation project with the IAEA. Whilst implementing the project, the capacities not only of VATESI but also those of other institutions participating in the supervision of implementation of the new NPP project will be enhanced. A draft of new administrative structure of VATESI was produced in 2007. It is planned to reorganize the Inspectorate in 2008 with a view to enhance the effectiveness of regulatory authority. In view of the objectives regarding implementation of the new NPP in Lithuania, 43 documents are to be reviewed in accordance with the plan of review of legal documents governing safety of nuclear energy in 2008–2011.

VATESI specialists took an active part in the activities of the working groups of Western European Nuclear Regulators' Association (WENRA) and institutions of the European Commission, during the year they have been working in two safety standards committees of the IAEA. They also participated in regional and national technical cooperation projects. For the first time in the history of the IAEA membership, in September 2007 Lithuania became a member of its Board of Governors for a two-year term.

VATESI did its best to effectively use the support provided by the EC for improving nuclear safety and supervision of the INPP decommissioning.

The year 2007 was full of interesting and important work for VATESI staff. I am positive that the young and dynamic staff is ready to address not only the issues that arise today but also to accept the challenges related to the project of the new nuclear power plant and to successfully accomplish VATESI mission.

VATESI Head

Gytis MAKSIMOVAS

# 1. VATESI OBJECTIVES AND STRUCTURE

Establishment of the system of nuclear safety in Lithuania began after the country regained independence. Its objective consists in ensuring that the level of safety requirements set by the Republic of Lithuania meets international standards. 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 Lithuania became independent again. 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 substances 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 installations, 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 installation.

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 whether or not the conditions are complied with.

VATESI issues, specifies and approves in accordance with the set procedure standard documentation of nuclear energy, and supervises compliance with the 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** performs 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 Treaty Organization, and coordinates the activities of Lithuanian governmental institutions related with this Organization.

**Licensing Division** sets the conditions for licensing Ignalina NPP and its safety systems, develops standard documents that govern INPP safety, assesses the reliability of the components, installations 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 technological processes and repairs.

**Decommissioning and Radiation Protection Division** performs state regulation of radioactive waste management, decommissioning and emergency preparedness of nuclear power installations, and controls radiation protection at these. It also notifies international organizations and neighboring countries about nuclear accidents.

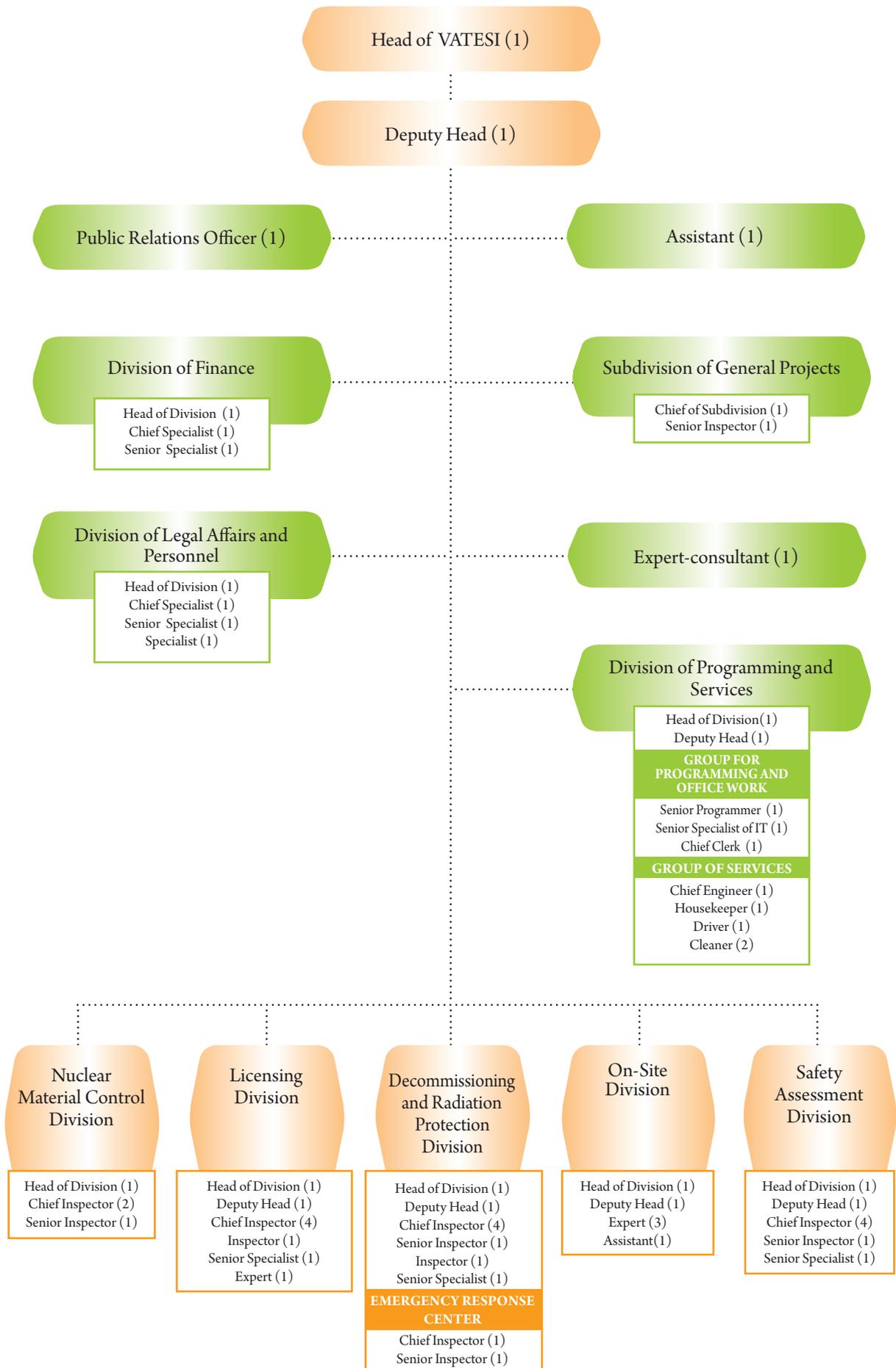
**Safety Assessment Division** assesses design decisions, produces reviews of safety analysis reports, checks the adequacy of the computer software used for safety assessment, and analyzes the physical issues of the reactors.

Subdivision of General Projects coordinates preparation and implementation of support and cooperation projects of the European Union, other foreign and international institutions, supervises introduction and improvement of VATESI quality management system, controls compliance with nuclear safety requirements in the areas of quality management, qualification assurance and safety culture, and drafts legal documents governing these.

VATESI also has divisions that carry out information, legal and financial activities, and provide economic services. In all VATESI had 52 employees in 2007, including five doctors of sciences. 49 specialists have higher education diplomas, 3 are studying at universities. Most of VATESI specialists are young. There are 14 in the 20-30 years category, 15 are 31 to 40 years old, 14 and 6 fall into the 41-50 and 51-60-year categories respectively, another 3 are between 61 and 70 years old (as of January 1, 2008).



## Structural scheme of VATESI



## 2. STRATEGIC PLANNING AND FINANCIAL ACTIVITY

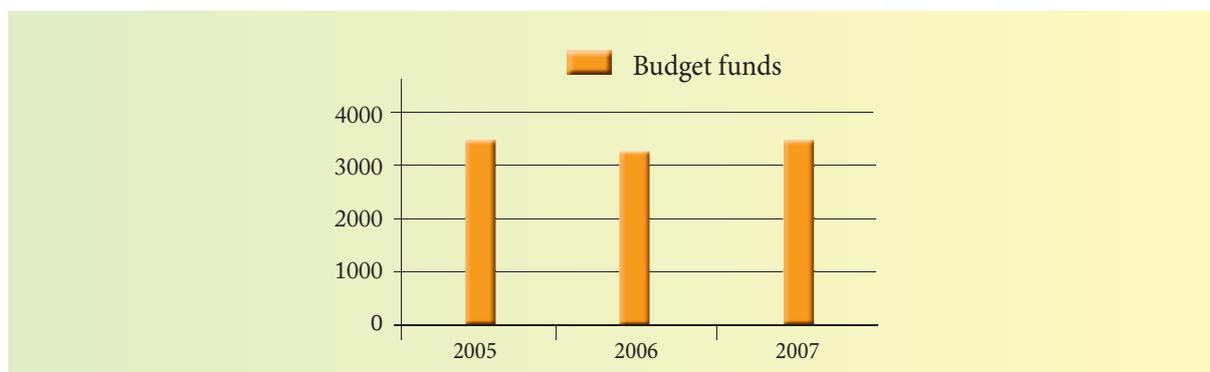
VATESI activities are long-term and continuous. The program and priorities set by the Government of the Republic of Lithuania, as well as the provisions of the Long-term Development Strategy of the State are always taken into consideration when planning them.

A single strategic objective, i.e. assuring a high level of safety of nuclear installations, was set in the 2007–2009 strategic plan of VATESI activities for implementing its mission. To assess whether or not the strategic objective has been attained, the single criterion of effect has been set, i.e. nuclear safety improvement defined as the absence of level two and upwards unusual events on the INES scale identified. To date, the Ignalina NPP has been operated in a safe and reliable manner (see pp 19–21).

A single program, *04 Public and Internal Administration of Nuclear Safety*, was being implemented in 2007 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. Four objectives were set for implementing the program: controlling compliance with nuclear safety standards and license conditions at nuclear installations; upgrading the systems of nuclear safety assurance and licensing at nuclear installations with international practice taken into consideration; conducting and enhancing internal administration; and preparing for supervision of design and construction of a new nuclear power plant. Whilst implementing the objectives the probability of events and accidents at nuclear 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-963 (Valstybės žinios, 2006, No. 138-5267)*, VATESI was allocated LTL 4,492.100 from the state budget in 2007. LTL 3,559.000 was spent for implementing the program. The funds from the state budget were used in an economical manner when implementing the program in 2007, and the articles of economic classification confirmed in cost estimates were adhered to. Therefore in many cases actual expenses were less than planned.

### THE USE OF STATE BUDGET FUNDS IN 2005–2007 IN LTL THOU.



## 3. 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 legal documents. In accordance with Article 4, part 2, of the *Law on Nuclear Energy*, safety rules and regulations are mandatory to all legal and natural persons.

On December 18, 2006, a team for perfecting legislation governing nuclear safety was set up by the Order of the Head of VATESI. 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. After legal and standard technical documents were reviewed, in particular those related to construction of a new nuclear power plant, *The plan for perfecting legal and standard technical documents* was approved on July 2, 2007. The currently valid technical standard documentation governing nuclear safety is mostly intended for the present Ignalina NPP, therefore immense amount of work is awaiting VATESI – assessing it and developing the necessary changes.

## 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 was 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 installations.
- Assuring adequate control of the ongoing EU support projects.
- Assuring adequate skill improvement of VATESI staff.
- Assuring efficient management and use of information.

In 2007, due to changes in requirements and with a view to defining more accurately the set procedure, seven new Level 2 and Level 3 documents of QMS were approved (see the Table below). Three Level 2 (the code begins with KU-II) and four Level 3 (the code begins with KU-III) documents were developed and approved.

### NEW DOCUMENTS OF VATESI QMS APPROVED IN 2007

Valid since	Code	Edition	Title
June 21, 2007	KU-III-8	2nd	Regulations of VATESI Public Procurement Commission
June 21, 2007	KU-III-9	1st	Regulations of VATESI Commission of Simplified Public Procurement Through Usual Commercial Practice
Oct. 31, 2007	KU-II-02	3rd	The Methodology of VATESI Strategic Activities Planning
Nov. 5, 2007	KU-III-10	1st	The Methodology of Planning State Capital Investments
March 21, 2007	KU-II-11	2nd	The Procedure for Managing Ingoing and Outgoing documents
Dec. 28, 2007	KU-III-11	1st	The Rules Governing the Use by VATESI of Representation Expenses from the State Budget of the Republic of Lithuania
June 21, 2007	KU-II-14	2nd	VATESI Rules of Simplified Public Procurement Through Usual Commercial Practice

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

1. VATESI Mission.
2. VATESI Quality Manual (KU-I-01).
3. Safety Assessment Procedure (KU-II-01).
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 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. Procedure for Managing EU Support Projects (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 the Results of Certification of Safety Important Systems and Elements of the Ignalina NPP (KU-II-12).
15. Accounting Policy (KU-II-13).

In 2008, VATESI QMS is to be further enhanced by developing new and updating the already approved quality management documents.

## 5. TRAINING AND IMPROVING SKILLS OF VATESI SPECIALISTS

VATESI has been taking special care of the quality of its activities that can only be ensured by specialists having good skills and expertise. Therefore considerable attention is being paid to skill improvement of its employees.

Fifty-two employees, 19 women and 33 men, were working with VATESI as of late 2007, 40 of these were civil servants.

Seven employees joined the staff of VATESI in 2007, six of them as civil servants and one was hired with an employment contract. Seven employees left VATESI.

In 2007, 39 VATESI employees improved their skills at different training events in Lithuania and abroad. Six new employees participated in introductory training workshops. VATESI employees participated in a total of 44 training events in 2007.

VATESI employees, and nuclear safety specialists in particular, enjoy good opportunities for improving skills and making use of the support provided by international organizations, the EU institutions and foreign countries. The IAEA is the main international organization providing assistance in extension of knowledge of specialists in nuclear power. Seven VATESI specialists took part in 11 training events related to regulation of nuclear safety arranged by the IAEA in 2007. Three VATESI specialists improved their skills in training events funded by the EU.

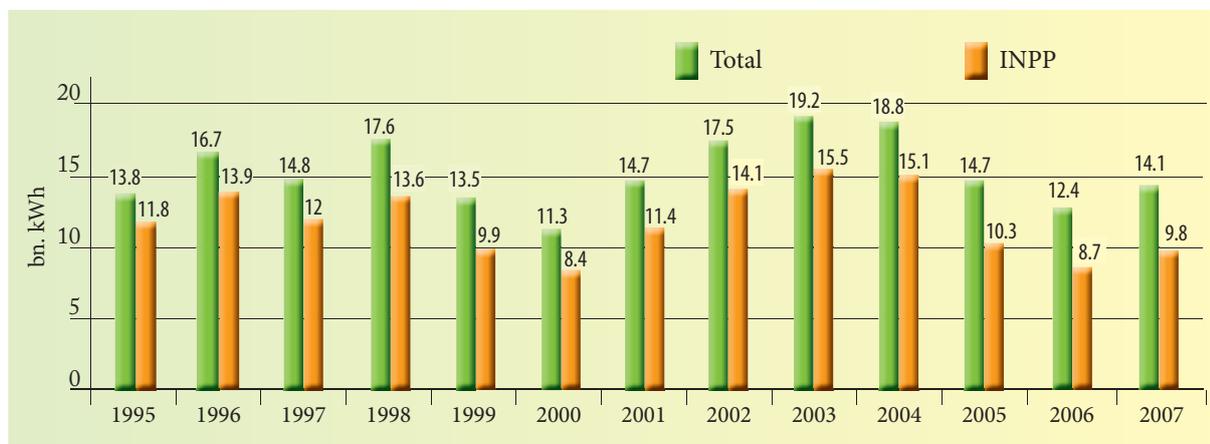
After Lithuania decided to construct a new nuclear power plant, the training of VATESI employees, and new ones in particular, becomes a task of great importance. Given the experience of other countries constructing nuclear power installations, especially Finland's, VATESI needs without delay to start preparing for construction of a new NPP, and planning to hire and train specialists in nuclear energy. New specialists and those working at present 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.

## 6. TECHNICAL AND ECONOMIC INDICATORS OF IGNALINA NPP

As of January 1, 2008, the Ignalina NPP produced since the beginning of its operation 286.4 bn. kWh of electricity, 136.9 bn. kWh and 149.5 bn. kWh by Units 1 and 2 respectively.

In 2007, the Ignalina NPP supplied 69.9% of electricity produced throughout Lithuania.

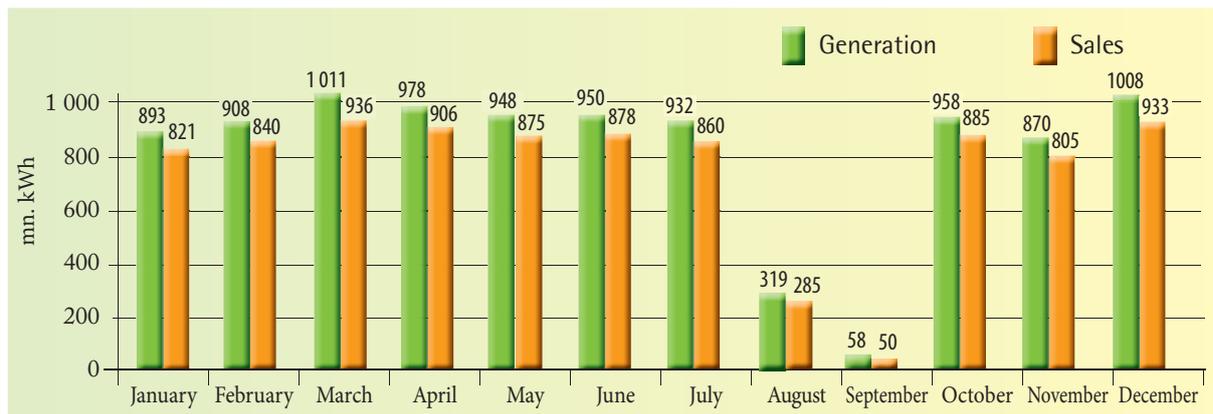
### ELECTRICITY GENERATION IN LITHUANIA



Since the commissioning, 252.9 bn. kWh has been sold to consumers.

In 2007, the Ignalina NPP produced 9,832.9 mn. kWh of electricity, or 1,271.6 mn. kWh more than in 2006.

**GENERATION AND SALES OF ELECTRICITY IN 2007**

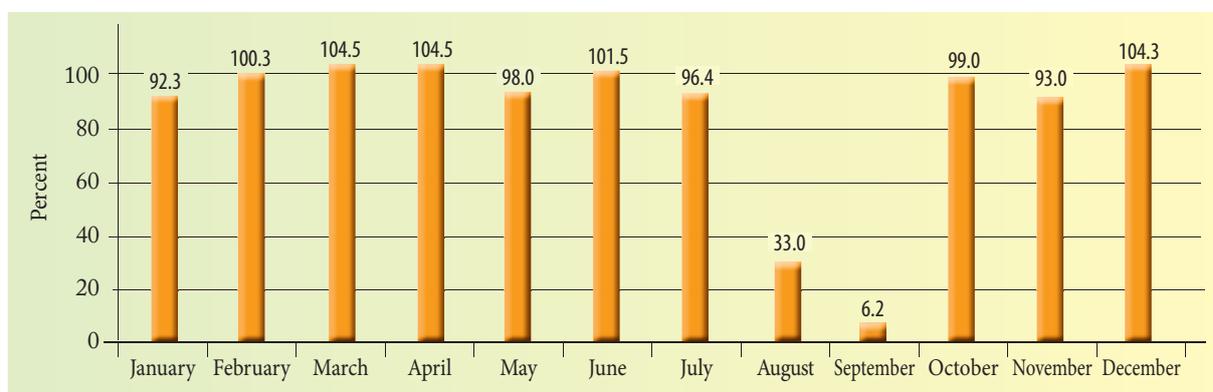


9,074.8 mn. kWh was sold to AB Lietuvos energija in 2007, of which 6,706.2 mn. kWh was consumed in the domestic market, and 2,368.6 mn. kWh was exported to other countries. The exports decreased almost by one fifth (1,978.2 mn. kWh was exported abroad in 2006).

A high level of loading accounted for the stability of technical and economic indicators at INPP in 2007. There were no dispatchers' limitations in 2007 that could have resulted in reduced generation of electricity. However, the repairs of TG-3 were only completed in January of 2007. Furthermore, TG-4 was stopped in an unplanned manner in May, and unplanned automatic scram of the Unit occurred in November. Therefore the capability factor was somewhat lower than planned. 7.71% of the electricity generated was consumed for generating electricity and heat (8.17% in 2006).

The capacity factor of the INPP was 86.3% in 2007.

**CAPACITY FACTOR OF INPP ( $N_{INST} = 1300$  MW) IN 2007**



The amount of electricity not generated because of delays in emergency repairs and plant deficiencies in 2007 was 180.0 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 DUE TO REPAIRS AND OUTINGS**

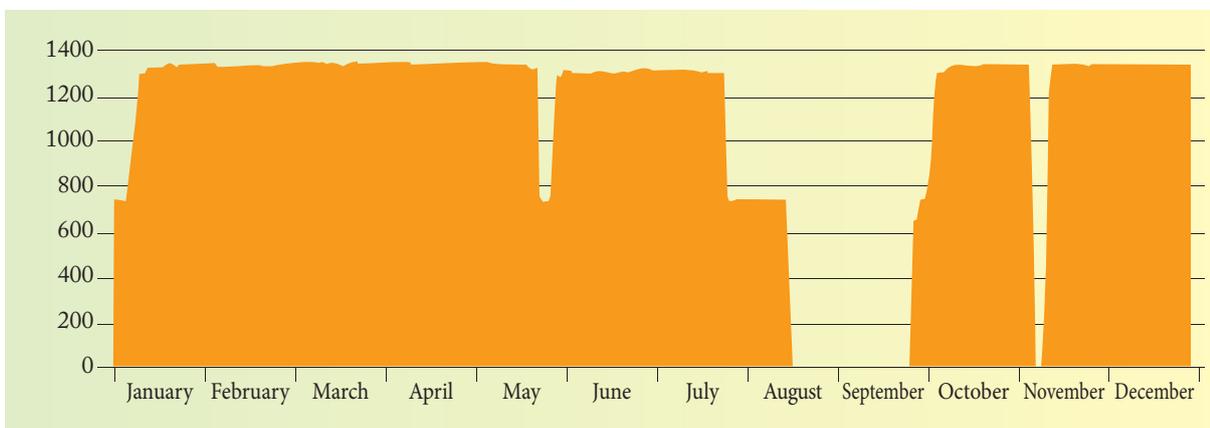
( $N_{unit\ inst.} = 1300$  MW)

INDICATOR	mn. kWh
Annual maintenance	1,562.0
Unplanned delays of repairs	129.7
Plant deficiencies	150.3
Limitations of dispatchers' loads	0
Total not generated	1,842.0

INDICATORS OF UNIT 2 OPERATION IN 2007

ITEM	UNIT	REACTOR	TG-3	TG-4
1 Gross capacity, MW	1500 MW (el.)	4800 MW (thermal)	750 MW (el.)	750 MW (el.)
2 Licensed gross capacity, MW	1300 MW (el.)	4200 MW (thermal)	750 MW (el.)	750 MW (el.)
3 Gross electricity generation, GWh	9,832.8 GWh	–	5,283.7 GWh	4,549.1 GWh
4 Net electricity sales, GWh	9,074.8 GWh	–	–	–
5 INPP needs, %	7.71	–	–	–
6 Relative heat consumption per kWh	2,855 kcal/kWh	–	–	–
7 Average load, MW	1149 MW (el.)	3514 MW (thermal)	685 MW	691 MW
8 On-line hours	7747	7799	7601	6990
9 Time availability factor, %	88.4	89.0	86.8	79.8
10 Number of outages, of which:	2	2	2	3
	• For annual maintenance	1	1	1
	• Unplanned	1	1	2
	• Reserve	0	0	0
11 Number of startups	2	2	2	3
12 Number of unplanned automatic scrams	–	1	–	–
13 Capability factor, %	83.8	89.0	86.8	79.8
14 Load factor $N_{inst} = 1500\text{ MV}$	74.8%	72.4%	80.4%	69.2%

UNIT 2 LOAD IN 2007



No.	Date	Reason for emergency outing or capacity reduction.
1	Jan. 7, 2007	The repairs of TG-3 finished (begun in September 2006). TG-3 tripped after earthing protection was activated in 24-kV circuit.
2	May 26, 2007	TG-4 was stopped for repairs of emergency regulating valve 2.
3	July 28, 2007	TG-4 stopped for annual maintenance.
4	August 18, September 27, 2007	Annual maintenance of Unit 2.
5	November 8, 2007	The unit was scrambled after overflow protection in drum separator was activated during a transient.

## 7. 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 installations 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.

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 Plant.

VATESI is carrying out supervision in accordance with the laws of the Republic of Lithuania, resolutions of the Government, 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 installations.
- Regulatory control of design, construction, manufacture, installation, and repairs of safety-related systems of nuclear power installations, 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 associated 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 instructions laid down to the 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 associated piping, official reports were drawn up and entries made in equipment 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 2007, the inspectors of the On-Site Division examined the knowledge of 145 high- and medium-level specialists of the INPP.

In 2007, INPP Unit 2 was started up twice. Prior to startups a comprehensive examination of the unit was carried out, with appropriate authorizations being issued for each stage of starting up. The control was conducted through 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 reactor 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 the 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).

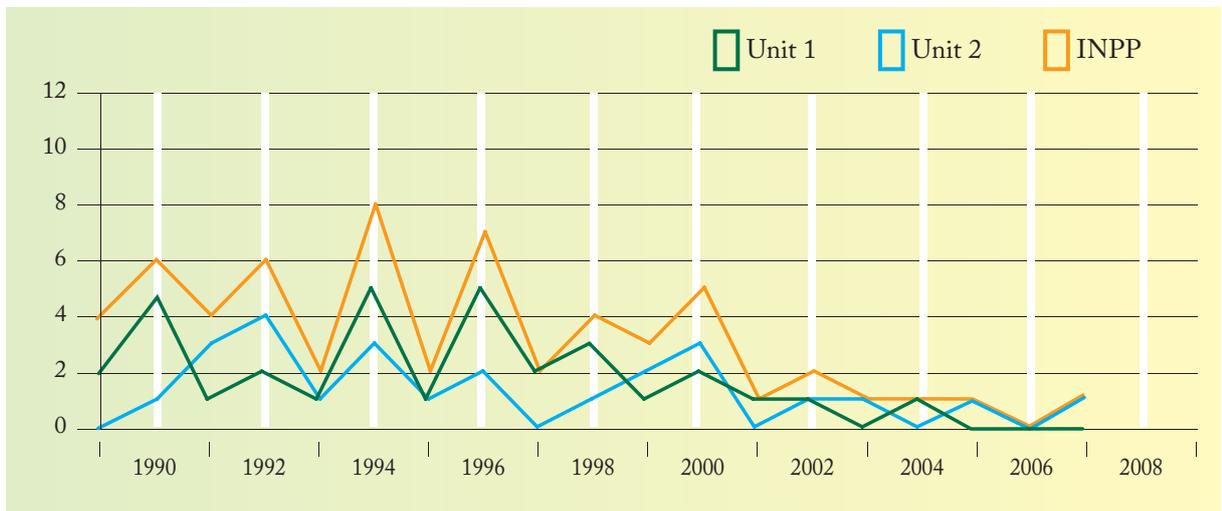
VATESI, when supervising operation safety of INPP, in 2007 reviewed and analyzed 34 technical decisions regarding modifications of safety-related systems. VATESI specialists, considering the compliance of the modified systems with design requirements and the results of checks on preparation for operation, 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 2007 are viewed positively. No cases were recorded of violations of conditions and limits of safe operation or unacceptable exposure of the personnel.

An increase in leaking fuel assemblies was noticed in late 2007. Although their number did not exceed the limits of safe operation, they were immediately unloaded from the reactor. Several working teams have been set up at the Ignalina NPP that are cooperating with TSOs and are actively looking for the ways of resolving the problem.

The number of unplanned outages of nuclear power units is one of the most informative indicators of safe operation. In 2007, Unit 2 was stopped only once for an unplanned outage (and not a single time in 2006). The fact allows concluding that safety improvement measures that are being implemented at the INPP over the recent years, including upgrading of safety culture and quality assurance system, have been efficient and adequate.

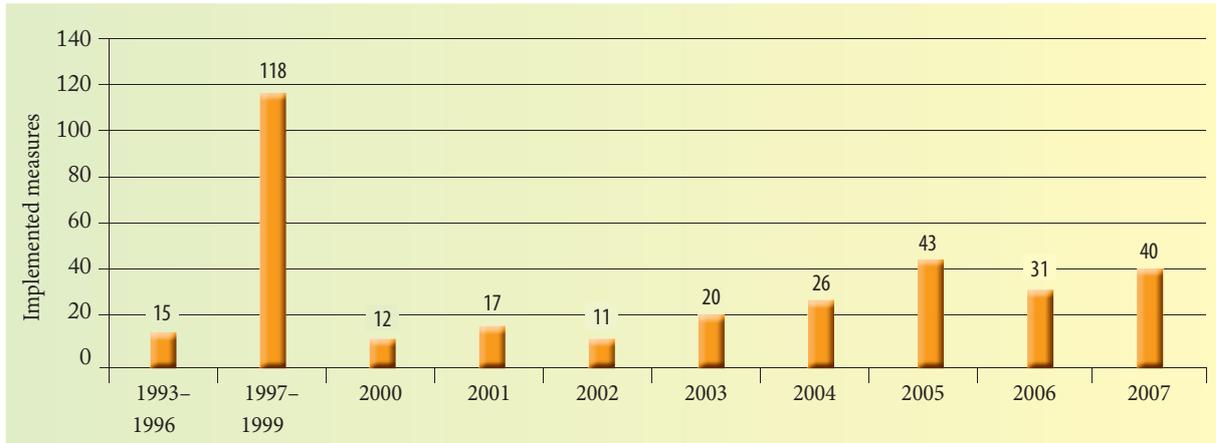
NUMBER OF UNPLANNED OUTAGES



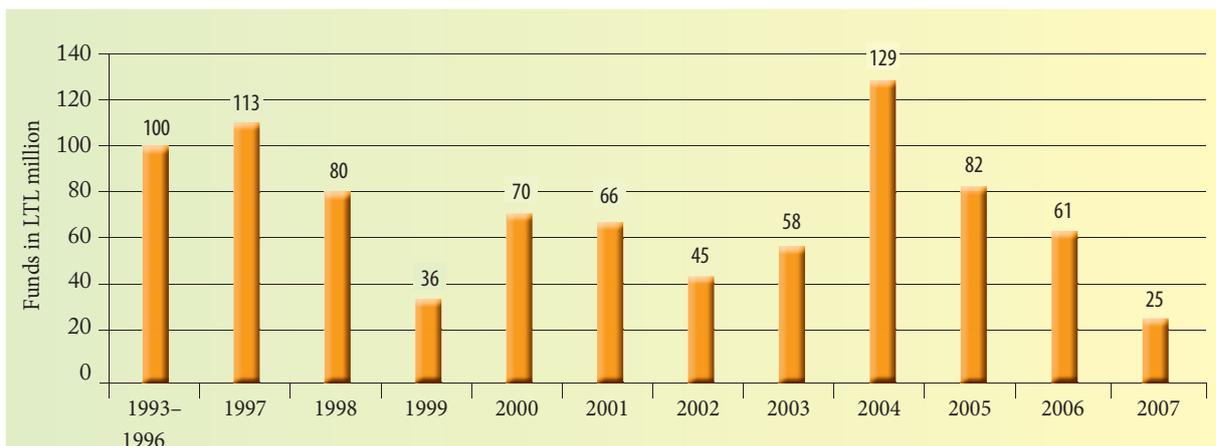
8. IMPLEMENTATION OF SAFETY IMPROVEMENT PROGRAM (SIP-3) AT IGNALINA NPP

Nuclear energy experts are unanimous that the only way to successfully develop nuclear power lies in unconditional assurance of safety and reliability based on rational application of scientific and technological innovations. Therefore safety at the Ignalina NPP has been continuously improved. Work in this area is done in accordance with a special safety improvement program (SIP) coordinated with VATESI that is updated and reviewed on an annual basis. The Ministry of Economy approves the program.

In 1993–6, SIP-1 was implemented, SIP-2 in 1997–2004, and SIP-3 was launched in 2005. Over 330 measures were put into practice in 14 years of SIP implementation (Fig. 1). Some LTL 865 million was spent for this purpose (Fig. 2).



**Fig. 1. IMPLEMENTATION OF SAFETY IMPROVEMENT MEASURES AT IGNALINA NPP IN 1993–2007**



**Fig. 2. FUNDS ALLOCATED FOR SAFETY IMPROVEMENT AT IGNALINA NPP IN 1993–2007**

To make sure that safety upgrading measures are implemented on time and in an adequate manner, VATESI has been supervising implementation of the Safety Improvement Program by the Ignalina NPP. The Ignalina NPP, having implemented a SIP measure, informs VATESI about it and submits documents to confirm it (quarterly and final reports on measure implementation, the statements of work handing over and acceptance, and other relevant documents). In addition to that, VATESI specialists conduct inspections to check implementation of safety improvement measures. Execution of this is discussed at the periodically held meetings of the Ignalina and VATESI management.

Eighty-eight measures were included in SIP-3/2007 program; 77 of these were to be implemented in 2007, 4 in 2008, and one in 2009 and 2010 each. Five of the measures are being implemented continuously.

In 2007, the Ignalina NPP implemented and coordinated with VATESI 40 measures. Work on implementation of 28 measures was not completed in 2007, and will be continued in 2008. The arrears of work were mostly due to delays in signing contracts with suppliers, supplying equipment, as well as processing and submitting to VATESI report documentation. The Inspectorate agreed with the INPP proposal to implement 9 measures in accordance with the work schedules of the nuclear power plant’s divisions rather than SIP-3/2008 program.

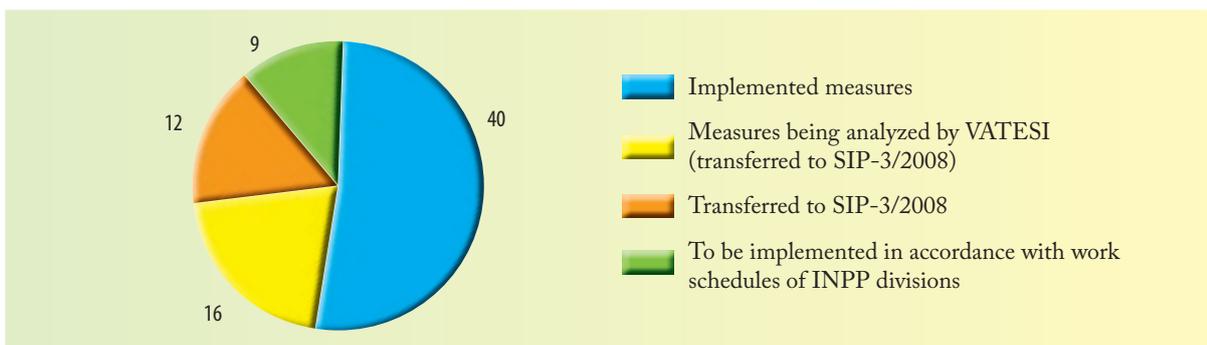


Fig. 3. IMPLEMENTATION OF SIP-3/2007 MEASURES IN 2007

In 2007, the Ignalina NPP accomplished and coordinated with VATESI the following major safety improvement measures:

1. Putting in storage the filled sections of the storage facility for solid radioactive waste (building 157/1) with a view to preventing water ingress inside the sections and subsequent leaching of radionuclides with the water into groundwater.
2. Introduction of cluster rods with a view to reducing changes in reactivity due to draining of control and protection system channels.
3. Introduction of a facility intended for picking of spent fuel debris in Units 1 and 2 of the Ignalina NPP.
4. Replacement of traveling cranes in compartment 143 of block A1 in building 101/1 and compartment 143 of block A2 in building 101/2.
5. Modification of the system of notification about accidents at the Ignalina NPP.
6. Modification of the pressure circuit of the turbine shop installations with a view to preventing water ingress into installations of Unit 1 during hydraulic testing of thermal plant.
7. Preparation of a procedure for annual checks of the full-scope simulator performance and its certification.

Safety upgrading at the Ignalina NPP is an important and responsible process, whose aim is to continuously improve the safety of the INPP Units, as well as systems and procedures important to safety with the operational experience of the Ignalina NPP and organizations of foreign countries taken into consideration.

## 9. LICENSING ACTIVITIES

Licensing is a key element of regulation and supervision of activities in nuclear energy area. In the course of licensing, the applicant's preparedness to carry out the activity being licensed, the level of nuclear safety assurance, the personnel qualification, and other important aspects of safety assurance are assessed. Licensing consists of the following stages:

- submission of application;
- analysis of application documents;
- the applicant's inspection;
- making a decision regarding granting of license;
- granting of license;
- supervision of licensed activity.

In 2007, VATESI conducted supervision of compliance with previously issued licenses' conditions and continued licensing activity related to design and construction of a spent nuclear storage facility at the Ignalina NPP, as well as design of facilities for solid radioactive waste treatment and storage. The safety and environmental impact of these nuclear facilities were assessed in the course of licensing. Detailed designs and their preliminary safety analysis reports submitted for special review are among principal documents that are analyzed in the licensing process.

### SUPERVISION OF COMPLIANCE WITH LICENSE CONDITIONS OF PREVIOUSLY ISSUED LICENSES

Reports on compliance with license conditions of all the licenses granted by VATESI were received and analyzed in 2007.



TABLE 1. VALID LICENSES GRANTED 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
1/2004	AB Lietuvos geležinkeliai	Transporting nuclear material
2/2004	Ignalina NPP	Operating INPP Unit 2
1/2006	Ignalina NPP	Operating storage facility for cemented liquid radioactive waste at Ignalina NPP
2/2006	Radioactive Waste Management Agency (RATA)	Conducting supervision of the closed Maišiagala repository of radioactive waste
1/2007	Ignalina NPP	Designing SNF storage facility for INPP
2/2007	Ignalina NPP	Designing facilities for treatment and storage of solid radioactive waste at INPP

\* – licenses of type one issued in 1996–2003 not included in the table.

### The Ignalina NPP Unit 2

The 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 set forth in the safety improvement program based on results of SIP-2 and other analyses; work, modifications and maintenance were planned, inspections and tests conducted.

In March 2007, proposals were prepared and submitted to the operating organization regarding alterations in license conditions for the INPP Unit 2. After a lengthy process of analysis, deliberation and coordination, order No. 22.3-78 was confirmed on November 21, 2007, altering the license conditions for Unit 2 and the list of documents submitted.

In accordance with *The regulations governing granting of permits for startup of power units following annual outages or short outages* approved by VATESI Head, prior to the outage of 2007, the Ignalina NPP submitted on August 10 a list of safety improvement measures in Unit 2 during the 2007 outage, as well as the implementation schedule. On August 18, 2007, the INPP Unit 2 was shut down for the annual outage. During this outage VATESI specialists controlled implementation of work in safety and safety-related systems of the INPP. Simultaneously they analyzed 38 sets of documents submitted in accordance with the plan of safety improvement measures for the 2007 outage of INPP Unit 2, the most important of these being:

- Report on results of the operational control of installations and pipings of INPP Unit 2.
- Report on work on the INPP Unit 2 safety and 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 work that must be done in the INPP Unit in accordance with the SIP prior to the end of the 2007 annual outage, with the measures that were not completed indicated. The causes of failure to complete these must be substantiated and new deadlines of their implementation coordinated with VATESI.
- Report on the results of diagnostics and replacement of flow meter sensors in fuel channels.
- Report on the results of pressure tube-graphite gap checks, the result assessment and forecast of changes.
- 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 progress in the use of higher enrichment fuel with burnable absorbers and reactor control rods of new design.
- Cartogram of reactor loading in Unit 2.

- Information about the Unit preparedness for operation in terms of fire protection.
- Report on the results of tests of the Accident Confinement System.
- Information about the Unit preparedness for operation in terms of physical protection.

In addition to the work described above, specialists of VATESI On-Site Division participated in tests of safety and safety-related systems. The results were recorded in protocols, registers 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 issued on September 25, 2007, permit No. 5/2007-09-25 entitling to attain the critical state of the reactor in Unit 2 in order to further increase power and generate electricity. A single unplanned shutdown of short duration of the INPP Unit 2 occurred in 2007. Having analyzed the documents related to the unplanned shutdown, VATESI issued permit No. 6/2007-11-10 entitling to attain the critical state of the reactor in Unit 2 in order to further increase power and generate electricity.

VATESI specialists performed an inspection to verify compliance with license conditions in Unit 2, to check the implementation of the measures of SIP and SAR, as well as its Additional recommendations. Control by responsible specialists of the INPP of implementation of the above conditions, measures and recommendations was checked in the course of this inspection.

### *The Ignalina NPP Unit 1*

The 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 Ignalina NPP took this decision on the basis of resolution No. 1491 by the Government of the Republic of Lithuania, dated November 25, 2004.

In January 2007, the Ignalina NPP submitted a request to modify license conditions for Unit 1. After the request was analyzed, new license conditions were drafted, and on March 6 VATESI Head order No. 22.3-15 *Regarding changes in license conditions for Unit 1* was approved.

VATESI in late 2006 granted Unit 1 the status of a finally shutdown facility. In 2007, VATESI was implementing projects of preparation for dismantling of no-longer-used installations of Unit 1. During the same year VATESI analyzed and approved technical specifications for dismantling installations in the turbine hall (building G1) and the system of reactor emergency cooling (building 117/1).

### *Spent nuclear fuel storage facility of the 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 2007, the Ignalina NPP approached VATESI with a request to extend the storage room for additional casks in the facility. Having analyzed the submitted technical decision and safety justification documents for this modification, VATESI agreed to the SNF storage facility extension. VATESI specialists conducted an inspection of the use, management, transportation and storage of SNF. Compliance by the INPP with requirements of standard documents governing the use, management, transportation and storage of SNF, as well as control of supervision of railway rolling stock and sections were checked in the course of the inspection.

### *Facility for cementing liquid radioactive waste and storage facility for solidified radioactive waste*

In 2006, license No. 1/2006 was granted to the Ignalina NPP entitling to operate a storage facility for solidified liquid radioactive waste. In addition to that, license conditions for the Ignalina NPP Unit 2 were supplemented with the modification in the course of which the cementation facility was designed and built taken into consideration. To supervise compliance with the license conditions, VATESI conducted in 2007 an inspection and checked the operation of the facility for cementing liquid radioactive waste and storage facility for solidified radioactive waste.

### *Transportation of nuclear material*

In accordance with license No. 1/2004 issued by VATESI, AB *Lietuvos geležinkeliai* in 2007 transported once fresh nuclear fuel intended for the Ignalina NPP. No violations or incidents occurred, and the level of radiation of the cargo did not exceed the permissible levels.

VATESI specialists analyzed the issue of transportation of enriched uranium fuel pellets from the Institute of Physics to the Ignalina NPP. 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. The application was analyzed and approved in 2007, with additional conditions laid down.



In 2007, VATESI analyzed the draft standard document based on the EU directive *Transportation of radioactive waste and spent nuclear fuel*. A VATESI representative took part in the 45th meeting of the standing working group on issues of radioactive material transportation held in Luxembourg. A VATESI representative also participated at the IAEA technical meeting in Vienna, the Draft Safety Standards Series *Compliance Assurance for the Safe Transport of Radioactive Material*. In 2007, VATESI approved 20 applications for transporting radioactive materials containing radioactive materials not intended for nuclear purposes and wastes with nuclear materials.

In 2007, the draft rules for multilateral approval of a package for transporting radioactive material prepared by the Radiation Protection Center were discussed at the meeting of VATESI and RPC specialists. In late 2007, the amended draft rules on the certificate of the compliance of the design of package for transporting radioactive materials and wastes were received from the RPC. VATESI specialists once again submitted their comments.

### *Supervision of the closed Maišiagala Radioactive Waste Repository*

On May 26, 2006, VATESI granted RATA license No. 2/2006 to carry out supervision of the closed radioactive waste repository 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 repository with an impervious membrane and to improve the condition of the fence surrounding the repository's site. In late 2006, RATA submitted VATESI documents confirming that the measures had been implemented, and the Inspectorate's specialists analyzed these in 2007. VATESI received from RATA in 2007 an amended program of personnel training and actions to be taken in case of failure of physical protection installations. VATESI specialists analyzed these documents.

## ISSUED LICENSES

In 2007, VATESI issued a license to the Ignalina NPP for design a new SNF storage facility and facilities for treatment and storage of solid radioactive waste. In September 2007, the detailed design of solid radioactive waste management and storage facilities at the INPP (project B34) and its preliminary SAR were submitted for special expertise and conclusions. VATESI specialists participated at the meeting with Nukem Ltd. arranged by the INPP Decommissioning Service in which the detailed design of solid radioactive waste management and storage facilities and its preliminary SAR were presented.

In late 2007, the detailed design of storage facilities for RBMK nuclear fuel assemblies from the INPP Units 1 and 2 (project B1) and its preliminary SAR were submitted for special expertise and conclusions. VATESI specialists analyzed within their areas of competence the submitted documents and relevant appendices, as well as the results of the review conducted by TSOs.

## ANALYZING APPLICATION DOCUMENTS

### *Application for construction of a new facility for spent nuclear fuel (B1 project)*

Analysis of the application began in September 2007. The work is being carried out in accordance with a schedule of document presentation submitted by the Ignalina NPP and coordinated with VATESI. The Inspectorate will take the decision whether or not to grant a license for constructing a new storage facility for spent nuclear fuel only after it receives and analyzes all the relevant documents. In 2007, VATESI specialists participated in several meetings with representatives of the Ignalina NPP and companies implementing the project (Nukem Ltd., GNS) on issues related to the project. *Suitability of the CONSTOR RBMK 1500/M2 Casks for Off-site Transport of Spent Fuel* was among the analyzed documents.

### *Application for designing facilities for retrieval and conditioning of solid radioactive waste (B2 project)*

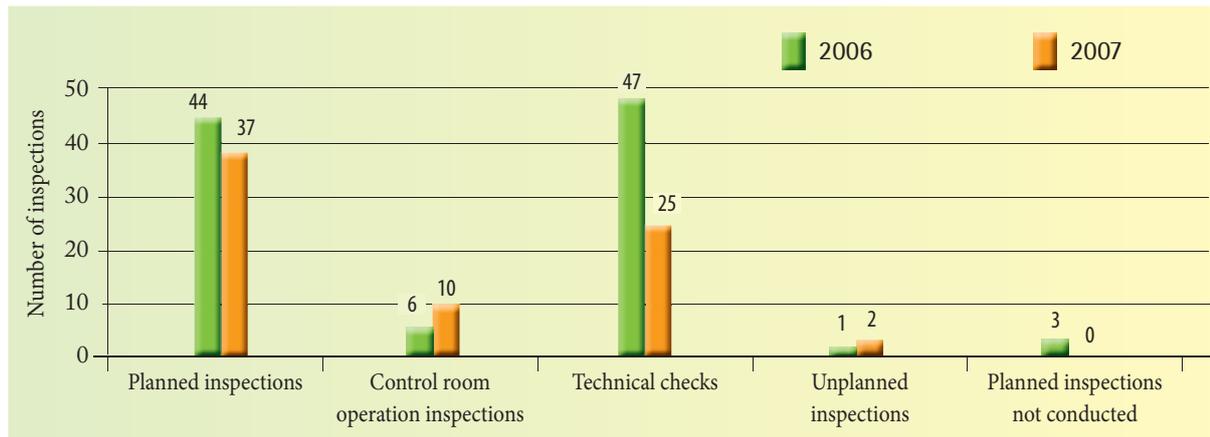
Analysis of the application also began in September 2007. The work is being done in accordance with a schedule of document presentation submitted by the Ignalina NPP and coordinated with VATESI. The Inspectorate's specialists participated in 2007 in meetings with INPP representatives to discuss the issues related to implementation of the project. VATESI will take the decision whether or not to grant a license for designing facilities for retrieval and conditioning of solid radioactive waste only after it receives and analyzes all the relevant documents.

## 10. INSPECTION

The activities of the nuclear safety regulatory bodies are based on three key aspects, i.e. setting of nuclear safety requirements, assessment of activities related to nuclear safety, granting of licenses and supervision of licensed activities.

Inspections can be conducted at all stages of licensing activities: during the site evaluation for a nuclear power installation, its design, construction, reconstruction or decommissioning, as well as during transportation of nuclear materials and when performing their accounting. In addition to that, VATESI inspectors have the right to inspect organizations that provide services to license holders.

In 2007, VATESI specialists conducted 74 inspections (98 in 2006), of which 37 were planned, 10 were control room operation inspections, 25 technical checks and 2 were unplanned inspections.



INSPECTIONS PERFORMED BY VATESI IN 2006–2007

In 2007, the same number of inspectors (26) participated in VATESI inspection activities as in 2006. In all, 395 man-days were spent for inspections in 2007 (495 in 2006). The volumes of inspections somewhat decreased in 2007. The systems of Unit 1 at INPP are being isolated in accordance with a set schedule, therefore the number of technical checks and other inspections decreased. The volumes of inspections are also subject to the requirements laid down in standard documents as regards the frequency of checks of individual systems depending on the importance of the systems to safety.

In 2007, 70, 3 and 1 out of 74 conducted inspections were performed at the Ignalina NPP, RATA and the Institute of Physics respectively.

### PLANNED INSPECTIONS

Whilst performing inspection activities it is very important to adequately assess the current situation in the nuclear power sector, to identify priority areas in terms of radiation hazard so that the issues related to safety are given proper attention.

Each year VATESI is developing a plan of inspections in accordance with established criteria and considering the available human and financial resources. In addition to planned inspections, technical and control room operation inspections, as well as unplanned inspections are performed.

Every December VATESI specialists, having assessed the gained experience of inspection activities, having analyzed the experience of organizations operating nuclear power installations, the results of safety improvement program's analysis and other documents related to safety, plan inspections for the coming year.

Thirty-seven inspections were scheduled in the plan approved by VATESI Head for 2007. All of them were conducted.

The following safety-related areas were inspected in 2007:

1. Training of INPP personnel
2. Safety systems and safety-related systems (the emergency core cooling system, the emergency power systems, the fire-extinguishing systems of Units 1 and 2, reserve control rooms, the system of reactor cavity overpressure protection, the reactor control and protection system (introduction of new servo drives), the system of protection against overpressure in the Main Circulation Circuit, the system of regular and reserve power supply for the Unit's own needs, and others).

3. Accounting for and control of nuclear materials.
4. Management of beyond-design-basis accidents.
5. Management of nuclear fuel.
6. Physical protection of nuclear facilities and nuclear materials.
7. Environmental monitoring conducted by INPP.
8. Quality management.
9. Management of radioactive waste by INPP and RATA.
10. Transportation of nuclear fuel.
11. License conditions of Unit 2.
12. Implementation of safety improvement measures.
13. Safety culture.
14. Equipment certification and ageing management of safety-related systems.
15. The use of imported strategic commodities intended for nuclear purposes.
16. Emergency preparedness.
17. Assessment of operational experience.

The results of an inspection are put down in a statement or report, and the organization that has been inspected is familiarized with them. Having received from VATESI the inspection statement or report, the inspected organization shall draw up a plan of corrective measures aimed at rectifying the identified non-compliances, then implement it and submit appropriate documents to VATESI.

## TECHNICAL CHECKS AND CONTROL ROOM OPERATION INSPECTIONS

In 2007, the specialists of the On-Site Division of VATESI performed 25 checks on technical condition of safety-related systems at INPP, including:

- a check on technical condition of tanks of main circulation pumps;
- hydraulic testing and inspection of the MCC prior to the 2007 annual outage of Unit 2;
- external inspection of the Accident Confinement System at operational parameters;
- external inspection of the Emergence Core Cooling System at operational parameters;
- external inspection of the welds of on pipelines of the MCC at operational parameters, etc.

The objective of technical checks is to ascertain that the technical condition of individual systems, installations and equipment of nuclear facilities complies with the requirements set in special operation, testing and repair regulations.

The Operational Manual is the principal document that defines safety of the NPP operation. Therefore certain actions by the personnel prescribed by the Operational Manual are examined in the course of control room operation inspections. Ten of these were performed in 2007. The results of control room operation inspections and technical checks are summarized in a report.

## UPGRADING INSPECTION ACTIVITIES AND TRAINING

Having analyzed the experience, knowledge and information gained in the course of inspections, workshops or working meetings, VATESI specialists submit proposals regarding improvement of inspection activities and documents governing these. *General Requirements for VATESI Inspections* were approved by the order of the VATESI Head on June 19, 2007. Based on these Requirements, VATESI quality management documents are being drawn up, viz. *The Procedure for Special Inspections by VATESI*, and *The Procedure of Regular Inspections, Control Room Operation Inspections and Technical Checks*. These documents of VATESI quality management are to be approved in 2008.

Measures related to training of inspectors (in-service training, training courses), are envisaged in the IAEA national project for 2008–2010 *Building of VATESI and other Institutions' Capacity in Relation to Licensing of a New Nuclear Power Plant in Lithuania*. The knowledge of VATESI is also to be extended through inspections of structural integrity of safety-related structures, systems and components within the framework of the transition facility *Support to VATESI in Assessing Safety of the Ignalina NPP*. The main objective of inspection activities envisaged in the above projects is to get acquainted with other countries' practice in inspecting nuclear facilities and to apply the knowledge thus gained when inspecting the operational facilities, as well as to prepare for supervision of implementation of the new nuclear power plant project. It is especially useful to young inspectors that are joining the ranks of nuclear community.

## 11. OPERATIONAL EXPERIENCE FEEDBACK

In order to improve safety of nuclear power installations, as well as to prevent accidents, incidents and non-compliances, it is necessary to systematically assess operational experience. The Ignalina NPP has 25-year experience of operating reactors of RBMK type. The facility's safety is continuously enhanced and ensured by analyzing its own experience, as well as the experience of other institutions and industries, especially in the field of nuclear energy.

Operational experience consists of information about events (including those not directly related to safety), defects, precursors to 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 installation. It comprises human activity, organizational and technological aspects.

VATESI has a permanent Commission of Unusual Events Analysis that analyzes the reports on unusual events at the Ignalina NPP, other nuclear facilities of Lithuania and discusses information about events in nuclear power installations worldwide.

In 2007, 11 sittings of the Commission were held in which 8 reports on unusual events at the Ignalina NPP were analyzed, as well as the information about unusual events in other NPPs received from the IAEA and the OECD Incident Reporting System of IAEA/NEA. In 2007, 11 unusual events were recorded, 1, 9 and 1 in Unit 1, Unit 2 and common facilities of the INPP respectively. In comparison with 2006 and previous years, the number of unusual events at the Ignalina NPP decreased in 2007 (Figs. 1 and 2).

Five of the events recorded in 2007 were due to equipment malfunction, 3 due to personnel errors and 3 occurred as a result of deficient procedures (Fig. 3).

In accordance with the International Nuclear Event Scale (INES), 2 of the events in 2007 were rated as level 1, 4 as level 0, and five were out of the scale (Fig. 4).

On May 26, the power of Unit 2 was reduced in an unplanned manner.

A scram of Unit 2 occurred on November 8; the Unit was re-started on November 11. The event was rated as level 0 on the INES scale.

Work was continued on improving the automated computation system of safety indicators at the NPP in 2007. The trends of changes in safety indicators (Figs. 5, 6 and 7) were analyzed on a regular basis. Safety performance indicators can only be used alongside other safety assessment measures. The results of safety assessment showed the safety level at the Ignalina NPP to be acceptable in 2007.

A special inspection was conducted at the Ignalina NPP in late 2007 to check whether or not the system of the use of operational experience meets the requirements set by VATESI and complies with the procedures effective at INPP. Considerable attention was paid to analysis of low-level events at the Ignalina NPP. No violations were identified in the course of the special inspection. Certain non-compliances, however, were revealed. The Ignalina NPP will have to draw up a plan of corrective measures to rectify these.

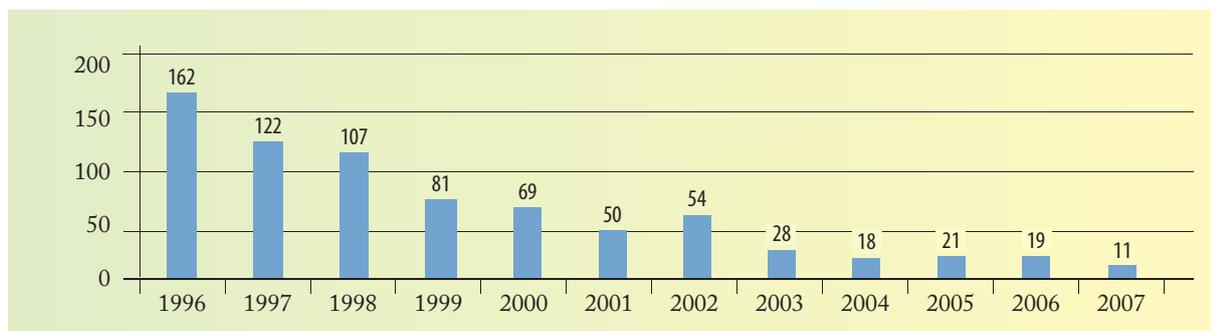


Fig. 1. UNUSUAL EVENTS IN 1996–2007



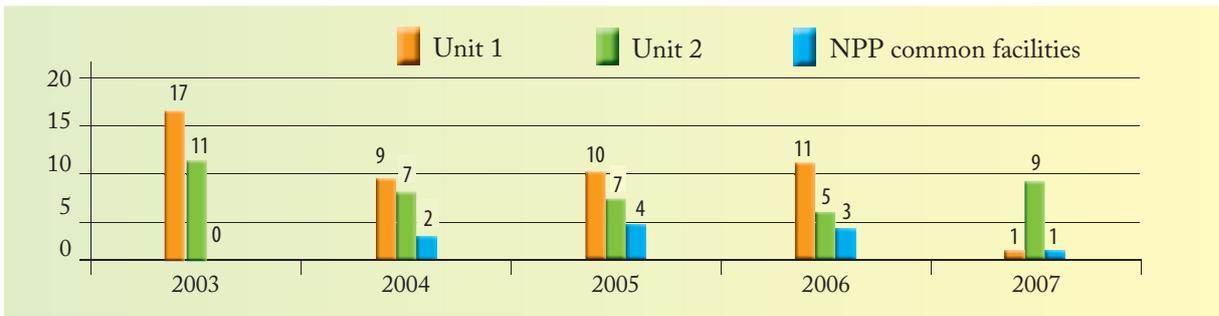


Fig. 2. DISTRIBUTION OF UNUSUAL EVENTS BY INPP FACILITIES

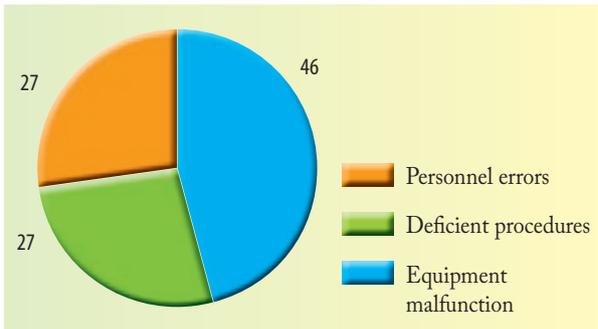


Fig. 3. DISTRIBUTION OF EVENTS BY CAUSE IN 2007

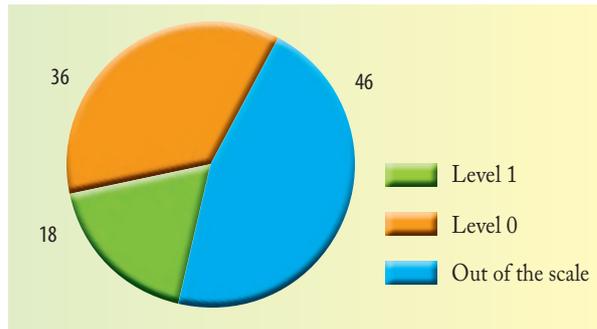


Fig. 4. DISTRIBUTION OF EVENTS IN 2007 ON THE INES SCALE

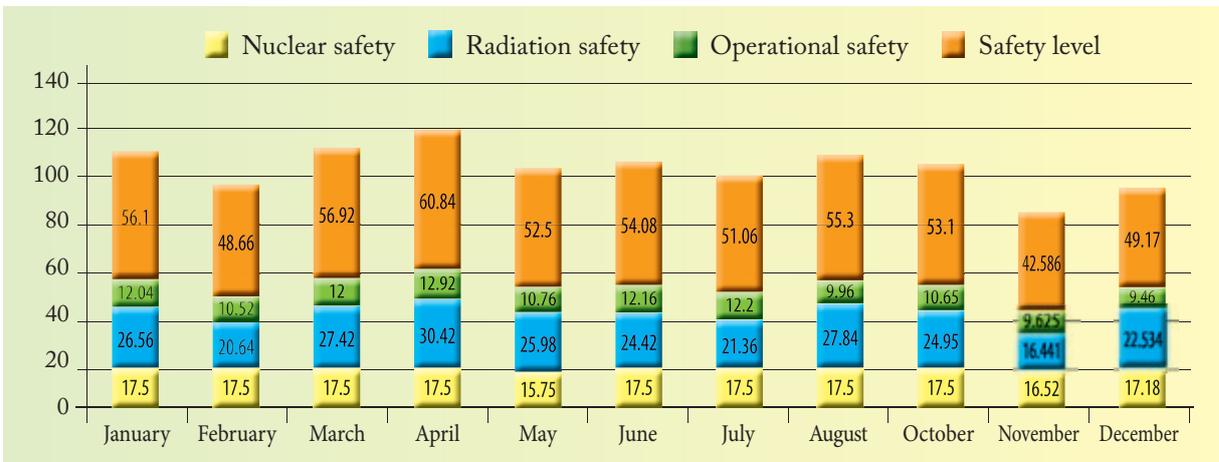


Fig. 5. TRENDS OF CHANGES IN PRINCIPAL SAFETY INDICATORS IN 2007

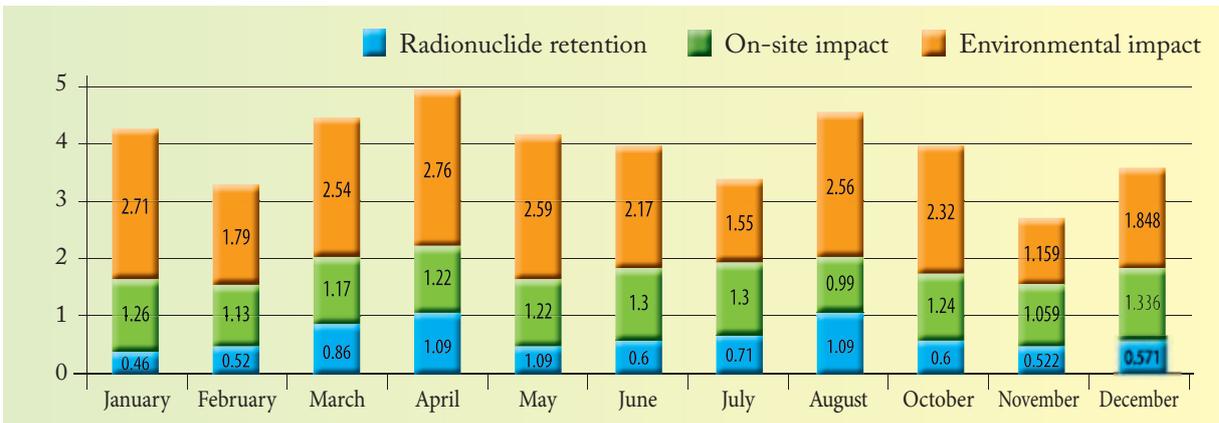


Fig. 6. TRENDS OF CHANGES IN SPECIAL INDICATORS OF RADIATION SAFETY IN 2007



Fig. 7. TRENDS OF CHANGES IN SPECIAL INDICATORS OF OPERATIONAL SAFETY IN 2007

## 12. SAFETY ASSESSMENT AT IGNALINA NPP

Safety assessment is a major function of VATESI in carrying out supervision of nuclear safety and radiation protection at the nuclear power installation. VATESI assesses safety throughout all the stages of the nuclear facility's life, from site selection, through operation, to decommissioning. The supervision is to last until the site where the nuclear power installation was operational has been arranged in accordance with nuclear safety and radiation protection requirements. Whilst performing safety assessment the experience gained in operating the nuclear power installation is taken into consideration, as well as information important in terms of safety obtained from other sources.

The main objectives of safety assessment performed by VATESI are as follows:

- Ascertaining that the information submitted by the organizations operating the nuclear power installation in safety analysis reports and other safety justification documents is accurate and sufficient to confirm the compliance with the set nuclear safety requirements.
- Ascertaining that technical and organizational decisions proposed by the organizations operating the nuclear power installation, and new decisions in particular, are based on experience or tests and ensure the required level of safety.
- Ascertaining that the available information makes it possible to determine the safety of the facility or proposed activity.

The Safety Assessment Division has been coordinating VATESI activities related to nuclear safety assessment. Work on safety assessment and the results achieved by the specialists of this and other divisions of VATESI in 2007 are described in more detail in Chapters 8, 9, 11, 13–17, 20 and 22 of the present Report.

VATESI has to address all kinds of technical issues that often require comprehensive, specific knowledge. Therefore considerable support has been provided by Lithuanian Technical Support Organizations (TSOs). They include the Lithuanian Energy Institute (LEI), the Institute of Physics (FI), Kaunas University of Technology (KTU) and other institutions. 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 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, improvement 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 1995, 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 do without additional neutron absorbers that maintain void 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, and the amount of fuel consumed and spent decreases. Furthermore, it has become possible to use fuel brought from Unit 1 shut down in 2004.

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 2005–7, another 57 rods were installed.

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 scrapped, and the existing control rods are being replaced with new ones 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.

Fuel is being removed from the shut down Unit 1 of the Ignalina NPP. Fuel assemblies are being unloaded in compliance with a safety case and program of work approved by VATESI. A fuel transportation facility installed in 2006 is used to take the fuel assemblies to Ignalina NPP Unit 2. After appropriate examination they are loaded into the reactor for the final utilization. In 2007, 373 spent fuel assemblies were unloaded from the reactor of Unit 1; 318 of these were transported to Unit 2, and 280 were loaded into the reactor. 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 2007)

Year	Part of fuel in the core				ANA	Average burnup, MWd/FA	Control rods of new design, pcs.	
	2 percent	Uranium-erbium					sb. 2477	CRO
		2.4 percent	2.6 percent	2.8 percent				
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
2007	2%	3%	65%	30%	4	1455	82	61

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

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

In 2007, VATESI completed the review of the Manual on Beyond-Design-Basis Accident Management (BDBAM) and relevant technical safety cases. Strategies were set in the BDBAM Manual that are to be applied to ensure the reactor cooling, to reduce the pressure in the reactor cavity, to manage the Accident Confinement System and the states of spent nuclear fuel storage ponds, and to mitigate the effects (by reducing the emissions of nuclear decay products into the environment) if a BDBA occurs at the Ignalina NPP. A consortium of TSOs with the Institute of Physics (FI) in charge assisted VATESI in reviewing the documents. A group of specialists from Serco Assurance, the UK, also rendered technical-scientific assistance in reviewing documents on management of beyond-design-basis and severe accidents within the framework of the DTI project NSP/03-L8 (for more detailed information on the project see Chapter 29).



*The final meeting of the IAEA RAMP Mission with participation of the Mission's experts (its Head, S. H. Lee, is second from left), and specialists from VATESI, the Ignalina NPP, FI, LEI and Serco Assurance.*

The experts of the IAEA Review of Accident Management Programs (RAMP) Mission conducted an independent assessment of the Ignalina NPP's preparedness to manage BDBAs. At VATESI's invitation, the mission worked in Lithuania on January 22–26. The mission's experts stated that the scientific-technical level of the Ignalina NPP's documentation on BDBA management was adequate, and submitted recommendations regarding improvement of the documentation. The comments of VATESI review and the plan for implementing the recommendations of IAEA RAMP Mission were discussed in the course of inspection that took place at the Ignalina NPP in December 2007. The Ignalina NPP has been upgrading the documentation on management of BDBAs to take into consideration the comments of VATESI review and recommendations of the IAEA Mission. The management of BDBAs, including severe accidents, will hopefully be introduced in Ignalina NPP Unit 2 and spent nuclear fuel storage ponds in 2008.

The results of mathematical simulation and analysis conducted within the framework of the PHARE project 5812.04.02 *Support to VATESI and its TSOs in assessment of beyond design basis accidents for RBMK-1500 reactors* were used for assessing the BDBA management manuals of the Ignalina NPP. In the course of the project implementation formation of radionuclide inventory in the fuel of an RBMK-1500 reactor, the loss of structural integrity of fuel assemblies, the transfer of radionuclides in the primary circuit and their retention within the Accident Confinement System, as well as potential releases were analyzed in detail. Fuel behavior, including zirconium burning in air, in the spent nuclear fuel storage ponds of the Ignalina NPP in case of BDBAs was also analyzed. The work that was being done within the framework of the project by specialists from FI, LEI, IRSN and GRS was completed in November. In the course of this two-year project, considerable technical and scientific information was accumulated and experience was gained in the use of complex codes, such as ASTEC, ATHLET-CD, COCOSYS and interpretation of computation results. Five theoretical workshops on issues of physics and phenomenology of severe accidents and seven training courses in the use of the codes were held as part of the project in 2007. Specialists from France, Germany and Lithuania delivered lectures and conducted trainings at these events.

Two inspections were conducted in 2007 with a view to checking implementation by the Ignalina NPP of the analytical means of DBA processes in accordance with SIP-3/2007 program and application of emergency instructions, the training of operational personnel and modernization of the full-scope simulator. Certain drawbacks were recorded in the inspection statements, and the Ignalina NPP was instructed to rectify non-compliances and violations.

After the information gathered at the workshops and the working meetings of WENRA was assessed, it was used in 2007 to upgrade draft legal documents related to nuclear safety that govern the management of probable operational events, DBAs and BDBAs.



*Theoretical workshop on the use of the ATHLET-CD code as part of PHARE project 5812.04.02 Support to VATESI and its TSOs in assessment of beyond design basis accidents for RBMK-1500 reactors.*



## 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.

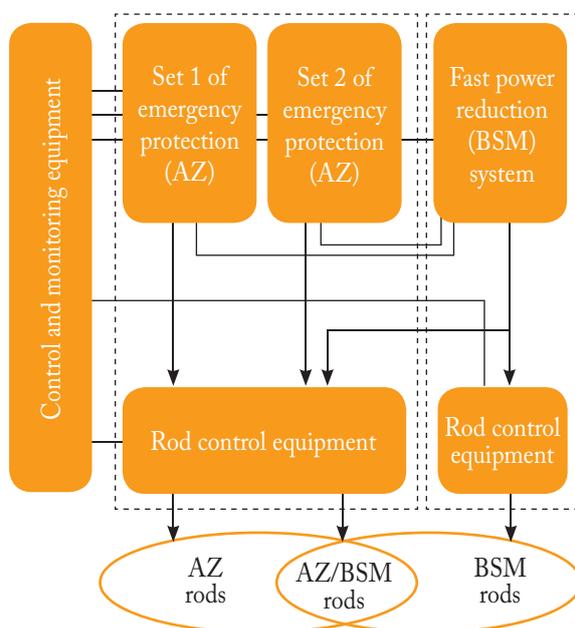
The results of PSA can be widely used when addressing licensing, safety management, and other issues relating to nuclear power installations. PSA can be used in combination with deterministic methods, and the principles of the two must complement each other. The main advantage of PSA consists in that it helps identify the key risk factors and 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.

In 2007, VATESI initiated work related to the application by the Ignalina NPP of a PSA model for special software to meet VATESI needs. Unusual events at the Ignalina NPP will be analyzed with the use of this model and software. The results of this analysis will complement the results obtained with conventional methods, which will make it possible to assess an event's importance to safety in a more detailed manner. The application of the PSA model will enable to assess potential events that might occur if the circumstances had been somewhat different. The use of the abovementioned software and model makes it possible to assess the way different operation modes of the nuclear power installation, changes in technological regulations and non-compliances revealed in the course of inspections affect safe operation of the Ignalina NPP.

PSA is also applied by certain regulating institutions of Western Europe and the USA for similar objectives of unusual events' analysis. In 2007, VATESI specialists participated in working meetings arranged by the IAEA where several methods of analysis were demonstrated, their drawbacks and advantages were discussed, and experts shared their experience.

In late 2006, the Ignalina NPP submitted two reports on implementation of the IAEA IPSART mission recommendations aimed at improving the quality of PSA, i.e. quality assurance in implementing PSA procedure and the model of introduction of a diverse shutdown system at the Ignalina NPP. VATESI specialists analyzed the reports in 2007 and found no non-compliances with VATESI requirements or modern practice.

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



In 2007, work was completed on installation of a diverse shutdown system (DSS). The electronic part of the DSS has been operational since late 2004, whereas the last batch of servo drives of new design was installed in the course of the 2007 annual outage.

When licensing the DSS, VATESI implemented two technical support projects funded by the EC, *TSO support to VATESI in assessing and licensing a diverse shutdown system in the Ignalina NPP Unit 2* (the years 2000–2004) and *Support to VATESI in assessing and licensing the design of new servo drives and their commissioning in INPP Unit 2* (commenced in 2005, completed in 2007).

## LICENSING OF DSS INTRODUCTION

The DSS was introduced in the INPP Unit 2 in two stages. The electronic part was completed in mid-2004. Work on design, manufacture and installation of 25 drives of new design was completed in 2006. The remaining 24 drives were installed in Unit 2 during the outage of 2007.

When reviewing the technical specification and safety justification documents of the DSS, and with a view of the systems being introduced meeting the set requirements, the Ignalina NPP was submitted numerous recommendations concerning improvement of the documents. Inspections were performed in the course of licensing and certain errors were revealed in the design, as well as drawbacks of quality control. Whilst implementing the project, all issues important in terms of safety assurance were resolved. Therefore the decision was taken that the final condition of the DSS prior to starting the reactor up after the outage was acceptable and that the reliability of the reactor shutdown function had increased. This was the main objective of the DSS introduction aimed at adequate response of RBMK reactors in case of scenarios of anticipated transients and actuation of the emergency protection.

The increased probability was due to the system's architecture. The system consists of at least three-fold redundancy, channels are physically well-separated throughout the signal path. Separation of signals is ensured by certified equipment such as relays and optical insulators. Considerable experience has been gained in operating major parts of the digital system (set 2 of emergency protection AZ) of reactors of different types, whereas a large part of analog system (set 1 of emergency protection) has been successfully functioning in RBMK reactors, including those in the INPP Units 1 and 2. It was decided that the system as a whole and the design of its subsystems are sufficiently redundant and meet the diversity criterion.

Whilst reviewing the documents, newly-introduced components were thoroughly analyzed that are closely related to sets 1 and 2 of the emergency protection or are common elements for introducing absorber rods (e.g. relay devices and servo drives of DSS).

In experts' opinion, the architecture of the system is complicated. Its design, analysis and assessment were thus also complicated. Therefore VATESI specialists and the experts, who provided assistance to them, put in a lot of effort in the course of licensing for the decision regarding the DSS operation to be taken.

## LICENSING OF SERVO DRIVES



*An AZ/BSM servo drive of new design.*

Three principal aims were envisaged in the project of review of documents justifying safety of servo drives.

1. To complete review activities remaining after the first project, to review the results of the DSS tests with a view to ascertaining that it had been properly installed and is functioning well, and to reviewing the part of the final DSS justification related to analysis of accidents.
2. To analyze the documents related with performance of the DSS early operation and to review improvements to the DSS so that it operates properly when the flow of coolant in the reactor falls below the specified value.
3. To review the design, safety justification, manufacture, installation and testing of the servo drives. The servo drives are novel devices intended for regulating the position of control rods that control the nuclear reaction. They make the rods drop promptly to shut the reactor down in an emergency and also help control the power in the reactor during normal operation.

The review of the commissioning test of the DSS revealed some non-compliances, which is to be expected at this stage. Therefore appropriate recommendations were issued to make sure that a sufficient part of devices will be tested and that the non-compliances will be properly rectified. The proposal to widen the final safety justification with supplementary, more thorough information in order to demonstrate compliance with the requirements, and to provide additional information about the preparedness of the shutdown system to respond to every potential cause of emergency scram, was one of the recommendations.

The main objective of the project is to conduct a preliminary and final analysis of servo drives of new design including their manufacture, testing and modifications of design. Five reports were produced in the



course of document review, including recommendations regarding the final safety justification. The following key issues were discussed during the follow-up review:

- The number of the protection system rods that may fail to drop into the core for the reactor to be safely shut down.
- Whether or not the design of servo drives is adequate and reliable.
- Whether or not all potential failures of servo drives have been identified.
- Quantitative assessment of reliability of servo drives (the probability that they will fail to act when necessary).
- Whether or not target reliability of the construction can be attained.

It is stated in the final comments of the follow-up review that the Ignalina NPP took into consideration the comments that had been submitted. In September 2007, VATESI on the basis of the additional information from the Ignalina NPP completed approval of the issues that had remained unsolved.

## FINAL PROVISIONS, ASSESSMENT OF ATTAINED RESULTS

After the DSS was installed in the Ignalina NPP Unit 2, the most important project of the NPP safety improvement was accomplished. The technical support projects implemented during licensing gave VATESI an opportunity to continuously receive necessary advice on technical issues. VATESI and Lithuanian TSOs gained experience and practical skills as a result of which their ability to assess, monitor and control large projects grew.

At different stages of the DSS introduction (when approving technical specifications, designing, manufacturing and installing the DSS), the Ignalina NPP was given conclusions regarding the project compliance, therefore certain basic modifications of the system design were introduced. As a result, adequate diversity and redundancy of the DSS was achieved, as well as reliability of the reactor scram. It can thus be maintained that the DSS has considerably improved reliability of safety functions of the Ignalina NPP Unit 2. The system would have hardly met all the set requirements without these modifications.

VATESI has been controlling implementation of the recommendations laid down in the final safety justification during the assessment of the DSS accident analysis.

The performed review ensured that large investment by the European Commission was exceptionally beneficial, as the maximum increase in the shutdown reliability was achieved. At the final meeting of the second project VATESI and the Review Team agreed that the review process had been demanding to all parties. Many documents had been analyzed in depth to test the safety justifications. Experts of the Review Team expressed numerous comments and had to thoroughly check response to them. This resulted in improved safety of the DSS and the servo drives and a demonstration of this improvement.

The results achieved while participating in the detailed and comprehensive review of this complex installation have increased VATESI staff's confidence in their work.

## 17. VATESI ACTIVITIES IN DECOMMISSIONING IGNALINA NPP

Decommissioning of the Ignalina NPP that begins with development of decommissioning projects and ends with concrete decommissioning operations must be implemented safely. The Ignalina NPP, as the organization operating the facility, is responsible for safe decommissioning, decontamination and dismantling of installations and equipment, as well as for radioactive waste management. VATESI licenses these activities, analyzes the safety of projects that deal with decommissioning operations, and arranges a special expertise of the projects in terms of nuclear safety.

In May 2004, VATESI approved *The final plan of the Ignalina NPP decommissioning*. The plan describes individual decommissioning projects the entire decommissioning process has been divided into. Every project must be coordinated with appropriate institutions and its safety must be justified. All decommissioning operations, organizational, technical and radiation protection measures are envisaged in the project, dismantling and decontamination methods are identified, the equipment and tools necessary for the operations and their usage conditions are described, and methods of radioactive waste management are set forth. It is verified in the safety analysis report that individual decommissioning operations and the process as a whole will be safe.

In 2006, VATESI approved *Unit 1 final shutdown and defueling phase decommissioning (UIDPO) project* and its *Safety Analysis Report*. Analysis was performed of the systems of Ignalina NPP Unit 1 and their configuration identified, working parameters were assessed, systems and components that are no longer necessary and that can be isolated until the time comes to dismantle them were identified. The Ignalina NPP took into consideration the comments that had been expressed by VATESI when approving the project, introduced certain changes and in early 2007 obtained the final approval from the Inspectorate.

A similar project will have to be drawn up for the INPP Unit 2, too. Therefore a meeting was held with representatives of the nuclear power installation in the summer of 2007 to discuss the development of *Unit 2 final shutdown and defueling phase decommissioning (U2DPO) project* and its *Safety Analysis Report*. VATESI submitted its comments regarding the list of documents necessary for obtaining a permit for the final shutdown of Unit 2. VATESI will be able to grant Unit 2 the status of a finally shutdown one and will give permission to carry out operations envisaged in *Unit 2 final shutdown and defueling phase decommissioning project* only after it has analyzed and approved these documents.

The Ignalina NPP will perform dismantling operations of installations and equipment by implementing individual decontamination and dismantling projects that must be coordinated with the regulating authority together with safety analysis. In 2007, VATESI specialists analyzed and approved *The technical specification of project B9-0*, they also approved alterations to *The technical specification of project B9-1* (approved by VATESI in 2006). Both technical projects are related with the decontamination and dismantling of compartments in building 117 (project B9-0) and turbine hall (project B9-1) of INPP. To implement them, technical and safety justification documents will be drawn up necessary for licensing dismantling operations and purchasing the necessary equipment. Reactor emergency cooling systems will be decontaminated and dismantled in building 117, therefore the decision will be taken in the course of the project as to the ways of dismantling large-size installations and the additional tools that will have to be purchased. The systems and installations that are no longer necessary for ensuring nuclear safety and operation will be decontaminated and dismantled in the turbine hall. This will prepare room for managing other decommissioning radioactive waste.

The decommissioning radioactive waste will have to be managed in compliance with the requirements set by VATESI. Therefore the Ignalina NPP bears responsibility for adequate characterization of radioactive wastes and identification of each flow of radioactive wastes in terms of potential ways of disposal. In order to accurately determine radionuclide composition of radioactive waste, nuclide vectors are used for identifying activity of hard-to-measure radionuclides in solid radioactive wastes. In 2007, VATESI analyzed and approved *The preliminary inventories of declarable radionuclides and activity estimation methods in the decommissioning waste of INPP building 117/1 and turbine hall*. The nuclide vectors will be used for characterizing the wastes due to be sent to the clearance level measuring facility, as well as for assessing whether or not the decommissioning waste meets preliminary acceptance criteria for radioactive waste disposal in a repository for very-low-level radioactive waste and in a near-surface repository.

Whilst decommissioning a nuclear power installation it is necessary to minimize the amount of radioactive waste. Therefore decommissioning waste contaminated with radioactive substances will be decontaminated and removed on the basis of clearance levels. Legal documents of Lithuania set levels to which the surfaces of equipment, apparatus, installations and structures must be decontaminated so that they can be further used without restrictions. The principle of clearance levels will also be applied for the Ignalina NPP site or its parts. Therefore in the summer of 2007 VATESI jointly with the IAEA arranged the workshop *Establishment and control of clearance levels* in which experts from abroad shared their experience in the ways of establishing these levels, the methods to be used for applying the levels, and informed about the methodology of sampling and the control of clearance levels application.

## 18. 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 make sure 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).



VATESI supervises development of safety culture at the Ignalina NPP. In 2007, VATESI conducted a routine safety culture inspection. It was ascertained in the course of the inspection that the Ignalina NPP had accomplished all the measures aimed at improving safety culture envisaged for 2007.

VATESI also analyzes periodical safety culture reports by the INPP. The safety culture indicators presented in them show the overall level of safety culture and the trends in 2007.

**SAFETY CULTURE INDICATORS AT THE INPP IN 2007**

Code	Short description	Max. positive value	Quarter of 2007			
			1	2	3	4
I <sub>1,1</sub>	Training process at INPP	1	1	1	1	0.88
I <sub>1,2</sub>	External training process	1	1	1	0	1
I <sub>2</sub>	Implementation of Safety Committee's recommendations	1	1	0.67	1	0.75
I <sub>3,1</sub>	Implementation of audit results	1	0.08	0.47	0.5	0.47
I <sub>3,2</sub>	Implementation of inspection results	1	0.84	0.91	0.95	0.94
I <sub>4</sub>	Coefficient of recurrence of events	1	1	1	1	1
I <sub>5,1</sub>	Coefficient of events due to personnel error	1	0	1	0.8	0.17
I <sub>5,2</sub>	Coefficient of encouraging/punitive measures	1	1	0.85	0	0
I <sub>6,1</sub>	Coefficient of implementation of proposals submitted to management by personnel	1	0	1	0	0.67
I <sub>6,2</sub>	Coefficient of implementation of personnel's proposals regarding modifications	1	0.72	1	1	0.89
I <sub>6,3</sub>	Taking into account personnel's proposals to use own and operational experience	1	1	0.72	0.47	1
<b>I<sub>КС</sub></b>	<b>Relative safety culture indicator</b>	Target: not less than 62%	69.4%	87.4%	61.2%	70.6%

It can be seen from the data in the Table that the INPP has achieved the set target. The relative safety culture indicator exceeded 62%, and in the fourth quarter it was as high as 70.6%. The following positive trends of safety culture indicators are worth noting:

- High level of implementation of training plans (I1.1 and I1.2).
- Fairly successful implementation of recommendations of the Safety Committee (I2).
- Fairly high values achieved of coefficients of implementation of inspection results (I3.2), recurrence of unusual events (I4), and implementation of the personnel's proposals regarding modifications (I6.2). Besides, the coefficients remain at a relatively stable level for a second successive year.

However, certain areas of safety culture still may be improved further. The directions for further improvement could be concentrated upon the following areas of the safety culture indicators: frequency of unusual events due to personnel errors (I5.1), personnel encouragement (I5.2), implementation of proposals on safety improvement and other issues submitted to the management by the personnel (I6.1).

The possibilities to further improve the Ignalina NPP management are demonstrated by two positive trends in safety results: not a single unusual event (incident) was reported in 2007 due to errors of contractor organizations' personnel, whereas the number of unusual events resulting from personnel errors decreased from 11 in 2006 to 4.

Issues of safety culture gain particular importance in preparation for discontinuing electricity generation at the Ignalina NPP Unit 2, especially in the light of personnel reduction. Experience of other countries shows that during the complicated period of a NPP decommissioning safety culture can be enhanced through implementation of such measures as encouragement of efficiently working employees, regular assessment of psychological climate of the organization, assuring a dialogue between the leadership and the rank and file, and improvement of managers' skills (based on recommendations laid down in the IAEA publication *Planning, managing and organizing the decommissioning of nuclear facilities: lessons learned*, TECDOC-1394, Vienna, 2004).

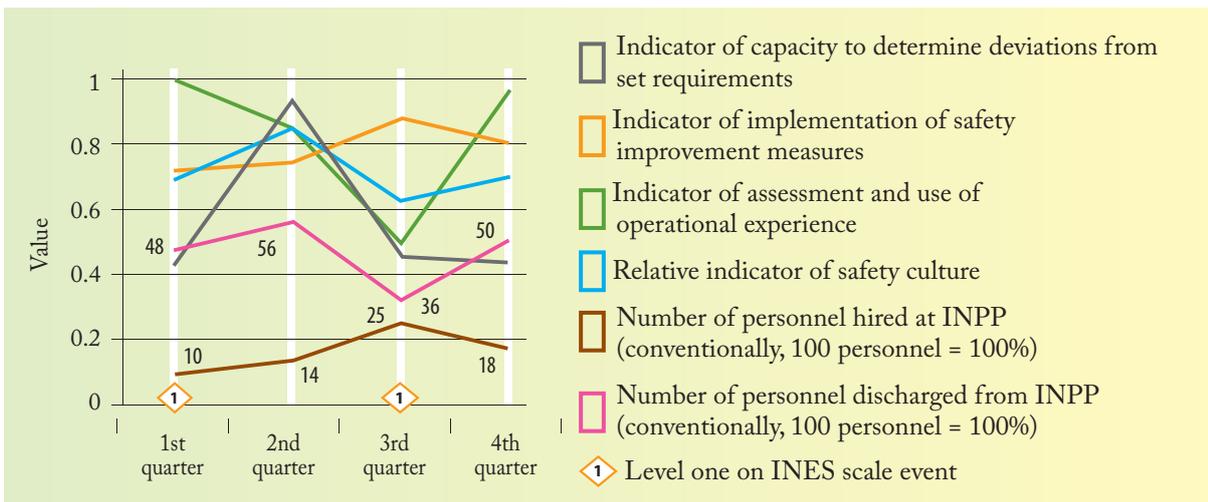


Fig. 1. TRENDS OF PRINCIPAL SAFETY CULTURE INDICATORS IN 2007

The trends in principal safety culture indicators, data on personnel hired at and dismissed from the INPP in 2007 are shown in the above figure, as well as the time when events most significant from the viewpoint of safety occurred. The combination of the described trends implies the need to assess or observe later on whether it is just a coincidence that the more personnel left, the higher was the overall relative indicator of safety culture.

## 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 2006 issued in the second quarter of 2007. For a fourth successive year it was concluded that all declared nuclear material had been used for peaceful purposes only and that no undeclared nuclear activities had been discovered.

The conclusion confirming transparency of nuclear power activities and other areas related with the use of nuclear energy enables the IAEA to apply integrated safeguards in a Member State. Since June 1, 2007, the integrated safeguards have also been implemented in Lithuania. After implementation of integrated safeguards, a new type of inspections (unannounced inspections) was introduced. Previously, four scheduled inspections used to be carried out at the Ignalina NPP on a quarterly basis. From now on, one physical inventory verification (PIV) and two unannounced inspections are to be performed every year.

As in previous years, a scheduled inspection of physical inventory verification was conducted at the Ignalina NPP in March 2007. Inspectors of the EC and VATESI participated in it alongside their counterparts from the IAEA. As early as in July, the first unannounced inspection by the IAEA took place.



The storage facility during inspection.

In the course of inspections, the IAEA inspectors selected part of the fresh nuclear fuel in the storage facility and in the NPP's Units in accordance with probabilistic statistical methodology. Identification numbers of assemblies were examined and, in the course of the PIV, non-destructive analysis measurements were also made. The IAEA inspectors examining spent fuel assemblies in the INPP Units performed verification measurements of assemblies and replaced seals selected by the use of probabilistic statistical methodology.

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



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 to the Agreement on Application of IAEA Safeguards, a country complying with its provisions must submit by May 15 of every year an updated declaration for the previous calendar year. VATESI collected and summarized by May 15 information about activities in the field of the use of nuclear energy in Lithuania and sent the prepared report to the IAEA via the Permanent Representation of the Republic of Lithuania at the International Organizations in Vienna. In compliance with the Protocol Additional, reports were also sent on export from Lithuania of equipment and technologies under control on a quarterly basis.

In September, the IAEA inspectors, in accordance with the Protocol Additional, requested a complimentary access to the IAEA site to verify whether no undeclared activities related to the use of nuclear energy were taking place there.

In September, an annual PIV was conducted at the Institute of Physics in compliance with the EURATOM and IAEA safeguards.

The EURATOM safeguards are implemented in accordance with the Treaty establishing the European Atomic Energy Community (EURATOM), and the system of the IAEA safeguards is based on the Agreement on Application of IAEA Safeguards and its Protocol Additional. To link the two systems in the EU, a Trilateral Safeguards Agreement between the EU non-nuclear-weapon states, the EURATOM and the IAEA with its Protocol Additional is applied (replacing the Bilateral Agreement, between the state and the IAEA, and its Protocol Additional).

On March 13, 2007, the Seimas of the Republic of Lithuania ratified the Trilateral Safeguards Agreement and its Protocol Additional, and on September 26, 2007, VATESI was appointed institution responsible for its implementation by Government resolution No. 1047.

In 2007, preparations were completed for transition to a common EURATOM and IAEA safeguards system. VATESI submitted reports on nuclear materials accounting (data as of December 31, 2007) to the IAEA and EC, and the trilateral documents became effective on January 1, 2008.

Inspection activities by the IAEA, the EC and VATESI in 2007 are summarized in the Tables below together with data of two previous years for comparison and data of nuclear materials accounting.

**TABLE 1. SUMMARY OF THE IAEA, EC AND VATESI INSPECTION ACTIVITIES IN LITHUANIA IN 2006**

	2005	2006	2007
Total number of IAEA inspectors and technicians' working days in Lithuania	188	156	164
Number of EC inspectors' working days in Lithuania	8	8	9
Number of working days at facilities of VATESI inspectors engaged in the area of safeguards	25	20	13
Number of IAEA inspectors designated to conduct inspections in Lithuania	324	332	342
Number of EC inspectors designated to conduct inspections in Lithuania	190	180	182
Number of VATESI inspectors engaged in the area of IAEA safeguards	2	1	2

**TABLE 2. DATA OF NUCLEAR MATERIALS ACCOUNTING**

	2005	2006	2007
Number of reports	25	19	38
Number of entries	18,924	18,469	35,928
Amount of depleted uranium (tonnes)	20.9	21.1	30.3
Amount of enriched uranium (tonnes)	2272	2291	2320
Amount of U <sup>235</sup> (tonnes)	28.5	28.2	28
Amount of plutonium (tonnes)	7.4	7.7	8

## PHYSICAL PROTECTION OF NUCLEAR MATERIALS AND NUCLEAR FACILITIES

To check compliance with physical protection requirements, VATESI conducted three physical protection inspections in 2007. An inspection was performed at the Ignalina NPP to check the implementation of physical protection improvement projects; the system of physical protection was inspected at the Maišiagala Radioactive Waste Repository, and the inspection at RATA was aimed at checking assurance of physical protection during transportation of nuclear material. Certain non-compliances with the valid physical protection requirements were identified in the course of inspections, and the inspected organizations were instructed to put these right. The revealed non-compliances, however, posed no threat to safe operation of the Ignalina NPP, the Maišiagala Radioactive Waste Repository or transportation of nuclear material.

To strengthen international and national nuclear security regime, the ratification documents regarding amendments to *The Convention on the Physical Protection of Nuclear Material* were submitted to the Seimas in 2007. Considering changes in the Convention, VATESI drafted new requirements for physical protection of nuclear materials and nuclear facilities. The new edition of the requirements was submitted to the competent authorities of the Republic of Lithuania for approval.

In 2007, the IAEA held several technical meetings in which different recommendatory documents were drawn up aimed at helping the IAEA Member States to enhance the system of nuclear security. Specialists from VATESI and other competent authorities of the Republic of Lithuania took an active part in these events. Several Lithuanian specialists improved their skills in international courses and workshops arranged by the IAEA.

## 20. RADIOACTIVE WASTE MANAGEMENT

After the Law of the Republic of Lithuania on Radioactive Waste Management was passed on May 20, 1999, much more attention is being given to the management of this kind of waste in our country and especially at the Ignalina NPP, the facility that generates the bulk 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 to avoid imposing undue burdens on 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 2008 are summed up in the table below.

Amount of waste, m <sup>3</sup>	Group 1 combustible	Group 1 incomb.	Group 2 combustible	Group 2 incomb.	Group 3	Total
Accumulated as of January 1, 2008	11,277	7979	2121	2726	803	24,906

Liquid radioactive waste also forms at the Ignalina NPP. It is evaporated in special evaporation facilities, and the evaporation residue is bituminized. The steam that forms following evaporation is filtered through special ion exchange and pearlite filters that retain radionuclides. The filters are then cemented.

By 2008, 12,730 m<sup>3</sup> of bituminized waste accumulated in the radioactive waste storage facility (building 158).

One hundred and thirty m<sup>3</sup> (145 tonnes) of ion exchange resins and pearlite was processed in the cementation facility. 1384 cemented waste packages (drums) were produced that are stored in the cemented waste storage facility (building 158/2).

The Government of the Republic of Lithuania approved the Radioactive Waste Management Strategy on February 6, 2002. In accordance with the Law on Radioactive Waste Management, the Ministry of Economy every five years shall submit to the Government the Strategy of Radioactive Waste Management after coordinating its draft with VATESI and other institutions first. VATESI has recently submitted comments regarding the draft strategy. The updated Strategy will hopefully be approved in the first half of 2008.

VATESI has approved the plan submitted by the Ignalina NPP to convert the storage facility of bituminized waste into a repository. The plan envisages the following alternatives: converting the bituminized waste storage facility into a repository by constructing additional protection barriers, or retrieval of the waste from the facility, re-packing it into casks and transporting to the would-be repository for low- and intermediate-level radioactive waste. VATESI also approved the program of the feasibility study on conversion of the bituminized waste storage facility into a repository.

In accordance with the Radioactive Waste Management Strategy approved by the Government in 2002, the Ignalina NPP is to reorganize management and storage of solid short-lived and long-lived radioactive waste in a manner consistent with new requirements. Radioactive waste in the existing storage facilities must be retrieved,

re-categorized in accordance with the new classification, processed and placed into appropriate containers so that later on it can be safely disposed of without endangering the public or environment. The Ignalina NPP has already developed and coordinated with VATESI and other institutions technical specifications of the facilities that will be used to attain the objectives set in the Strategy. The Ignalina NPP has also submitted to VATESI and other institutions for review a detail design of waste processing facilities and storages, as well as a preliminary safety analysis report (project B3/4), and has been developing a detail design of retrieval of the waste from the existing storage facilities and a preliminary safety analysis report (project B2). VATESI assisted by experts has been reviewing the submitted documents.

In 2006, the Ignalina NPP submitted and VATESI reviewed the technical specification of a repository for very-low-level radioactive waste. In 2007, VATESI approved the final version of the repository's technical specification in which the part related to design of physical protection systems was separated as an individual project.

In late 2007, the Ignalina NPP submitted to VATESI and other institutions for review the detail design of a new storage facility for spent nuclear fuel and a preliminary safety analysis report. At present VATESI is reviewing the submitted documents.

The Radioactive Waste Management Strategy approved by the Government 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. 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. A supplemented report of the environmental impact assessment study was submitted in 2006, in which the Stabatiškė site was also analyzed. In 2007, VATESI submitted its conclusion regarding the possibility of this planned activity. It stated that both potential sites (Stabatiškės and Galilaukė) were suitable, but the latter was preferable due to natural conditions for disposal of radioactive waste. However, pursuant to the resolution of the Government of the Republic of Lithuania *Regarding design of a repository for short-lived low- and intermediate-level radioactive waste*, dated November 21, 2007, the decision was made to construct the repository at the Stabatiškė site. Social factors were behind this decision: the opinion of Belarus was taken into consideration that the Stabatiškė site is too close to its national border.

On May 20, 2004, RATA submitted VATESI an application for a license to post-closure surveillance of the Radioactive Waste Disposal Facility of Radon Type situated in Bartkuškis Forest near Maišiagala. On May 5, 2005, RATA submitted a safety analysis report of this facility. VATESI specialists jointly with experts stated that the facility did not comply with criteria for a repository as it could not ensure long-term safety. Therefore the 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 closed radioactive waste storage facility at Maišiagala. In 2007, VATESI approved the report on studies of the liquid RW tank and its piping on the repository's site and submitted comments regarding the plan of measures to manage this type of waste.

By the end of 2007, 20 CASTOR RBMK-1500 and 74 CONSTOR RBMK-1500 casks with spent nuclear fuel were transported from SNF storage ponds of INPP to the interim spent nuclear fuel storage facility of dry type. There remained room for 4 CONSTOR casks at the storage facility as of the end of 2007.

## 21. EMERGENCY PREPAREDNESS

### INTERNATIONAL COMMITMENTS

In 2007, VATESI maintained close relations with international organizations in the area of emergency preparedness.

In March, a meeting of competent institutions of Eastern Europe within the framework of the Convention on Early Notification was held in Budapest. Its aim consisted in coordinating the interests of authorized institutions of Eastern Europe in preparation for the 4th meeting of Member States' authorized institutions within the framework of the Convention on Early Notification and Assistance in Vienna. The results of the IAEA working groups, the countries' activities and regional problems were discussed at the meeting.

The 4th meeting of Member States' authorized institutions within the framework of the Convention on Early Notification and Assistance took place in Vienna in July (the meetings are held once in two years).

Universal systems of exchange of information about nuclear and radiological accidents and incidents, and the potential to upgrade these were discussed at the meeting, and proposals were given regarding improvement of countries' preparedness for nuclear and radiological accidents.

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. A project of the new WebECURIE system of exchange of information was presented in the event. The aim of the project is to replace the currently used CoDecS system of information exchange by a new, more flexible system with greater potential. An operational model of the new system was demonstrated at the meeting. WebECURIE is an Internet website in which information about critical radiological situations will be accumulated. When any EU country provides information about an event, all other EU countries will be immediately informed about it. The duty personnel of EU Member States' authorized institutions will be informed about new information on the WebECURIE website by an automatically generated telephone call, via e-mail or by a fax message. Transition to the WebECURIE system is to be made in 2010. Until then the CoDecS system will be used for exchange of information. Its updated version was also presented at the meeting.

In 2007, information about two events, neither of which had radiological consequences, was circulated through ENAC, the IAEA official system of early notification about radiological accidents. On March 21, Sweden's information was announced about threats to blow up Unit 1 of the Forsmark NPP. Sweden's special services checked the area of the Unit and found the threat to be false. The operation of Forsmark NPP Unit 1 was not disturbed. On July 16, Japan's information was circulated about an earthquake whose epicenter was 10 km away from the Kashiwazaki-Kariwa NPP. Out of 7 facility's reactors only the service building of Reactor 3 was slightly damaged, which did not directly affect its operation.

In the area of emergency preparedness, VATESI closely cooperated with institutions of SKI, the Swedish Nuclear Safety Regulatory Authority, and SSI, the Swedish Radiation Protection Authority. Topical information was exchanged with Sweden's representatives at the meeting held in Vilnius in April.

In May, a delegation from Lithuania visited Sweden and familiarized themselves with institutions participating in emergency preparedness activities and their experience in assuring emergency preparedness. One of the principal objectives of this bilateral cooperation is to sign an agreement between SKI, SSI and VATESI as regards early notification about a nuclear or radiological accident. After the agreement is signed, the two countries will exchange information about events not only through official channels of the EC and IAEA, but also directly. The information will thus be provided more promptly. Furthermore, the agreement will enable to exchange information about events that do not pose real threat but that might be of interest to the other country.

## EMERGENCY PREPAREDNESS OF THE IGNALINA NUCLEAR POWER PLANT

A meeting was held on September 5, 2007, at which representatives of VATESI, the Fire and Rescue Department under the Ministry of Interior and the Ignalina NPP discussed and resolved the issues of coordination of the INPP emergency preparedness plan. On October 29, the plan was approved by the Ministry of Economy of the Republic of Lithuania.

An emergency preparedness inspection of the Ignalina NPP was conducted in December 2007, aimed at checking the efficiency of the Ignalina NPP emergency preparedness plan in exercises. Basically, the exercise went smoothly. However, the participants of the inspection noticed certain drawbacks that were recorded in the inspection statement and sent to the INPP management.



*ECURIE level 3 international exercise.*

## EMERGENCY PREPAREDNESS OF VATESI

In 2007, 50 VATESI communication exercises, 5 international communication tests and one international exercise arranged by the EC were held.

Most of the international communication exercises took place after working hours with a view to checking the potential of authorized institutions for responding to emergencies any time of the day.

On December 12, ECURIE level 3 international exercise was arranged by the EC in which





*ECURIE level 3 international exercise.*

specialists from VATESI Emergency Response Center took an active part. The exercise scenario was fairly unusual, with an atomic submarine supposedly involved in the emergency. According to the exercise scenario a notification was received at 10.54 AM Lithuanian time to the effect that monitoring stations recorded a considerably increased level of radiation on the eastern coast of Ireland near Dublin. Information was provided later on to the effect that a submarine on fire discovered in the Celtic Sea was the source of increased radiation. Specialists used the software available at the ERC and established that there was a possibility of the radioactive releases approaching Lithuania in 84 hours. However, after the EC later on specified the data about the accident site, it was found that there was no real threat to Lithuania.

All information about the exercise from the EC as well as other countries participating in the exercise was received through the CoDecS system of information exchange. Communication with Lithuanian institutions was via fax and telephone. In addition to VATESI, the Ministry of Environment, the Fire and Rescue Department under the Ministry of Interior, the Radiation Protection Center and the Hydrometeorological Service participated in the exercise in Lithuania. After the results of the exercise and participants' comments were generalized, it can be maintained that the exercise was a success and that all the tasks were accomplished. It goes without saying certain shortcomings and inaccuracies were noticed that will have to be avoided during the next exercise.

A new edition of VATESI emergency plan was drafted in 2007. The plan remains basically the same. Only some of its parts and instructions were amended and supplemented.

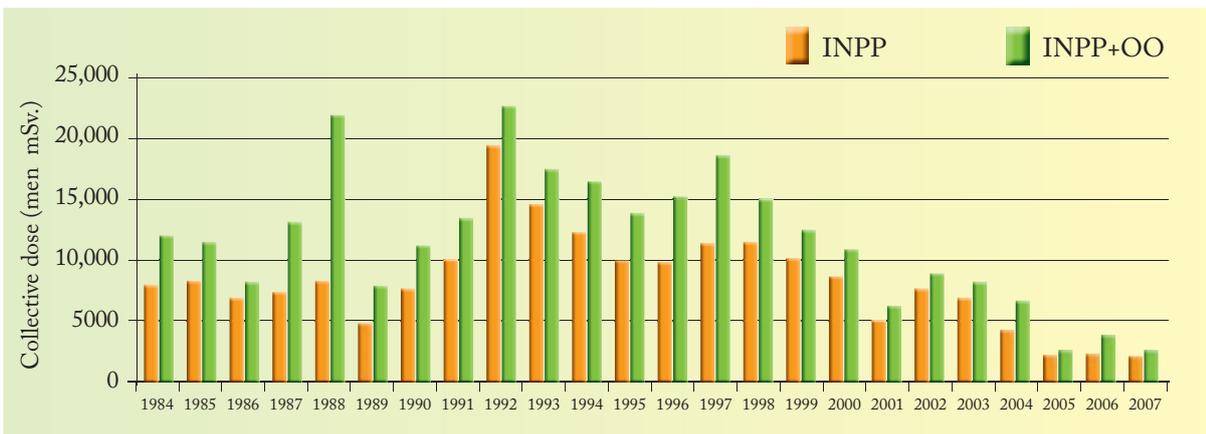
Whilst implementing its commitments under *The Convention on Early Notification* and ECURIE agreements, VATESI has successfully organized duty that ensures around-the-clock communication with international and Lithuanian institutions. VATESI trained five new duty officers in February. They received initial training consisting of theoretical and practical parts, after which their knowledge was examined and they were given practical tasks. The candidates who successfully passed the tests were appointed duty officers by the order of VATESI Head. There were 13 duty officers at VATESI as of the end of 2007.

## 22. RADIATION PROTECTION OF NUCLEAR POWER INSTALLATIONS

VATESI is the principal state institution that is carrying out the functions of control and supervision of nuclear power installations 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 installation (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 installation may pose. The nuclear power installation itself must have properties ensuring that the effects of ionizing radiation to the population and environment do not exceed the set limits both during normal operation and in case of an accident. Therefore VATESI is controlling compliance with license conditions and requirements set in safety regulations and standards during operation of such 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 facility in Lithuania. The results of the occupational exposure control, monitoring of radiological effects 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 2007, individual dosimetric control was applied to 3661 persons, including 2419 of INPP personnel. Distribution of external exposure collective doses in 1984–2007 is shown in Fig. 1.



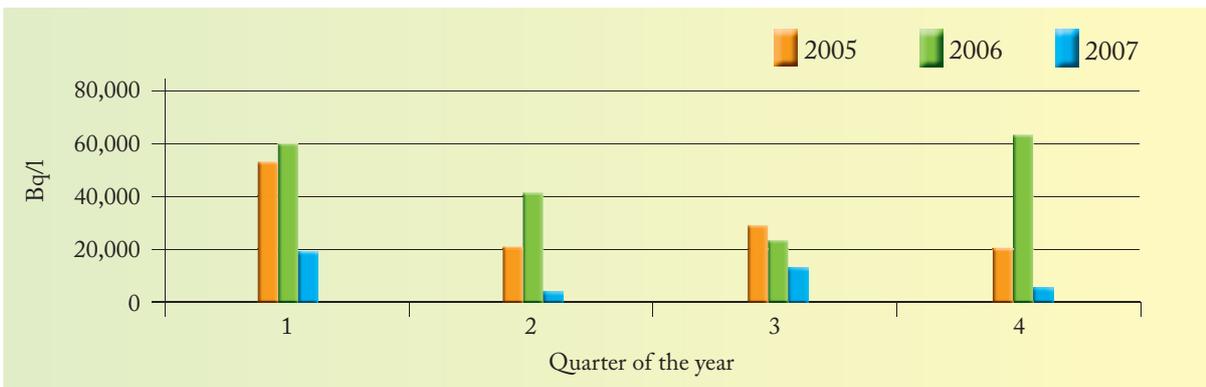
**Fig. 1. ANNUAL COLLECTIVE DOSES OF INPP AND OTHER ORGANIZATIONS (OO) PERSONNEL**

After Unit 1 was shut down, the collective personnel’s exposure dose decreased in 2005–7. The largest collective dose is received during annual outage. Therefore the duration of this work is very important. In 2007, the annual collective dose of INPP and contractor organizations’ personnel was 77% of the planned annual dose. In the course of the annual outage in Unit 2 the collective dose was 65.2% of the personnel’s overall exposure dose. The mean individual dose of the INPP and contractors’ organizations in 2007 was 0.71 mSv. Of all the personnel of the INPP, an employee of the reactor department was subjected to the largest dose (17.97 mSv). The largest individual dose received by an employee of contractors’ organizations was 9.87 mSv. These doses did not exceed the set limit of 20 mSv.

To protect the environment and at the same time all the population, emissions from the Ignalina NPP into the atmosphere and Lake Drūkšiai are restricted. In the course of radiation monitoring conducted at the Ignalina NPP emissions were found to be very much below permissible levels. In 2007, emissions of inert gases into the atmosphere were 0.56%, those of radioactive aerosols 0.08%, and those of 131I 0.86% of the permissible level. The total emission of radionuclides into Lake Drūkšiai was 7.4% of the set limit. Evaluation of the dose received by the critical group of population in 2007 showed that the received dose resulting from emissions into the atmosphere and the lake was sixty times lower than the dose set in the standard document LAND 42-2007. The established dose rate in the sanitary protection and monitoring zones ranged from 0.07 to 0.16 µSv/h, i.e. was the same as the natural background radiation.

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

Since 1994, radiological monitoring of the facility has been conducted, with exposure doses and environmental pollution being observed on a continuous basis. Tritium (<sup>3</sup>H) is the most important radionuclide at the Maišiagala repository. It accounts for more than 70% of the overall activity. The maximum activity of tritium in observation wells of the Maišiagala repository by quarters of 2005–7 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 2005–7**



In order to further reduce the possibility of radionuclides entering the atmosphere, additional protection barriers that prevent ingress of water into the facility were installed in the repository with assistance from an international project, and the monitoring system was updated in 2004–6. The repository was covered with a denser 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 repository, not only radionuclide composition but also chemical composition of samples will be analyzed in accordance with the updated program of monitoring. As can be seen from Fig. 2, tritium concentration in observation wells considerably reduced after additional barriers were constructed. It proves that the additional barriers are efficient and that they reduce migration of radionuclides from the repository.

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

In 2007, VATESI continued cooperation with the Institute of Physics (FI); the Nuclear Installations Safety Laboratory (NISL) and the Laboratory of Nuclear Engineering Problems (LNEP) of the Lithuanian Energy Institute (LEI); the Department of Thermal and Nuclear Energy (DTNE), the Institute of Energy Technologies (IET), the Department of Engineering Mechanics, and the Strength and Fracture Mechanics Center (SFMC) of Kaunas University of Technology (KTU); the Laboratory of Nuclear Hydrophysics, the Department of Physics, the Materials Strength Department (MSD), the Laboratory of Numerical Simulation (LNS) and the Research Institute of Welding and Materials Science of Vilnius Gediminas Technical University (VGTU); the State Institute of Information Technologies (VITI); UAB ITECHA, and other organizations.

Lithuanian TSOs provide VATESI expert services in assessing safety of nuclear power installations, drafting legal documents and doing other work.

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 Council coordinates expert assistance of TSOs to VATESI, stimulates activities related to development of industrial infrastructure and the country's scientific-technical potential, and training of specialists in nuclear energy. 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 Institute of Chemistry, the State Institute of Information Technologies (SIIT), UAB ITECHA and UAB Scientific Research Center of Electromagnetic Compatibility. 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, 2006.

**The Institute of Physics (FI)** in 2007 was implementing the program funded from the state budget *Development of techniques to improve nuclear cycle safety and environmental impact analysis*, the programs funded by the Lithuanian State Science and Studies Foundation *The harmful effects of ionizing radiation on biomolecular systems*, the program funded by the Metrology Service *Developing metrology of ionizing radiation*. I. *Creating a state standard of a radionuclide activity unit*, the study funded by the Radiation Protection Center, *Assessment of radioecological and ecotoxicological condition of Lake Drūkšiai as the cooling pond of the Ignalina NPP*, *forecast of biological effects on flora and fauna of radionuclide ionizing radiation during operation of the NPP and after its decommissioning*, and *conducting comprehensive radiological studies of the NPP's environment (land flora, fauna, soil, groundwater, potable water, food, air, the dose of external radiation) with a view to determining radiation effects on the population and environment in the region of the Ignalina NPP*, as well as the studies funded by the Environmental Protection Agency *Studies of the equivalent dose rate of ionizing radiation with the use of the AGIR system and Radiological studies of air in the zone of direct impact of the Ignalina NPP*. Specialists of FI also participated in the EU-funded PHARE projects *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 *Support to the Radiation Protection Center related to radiation safety at the Ignalina NPP during decommissioning*. In addition to that, FI took part in the following work related to nuclear and radiation safety:

- Review of documents of beyond-design-basis accidents analysis at INPP. The work was done jointly with specialists from KTU and VGTU.
- Developing a program of radiological studies of INPP installations and equipment (jointly with LEI).
- Conducting comprehensive radiometric studies and developing scientific analysis for the closed Maišiagala Radioactive Waste Repository (ordered by RATA).

- Establishing properties of uranium-erbium fuel, parameters and transfer of radionuclides in the compartments of the Ignalina NPP (ordered by VGTU).
- Analysis of radiological effects of design-basis accidents at the Ignalina NPP (ordered by LEI).
- A study of nuclide composition of decommissioning waste from building G1 and developing a method for assessing activity (ordered by the Ignalina NPP).
- A study of nuclide composition of decommissioning waste from building 117/1 and developing a method for assessing activity (ordered by the Ignalina NPP).
- A study of nuclide composition of decommissioning waste from building V1 and developing a method for assessing activity (ordered by the Ignalina NPP).
- Application of radiochemical methods to distinguish hard-to-measure radionuclides from complex matrices when identifying the nuclide vector (ordered by the Ignalina NPP).
- A study of nuclide composition of solid radioactive waste at the Ignalina NPP and developing a method of activity assessment (ordered by the Ignalina NPP).

One of the key areas of activity of the **Laboratory of Nuclear Engineering Problems (LNEP, LEI)** is work related to assessment of environmental impact and safety of intermediate storage facilities for SNF under construction, and radioactive waste processing and storage facilities.

In 2007, LNEP specialists continued work on 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 2007, after LNEP specialists coordinated the Environmental Impact Assessment Report with appropriate institutions, it was approved by the Ministry of Environment. The preliminary Safety Analysis Report was submitted to appropriate institutions for review.
- *The new facility for treatment and storage of solid radioactive waste at the Ignalina NPP.* In 2007, the environmental impact assessment study and the preliminary safety analysis report for this facility were developed and submitted to competent institutions.
- *Converting the bituminized radioactive waste storage of the Ignalina NPP (building 158) into a repository.* In 2007, a feasibility study of the project was performed (a long-term safety justification).

In 2007, LNEP specialists began implementing the following projects:

- *Developing programs of detailed radiological studies of installations in blocks B1, D0, D1 and building 119 of the INPP.* Specialists of LNEP and FI gathered and analyzed data on radiological situation in the above compartments of the INPP and started developing the Microsoft Access database in which all data necessary for characterizing the equipment and drawings with indicated dose measuring and sampling points will be accumulated. Programs of detailed radiological studies of the above compartments were developed. All accumulated data was handed over to the Ignalina NPP for review.
- *Producing a digest of general documents pursuant to Article 37 of EURATOM treaty for the projects of a new SNF storage facility and facility for managing and storing solid radioactive waste at the Ignalina NPP.* Whilst implementing the project, LNEP specialists drew up the report *Data submitted to the European Commission on activities related to radioactive waste retrieval from the intermediate SNF storage and facility for managing and storing solid radioactive waste at the Ignalina NPP.* The report has been submitted to appropriate institutions for review.
- *Analysis and optimization of radiation effects in dismantling installations and managing radioactive waste at the INPP.*

In 2007, the project *Developing the program of environmental impact assessment for a new nuclear power plant* was commenced and completed. Specialists from LNEP and Pöyry Company, Finland, drew up a program of environmental impact assessment for a new nuclear power plant in Lithuania, presented it to the public and coordinated with appropriate organizations. The Ministry of Environment approved the program.

The Laboratory's specialists participated in 2007 in implementation of the project *Preparing documentation for decontamination and dismantling of INPP building 117/1.* LEI has been working on the project jointly with experts from the United Kingdom and Germany. Specialists from the LNEP have been taking part in preparing environmental impact and safety assessment programs. The CORA-CALCOM code was mastered with a view to assessing in detail the dismantling procedure and the related costs.

Specialists of the LNEP continued active work in implementing the scientific research projects coordinated by the IAEA *The Use of Numerical Models in Geological Characterization and Safety Assessment of Deep Geological Repository Sites, Safety Assessment and Justification in Decommissioning Nuclear Installations (DESA), Safety assessment driving radioactive waste management solutions (SADRWMS), and Application of Safety Assessment Methodologies for Near-surface Waste Disposal Facilities (ASAM).*

The Laboratory's scientists also participated in the work of the IAEA organizing committee developing an international database on irradiated graphite, in the activities of nuclear installations decommissioning experts of the EC Joint Research Center, and in the EU project *BP6 Fundamental Processes of Radionuclide Migration (FUNMIG).*



Scientists from the **Nuclear Installations Safety Laboratory (NISL)** of LEI in 2007 not only took an active part in the work related to safe operation of the Ignalina NPP, but also addressed the issues of construction of a new NPP and assessment of nuclear safety. The Laboratory's specialists were involved in the Ignalina NPP decontamination and dismantling projects that are also important for the construction study of a new nuclear facility. Simultaneously with the construction of a new NPP, the decommissioning of the Ignalina NPP and construction of storage facilities for radioactive waste of different levels will be carried out on the same site. Therefore when implementing these projects it is necessary to ensure that the facilities of the new NPP and the plant being closed do not negatively affect each other either in constructing/dismantling, or in operating them. It is also necessary to justify safety of the new NPP and the facility being closed.

In 2007, the Laboratory's scientists continued active participation in the SARNET network of excellence within the framework of EU BP6, aimed at integrating research on severe accident phenomenology and management in Europe, in the NULIFE network of excellence, intended for developing the methodology for managing the lifetime of nuclear installations, in the PHEBUS FP research program intended for safety of water-cooled nuclear reactors and research in severe accidents, as well as in the new promising thermonuclear energy program FUSION that has been the focus of great interest. It should be noted that the Laboratory's scientists continued research in the IRIS project of development of a new-generation nuclear reactors that are important in producing a study for the construction of a new reactor in Lithuania. Scientists from NISL also participated in the research program coordinated by the IAEA of new-generation safe, economically effective reactors *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.*

In 2007, work was continued within the framework of LEI agreements with *Inspecta Nuclear AB*, Sweden, *LEI Assistance to VATESI in Review of the Documentation of PULS 03 and GREAT Projects.* The attitude of Sweden's public and politicians towards the prospects of nuclear energy development has been radically changing recently. In early 2008, the decision was announced of the plans to build 4 new nuclear reactors in Sweden to replace the power facilities whose service life is coming to an end. A program of increasing the capacity of NPPs has been intensely implemented. Specialists of NISL have been taking part in PULS 03 and GREAT projects aimed at increasing the capacity of Oskarsham (reactor of BWR type) and Ringhals 3 (reactor of PWR type) operational in Sweden. The principal objective of LEI scientists implementing agreements with *Inspecta Nuclear AB* is to conduct a review of thermohydraulic and strength computations. Lithuanian scientists when participating in this work familiarize themselves with specific character of reactors of different types, Sweden's and international requirements for design documentation and safety justification of reactors of different types. The Laboratory specialists' experience will come in handy when building a new NPP in Lithuania.

Scientists from NISL also participated in the following international projects:

- B9-0 Producing the decontamination and dismantling project for INPP building 117/1 (consortium comprising *BNG Project Services, Nukem Technologies GmbH* ir LEI).
- Analysis of confinement of accidents at the Ignalina NPP (ordered by GRS mBH).
- Review of improvements and modifications by the NPP using RBMK reactors, analysis of operational experience and scenarios of selected accidents (ordered by GRS mBH).
- Technical assistance in issuing a license for operation of the Ignalina NPP (in partnership with Serco Assurance).

In 2007, the Laboratory's experts helped implement and participated in the following national projects aimed at improving safety at the Ignalina NPP:

- 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.
- Justification of the procedure *Hot scram following a complete breakdown of power supply for NPP's own needs.*
- Rejection of sensors based on results of the 2007 diagnostics in Unit 2.
- The assessment of probability of graphite-pressure tube gap closure in individual reactor cells in INPP Unit 2.
- Improvement of three-dimensional calculation of distribution of energy released.
- Development of a set of tools intended for picking of spent fuel debris in the hot cells of Ignalina NPP.
- Probabilistic safety analysis of the Ignalina NPP.
- Producing a safety justification package for the emergency protection/fast power reduction rod drives of the diverse shutdown system of the Ignalina NPP.
- Review of documents submitted to VATESI by the Ignalina NPP related to the changes in the configuration, physical properties and control of the reactor core, as well as other issues of reactor physics, storage and management of nuclear fuel.

The following divisions of **Kaunas University of Technology (KTU)** participated in activities related to upgrading of nuclear safety in 2007: **the Department of Thermal and Nuclear Energy (DTNE), the Institute**

of Energy Technologies (IET), the Department of Engineering Mechanics and the Strength and Fracture Mechanics Center (SFMC). The following work was done in 2007:

- The study *Developing a procedure for assessing the influence of human factors on safety assurance and review of the procedure for assessing human factor submitted by the Ignalina NPP* (ordered by VATESI). The procedure for assessing the impact of human factors on safety assurance was produced that will be used in safety analysis and assessment of modifications in newly built and already operational nuclear power installations. *The Procedure for assessing human factor* was reviewed and comments, conclusions and recommendations were submitted.
- A review of the report by the Ignalina NPP *Analysis of thermohydraulic accidents considering reactor loading with uranium-erbium fuel of 2.6% and 2.8% enrichment in INPP Unit 2*.
- A study of the need for nuclear energy specialists necessary for the construction, operation and service infrastructure of a new nuclear power plant, and of the possibilities to train them. The personnel structure of already operational new NPPs and their service infrastructure was analyzed in the study, as well as the demand for specialists in Lithuania's institutions related to nuclear energy, and training schedules of nuclear energy specialists by year were drawn up.
- The study *Technical decisions regarding potential reactors of a new nuclear power plant on the site envisaged for construction*. The replies by potential manufacturers of the equipment for a new NPP to the questions submitted were analyzed in the study and additional information was identified that will be necessary in order to select technologies and to take decisions as regards organization of a new tender. At the same time the use of Lake Drūkšiai for cooling steam condensers was analyzed. This issue may be of great importance in selecting technologies for the would-be NPP.
- A review of the report on radiation effects of design-basis accidents in case of the increase in mean burnup in the reactor core when uranium-erbium fuel is used. The report was produced and audit computations envisaged. The work was done in accordance with an agreement with VGTU, a VATESI contractor.
- A review and independent assessment of analysis of beyond-design-basis accidents at the Ignalina NPP and supplementary documents of their management (*A list of beyond-design-basis accidents, the manuals on beyond-design-basis accidents Ensuring reactor cooling and Pressure reduction in the reactor cavity, and accident analysis documents justifying them*).
- Experts from DTNE and IET participated in VATESI special inspection *Check on implementation of measures of design-basis and beyond-design-basis accident management in compliance with items 21, 32, 33, 34, 35, 45 and 48 of SIP-3/2007 program*.
- Support to VATESI in licensing activities related to decommissioning of the Ignalina NPP. KTU was involved as a subcontractor of *Riskaudit* in implementation of part 1 of the project, a review of the licensing documentation submitted by the Ignalina NPP.

The Institute of Energy Technologies of KTU participated in the IAEA mission of management of nuclear knowledge in Lithuania on March 26–30, 2007. The work being done at KTU and the potential for managing knowledge were presented to the IAEA experts.

**The Department of Engineering Mechanics of KTU** conducted a study of the container servicing platform resistance to dynamic loads in the event of a protection cask with spent nuclear fuel dropping. Its aim was to determine the ability of 632 servicing platforms in the INPP reactor Unit compartments A1 and A2 to withstand a load of a 115-tonne cask with SNF falling upon it from a height of 200 mm. A numerical analysis was performed of dynamic strength of the platforms' reinforced concrete elements while simulating a situation of a cask containing SNF dropping upon them.

**The Strength and Fracture Mechanics Center (SFMC) of KTU** performed the safety review of metal control of installations and piping of INPP Unit 1 during unloading of fuel. They also participated in review of certification reports of safety-related systems of the Ignalina NPP.

Specialists from **the Laboratory of Numerical Simulation (LNS)**, and **the Laboratory of Strength Mechanics (LSM) of Vilnius Gediminas Technical University (VGTU)** took part in designing the building for the solid waste retrieval facility of the Ignalina NPP. They also conducted static and seismological computations.

Specialists of the Institute of Welding and Material Research Problems (IWMRP VGTU) continued the study *Review of documents related to analysis of BDBAs at the INPP*. A group of VGTU experts jointly with scientists from the FI are analyzing the procedures for managing beyond-design-basis accidents produced by the Ignalina NPP. The Head of IWMRP together with other experts representing Lithuania participated at the 6<sup>th</sup> Non-destructive Testing Conference arranged by the IAEA in Budapest on October 8–10, 2007.

Specialists of **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*.

Scientists from the Laboratory of Nuclear Hydrophysics and the Department of Physics performed expert review of the report by the Ignalina NPP *Analysis of design-basis accidents in the Ignalina NPP Unit 2 in the event of the reactor loaded with uranium-erbium fuel of 2.8% enrichment*.



Experts from the **State Institute of Information Technologies (SIIT)** in 2007 were implementing the following safety improvement projects:

- Modifications in control circuits of emergency pumps of deaerators.
- Management of ageing of instrument and control tools in nuclear power plants (MAGIC).
- Producing the assembly scheme for manual control of hydrogen.
- The system of determining coolant leaks in the compartment of resistant structure of the Ignalina NPP Unit 2.
- Expert review of reports on certification of safety-related systems produced by the Ignalina NPP in accordance with the *Requirements for certification of safety-related systems of nuclear power installations* VD-E-10-2001.

Pursuant to the agreement signed in 2007 with RISKAUDIT, SIIT started providing assistance to the Armenian Nuclear Regulatory Authority (ANRA). Lithuanian scientists have been evaluating design decisions, conducting an expert review of SARs in modernizing and renewing the reactor protection system, the system of regulating the reactor power and in reconstructing the reactor control panel at the Medzamor 2 NPP.

Experts from **UAB ITECHA** in 2007:

- Completed the review begun in 2005 under the EU-supported project 2004/016-925-05-01.01 *Support to VATESI During Review and Licensing of New Servo Drives' Design and Commissioning in INPP Unit 2*.
- Participated in the expert review of reports on certification of safety-related systems at the Ignalina NPP (under subcontractor agreement with the SIIT).

Activities of the **Scientific Research Center of Electromagnetic Compatibility** in 2007 were related to safety improvement of the Ignalina NPP Unit 2. The Center's specialists did the following work:

- Modification of 12 BO (the Russian abbreviation) scram units.
- Designing additional circuit for the protection alarm in manual scram at set 2 of the Ignalina NPP Unit 2 in accordance with the technical specification PTO mod-1633-9 of October 13, 2006.
- Design and manufacture of mimic displays with two types of light-emitting diodes for the seismic protection system.
- *The project of transferring the alarm mimic display 2HZ01Z25 in the control panel of Unit 2 in accordance with MOD107-02-819 technical specification TAC-1633-33.*

## 24. INTERNATIONAL CONVENTIONS, LAWS AND SECONDARY LEGISLATION

### INTERNATIONAL CONVENTIONS

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

Srl. No.	Title	Legal status
1.	<b>The 1968 Treaty on the Non-Proliferation of Nuclear Weapons</b>	Lithuania joined it by Resolution No. I-1492 of the Seimas on September 23, 1991.
2.	<b>The 1959 Agreement on the Privileges and Immunities of the IAEA</b>	Ratified on December 14, 2000, by Law No. IX-78.
3.	<b>The 1963 Vienna Convention on Civil Liability in the Field of Nuclear Energy.</b>	On November 30, 1993, the Seimas declared it having the force of law in Lithuania. (Law No. I-314.)
4.	<b>The 1988 Joint Protocol Relating to the Application of the Vienna Convention and Paris Convention.</b>	On November 30, 1993, the Seimas declared it having the force of law in Lithuania. (Law No. I-314.)
5.	<b>The 1986 Convention on Early Notification of a Nuclear Accident.</b>	The Government of the Republic of Lithuania joined the Convention on October 13, 1994. (Government Resolution No. 972.)
6.	<b>The 1994 Convention on Nuclear Safety.</b>	Lithuania joined the Convention on November 16, 1993. (Order of Prime Minister of Lithuania No. 778p.)

Srl. No.	Title	Legal status
7.	<b>The 1979 Convention on Physical Protection of Nuclear Materials.</b>	Ratified by the Seimas on October 17, 1995. (Resolution No. I-1063.)
8.	<i>The Comprehensive Nuclear Test Ban Treaty.</i>	Ratified by the Seimas on October 28, 1999. (Law No. I-1372.)
9.	<i>The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.</i>	Ratified by the Seimas on July 20, 2000. (Law No. VIII-1882.)
10.	<b>The 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management</b>	Ratified by the Seimas on December 18, 2003. (Law No. IX-1921.)
11.	<b>The 1997 Convention on Supplementary Compensation for Nuclear Damage.</b>	Signed on September 30, 1997.
12.	<b>Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage.</b>	Signed by Law No. I-314 of the Seimas dated September 30, 1997.
13.	<b>Agreement Between the Kingdom of Belgium, the Kingdom of Denmark, the Federal Republic of Germany, Ireland, the Republic of Italy, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the European Atomic Energy Community and the International Atomic Energy Agency in Implementation of Article III, (1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons.</b>	Ratified by Law No. X-1051 of the Seimas dated March 13, 2007.
14.	<b>Protocol Additional to the Agreement between the Republic of Austria, the Kingdom of Belgium, the Kingdom of Denmark, the Republic of Finland, the Federal Republic of Germany, the Hellenic Republic, Ireland, the Italian Republic, the Grand Duchy of Luxembourg, the Kingdom of the Netherlands, the Portuguese Republic, the Kingdom of Spain, the Kingdom of Sweden, the European Atomic Energy Community and the International Atomic Energy Agency in implementation of Article III, (1) and (4) of the Treaty on the Non-Proliferation of Nuclear Weapons</b>	Ratified by Law No. X-1051 of the Seimas dated March 13, 2007.

Changes to the **Convention on Physical Protection of Nuclear Materials** were submitted to the Seimas for deliberation in 2007. Lithuania will strive to ratify them in 2008.

## 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. Other laws directly relating to safe operation of nuclear energy, are as follows: the **Law on Radioactive Waste Management**, the **Law on Radiation Safety**, the **Law on Control of Import, Export and Transit of Strategic Goods and Technologies**, the **Law on Civil Protection**, the **Law on Construction**, etc.

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

- **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

The current legislation governing the use of nuclear energy for peaceful purposes is mostly intended for the Ignalina NPP. Therefore there is immense amount of work to be done. Currently valid legal documents need to be reviewed so that they can adequately regulate design, construction and operation of a new nuclear power plant.

On June 28, 2007, the **Law on the Nuclear Power Plant of the Republic of Lithuania** was passed. Its objective is to identify provisions of implementation of a new NPP project, as well as to create legal, financial and organizational provisions for implementation of the project. Work was commenced in 2007 on changes to the **Law on Nuclear Energy**. In 2008 VATESI is going to draft the Law on Nuclear Safety.

## 25. 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.

Meetings of the Contracting Parties under the Convention on Nuclear Safety are held every three years. The fourth meeting is to be held in Vienna in April 2008.

In 2007, VATESI in cooperation with the Ministry of Environment, the Ministry of Health (the Radiation Protection Center), the Ministry of Internal Affairs (the Fire and Rescue Department), and the Ignalina Nuclear Power Plant, produced the fourth national report of Lithuania (<http://www.vatesi.lt/en/news.html>). On September 24–25, Organizational Meeting of the Contracting Parties under the Convention was held at the International Atomic Energy Agency. The participants were divided into six groups. Lithuania was appointed to group 4 together with Argentina, Australia, Croatia, the Czech Republic, India, Ireland, Mali, Singapore, and Russia.

Reports of the member countries were reviewed. Lithuania had 15 questions to other countries, and its representatives had to answer 90 questions/comments.

The countries in the group reviewing the Lithuanian report and other countries expressed a favorable opinion of the way issues of safety culture and motivation of the Ignalina NPP personnel are addressed and the measures being implemented, and referred to them as an example of good practice. The efforts aimed at ensuring the safety of the single operational Unit at INPP after Unit 1 was shut down in late 2004, were also viewed favorably. Foreign specialists consider VATESI activities related to the provisions of the National Energy Strategy and the Law on a New Nuclear Power Plant another example of good practice.

## 26. NUCLEAR SAFETY REGULATION IN THE EUROPEAN UNION

On January 10, 2007, the European Commission submitted the EU the Nuclear Illustrative Programme. In October, the Programme was approved with the necessity indicated of creating tools common to the EU to ensure nuclear safety, including a High-Level Group on Nuclear Safety and Waste Management (HLG). The EU Council of Ministers on May 8, 2007, in view of the provisions regarding the lines of safety improvement in the EU set forth in the report by the Working Party on Nuclear Safety (WPNS), urged the EC to set up a High-Level Group on issues of nuclear safety and radioactive waste management.

The objective of HLG activities is to produce and recommend common provisions on the EU nuclear safety, safety of radioactive waste, decommissioning and spent nuclear fuel. The group shall, in its activities, make use of experience already gained when cooperating with different international organizations such as the IAEA, OECD/NEA and WENRA, as well as conclusions drawn at review meetings of the Convention on Nuclear Safety and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Not later than three years after setting up, the group shall submit the EC its report on activities.

The EC established the HLG on July 17, 2007, and its first meeting was held on October 12. Heads and specialists of institutions supervising nuclear safety and safety of nuclear waste represent the EU Member States in the HLG. Lithuania is represented in the HLG by the Head of VATESI and his Deputy. In 2007, the

HLG discussed its regulations, drafted a program of activities for the first deliberation, and made decisions as regards setting up of working groups in three areas of activities:

- Group on nuclear safety improvement, to be chaired by the United Kingdom.
- Group on safety improvement of radioactive waste management, decommissioning and spent nuclear fuel, to be chaired by France.
- Group on public information and transparency to be chaired by Ireland.

VATESI delegated its representatives to the first two groups. The HLG will strive to make the most use of the results of WENRA activities, identify priority areas of nuclear safety upgrading in the EU, and produce proposals regarding regulation of nuclear safety in the EU.

## 27. LITHUANIA HAS JOINED THE IAEA BOARD OF GOVERNORS

In September 2007, at the IAEA 51<sup>st</sup> General Conference in Vienna, Lithuania was elected to the Agency's Board of Governors for a two-year term. Lithuania and Albania were nominated by the Eastern European regional group on the basis of a memorandum signed by a group of countries representing the region.

The IAEA Board of Governors has 10 permanent Member States, the remaining members are elected. Lithuania and Albania became the Board of Governors members for the first time.

Pursuant to the agreement between Lithuania, the IAEA and EURATOM ratified by the Seimas, Lithuania in 2007 made a transition from bilateral safeguards to trilateral. Transition to application of comprehensive safeguards was another important step in the history of relations between Lithuania and the IAEA. It means, without going into technical details, that Lithuania is entering a higher level of international confidence in the light of the Treaty on the Non-Proliferation of Nuclear Weapons. Activities related to supervision of safeguards in the country have been gradually reducing, which shows its reliability in the field of non-proliferation of nuclear weapons. At the same time Lithuania is getting more opportunities of improving cooperation conditions, the investment climate and other factors that are conducive to economic development.

Another equally important area is participation in developing the IAEA safety standards. VATESI is represented in two safety standards committees (NUSSC and WASSC), in expert groups and is preparing to join the IAEA Commission on Safety Standards in 2008.

Lithuania's membership in the IAEA Board of Governors will help enhance its international prestige as a country using nuclear energy, planning to use it in the future and competent in honoring all its international commitments. Participation in activities of the IAEA Board of Governors will enable to contribute to improvement of the IAEA management. In addition to that Lithuania will be able to use the IAEA forum for implementing strategic goals of the state.

## 28. VATESI PARTICIPATION IN ACTIVITIES OF WESTERN EUROPEAN NUCLEAR REGULATORS' ASSOCIATION

The Western European Nuclear Regulators' Association (WENRA) was established in 1999. Heads and specialists of regulating institutions of countries that use nuclear energy participate in the Association's activities. The initial goal of establishing WENRA was to perform an independent review of nuclear safety and its regulation in EU candidate countries, Bulgaria, the Czech Republic, Hungary, Lithuania, Romania, Slovakia and Slovenia, as well as to work out common principles of nuclear safety regulation applicable to the European Union. In October 2000, WENRA produced a safety assessment report of the above countries.

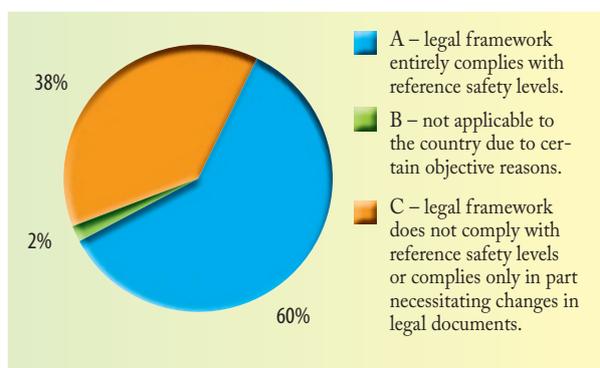
At WENRA plenary meeting held in Paris in the spring of 2003, new aims of the Association activities were approved and new members admitted. Since then, nuclear safety regulation institutions of Belgium, Bulgaria, the Czech Republic, Finland, France, Germany, Hungary, Italy, Lithuania, the Netherlands, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, and the UK have been represented in the Association. Representatives of regulating institutions discuss in WENRA events the issues of safety regulation and harmonization of supervision, they exchange information important in terms of safety and experience, and envisage the lines of safety improvement. WENRA's activities are open, it informs the EU institutions about the work done. Representatives of nuclear safety and radiation protection institutions of the countries that do not have nuclear power plants are also invited to its meetings. Dana Drabova, the Head of Nuclear Safety Regulatory Authority of the Czech Republic, has been chairing WENRA since November 2006.



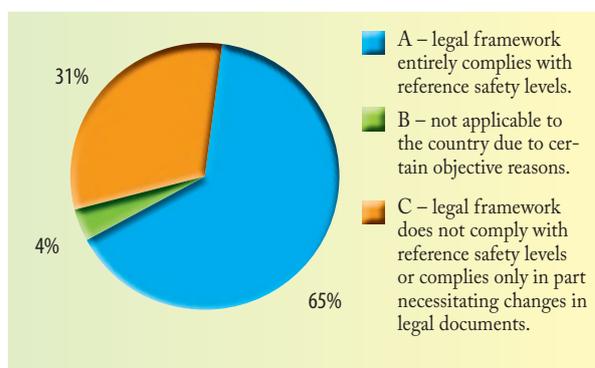
Two working groups are functioning in WENRA, the Reactor Harmonization Working Group (RHWG), and the Working Group on Waste and Decommissioning (WGWD). Lithuania joined these in 2004. After WENRA approved reference safety levels for 18 areas of reactor safety prepared by RHWG, all the countries of RHWG produced in 2006 and presented their harmonization action plans. In accordance with these, the level of nuclear safety in the EU Member States by 2010 will be harmonized with WENRA reference safety levels. The first edition of reference safety levels was issued in January 2006. Next year, the WENRA countries reviewed the safety reference levels and approved a new edition in which changes were made concerning management and safe activities at nuclear power installations taking into consideration comments from other organizations and enterprises engaged in the area of nuclear energy, as well as the new requirements of the IAEA. VATESI, in its turn, has been participating in WENRA activities and coordinating harmonization of national requirements in the area of nuclear safety and radioactive waste management.

In 2007, the WGWD member countries analyzed legal framework of their respective countries and compared these in terms of compliance with the reference safety levels for operation of storage facilities and decommissioning of nuclear power installations. To ascertain whether or not all the countries interpret the set reference safety levels in the same way, the countries were divided into four groups and had to review reports prepared by other countries of the group about themselves. Three meetings of the WGWD were held in 2007, during which the review was conducted and proposals were drafted regarding adjustment of reference safety levels.

The results of assessment of Lithuania's legal framework in terms of compliance with safety reference levels are shown in Figs. 1 and 2.



**Fig. 1. COMPLIANCE OF LEGAL FRAMEWORK FOR RADIOACTIVE WASTE STORAGE FACILITIES WITH REFERENCE SAFETY LEVELS**



**Fig. 2. COMPLIANCE OF LEGAL FRAMEWORK FOR DECOMMISSIONING WITH REFERENCE SAFETY LEVELS**

## 29. INTERNATIONAL TECHNICAL COOPERATION PROJECTS

### IAEA REGIONAL AND NATIONAL PROJECTS

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

In 2007, VATESI coordinated Lithuanian specialists' participation in nine IAEA European regional projects of technical cooperation in the field of nuclear safety and nuclear energy:

- RER/0/026 – Support for the Introduction of Nuclear Energy.
- RER/4/027 – Strengthening Capabilities for Nuclear Power Performance and Service Life including Engineering Aspects.
- RER/9/076 – Strengthening Safety and Reliability of Nuclear Fuel and Materials in Nuclear Power Plants.
- RER/9/082 – Safety Requirements and Responsibilities for Design Basis Documentation and Configuration Management.
- RER/9/084 – Effectiveness of Regulatory Authorities and Advanced Training in Nuclear Safety.
- RER/9/085 – Capacity Building for Upgrading Nuclear Security Related National Infrastructure.
- RER/9/087 – Harmonization of Probabilistic Safety Assessment Applications.
- RER/9/088 – Strengthening Safety Assessment Capabilities.
- RER/0/091 – Establishment of National Capabilities for Response to a Radiological and Nuclear Emergency.

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

In 2007, while engaged in the above projects, Lithuania's representatives participated in 33 events outside the country, including 22 working meetings, 8 training courses, 2 technical meetings and 1 workshop. Fifty-three 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 2007:

- The working meeting *Challenges and Opportunities Related to the Establishment of a new NPP in the Baltic Region* (within the framework of RER/9/026) was held in Vilnius on June 26–28.
- The working meeting *Communicating with stakeholders of NPP operating organizations related to construction of new NPPs and life extension* (within the framework of RER/4/027) was held in Vilnius on October 1–5.
- The working meeting *Operating Experience Feedback for Regulatory Bodies* (within the framework of RER/9/084) was held in Vilnius on October 22–26.

Specialists from Armenia, the Czech Republic, Estonia, Finland, Hungary, Latvia, Poland, Romania, Russia, Slovakia, Switzerland, Ukraine, and the IAEA participated in the above-mentioned events.

Thirty international events have been envisaged in 2008 for the above-mentioned projects including a number of meetings, courses and consultations important and interesting to Lithuanian specialists. Two of these, the workshop *Safety Requirements, Technology Assessment and the Bidding Process for New NPPs* (within the framework of RER/0/026), and the training course *Basic Professional Training Course on Nuclear Safety* (within the framework of RER/9/084), are planned to take place in Lithuania.

### The IAEA National Project for Lithuania

In 2007, VATESI initiated a new national project by the IAEA *Enhancing capabilities in VATESI and other institutions in the licensing of a new NPP*, LIT/9/009. As a result of active cooperation between specialists from VATESI and the IAEA, approval was granted for the project in late 2007. The measures envisaged in the project are to be implemented in 2008–2011, and the funds are to be allocated by the IAEA (USD 400,000), VATESI (USD 80,000), and the Ministry of Economy (USD 50,000).

To accomplish LIT/9/099 project, missions by the IAEA experts are to take place in the course of which issues important to safety of the new nuclear power plant will be assessed, the IAEA workshops and training courses on topical issues of licensing and safety assessment of the new NPP will be held, and employees from VATESI and other institutions engaged in the NPP licensing process will be sent for in-service training at nuclear safety and radiation protection regulating authorities abroad.

### THE EU-SUPPORTED PROJECTS FOR VATESI

VATESI was preparing, planning or implemented in 2007 five EU support projects (Table 1). Implementation of three projects was ongoing, two of these were successfully completed in the fall of 2007, and two new EU support projects were under preparation:

- The transition facility *Support to VATESI in safety assessment of Ignalina Nuclear Power Plant* (No. 2006/018-183-03-01).
- Project of the Ignalina program *Support to VATESI in licensing activities related to decommissioning of Ignalina NPP (Stage five)* (No. PI/2005/1.1).

TABLE 1. PROJECTS BEING IMPLEMENTED BY VATESI

Project No.	2005	2006	2007	2008
1. 2004/016-925-05-01-01				
2. 2003/5812.04.02				
3. 2006/018-183-03-01				
4. PI/2005/1.1				
5. <i>Support to VATESI in licensing activities related to the decommissioning of the Ignalina NPP (stage 5), (initiated)</i>				



**1. 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 project implementation began on November 30, 2005, and was finished in September 2007. The principal objectives of the Project:

- Providing support to VATESI in assessing safety justification documents and licensing the newly installed automatic shutdown system during initial operation, assessing the experience gained and rendering support to VATESI in controlling introduction of changes in the Diverse Shutdown System (DSS).
- Providing support to VATESI in reviewing and licensing the design of the new drives of the DSS, and assuring that the rod control drives of the DSS meet the most stringent safety requirements.

The project progress and its results are thoroughly described in the publication *Installation of a Diverse Shutdown System (DSS) at Ignalina NPP Unit 2: Assessment and licensing of the system.* One can find the publication on VATESI website [www.vatesi.lt](http://www.vatesi.lt).

The project was worth € 249,948.

**2. The PHARE project *Support to VATESI and its TSOs in Assessment of Beyond Design Basis Accidents for RBMK-1500 Reactors, No.2003/5812.04.02.***

The project implementation began on November 30, 2005 and was completed in October 2007. The principal objectives of the project:

- To assess the amounts of irradiated radionuclides in RBMK-1500 reactor fuel.
- To analyze the performance 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.

The project was worth € 649,620.

**3. The transition facility project *Support to VATESI in Safety Assessment of Ignalina NPP, No. 2006/018-183-03-01.***

The principal objective of the project is to enhance capabilities and know-how of VATESI necessary for safety assessment of nuclear power installations.

In accordance with the Project Fiche approved by the resolution of the European Commission No. K(2006) 3357, dated July 31, 2006, the simulation of reactor processes was to be continued with the most recent techniques used. However, the Ignalina NPP itself initiated similar work in 2007. Therefore in order to avoid redundancy, VATESI consulted with the Ministry of Finance and Central Project Management Agency concerning changes in the terms of reference set forth in the project description. VATESI took into consideration recommendations of the above institutions and proposed a new draft description of the project. Without changing the principal objective of the project, supervision of the Ignalina NPP is to be enhanced in the following priority areas:

- Ensuring safety of SNF management.
- Ensuring reliability of reactor control systems.
- Ensuring structural integrity of safety-related systems of the Ignalina NPP.

The EC is expected to approve the changes to the Project Fiche and an open international tender will be announced. The project value will be set in the service contract.

**4. 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 project started in April 2007 and is to be completed in December 2008. The principal objectives of the project:

- Continuing support to VATESI in review of documents related to licensing of INPP decommissioning activities.
- Obtaining support from Western European experts in review of documents submitted for the INPP decommissioning.

The project is worth € 649,620.

**5. Project of the Ignalina program *Support to VATESI Licensing Activities Related to the Decommissioning of the Ignalina Nuclear Power Plant (Stage five).***

Principal objectives of the project are the same as those of other stages: support from Western European experts in reviewing the Ignalina NPP decommissioning documents. The project is to be implemented in 2009–2010. The project value will be set in the service contract.

## BILATERAL COOPERATION WITH NUCLEAR SAFETY REGULATORY INSTITUTIONS OF OTHER COUNTRIES

### 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 VATESI 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 could 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.



*Visit of SKI delegation on May 9, 2007.*

Cooperation between VATESI and SKI is based on 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. Per Bystedt, a SKI expert, is also a member of the International Cooperation Group of VATESI.

In May 2007, SKI delegation with Directress General, Judith Melin, in charge visited VATESI. At the meeting, the most topical issues of nuclear safety regulation in Sweden and Lithuania were discussed, information was exchanged about the planned organizational changes in SKI and VATESI, and principles of bilateral cooperation were harmonized.

### Cooperation between VATESI and Radiation and Nuclear Safety Authority of the Republic of Finland

Cooperation between VATESI and Finland's Radiation and Nuclear Safety Authority (STUKA) has been going on for years.

On May 2–3, 2007, a delegation of Lithuanian specialists visited STUK and the construction site of Olkiluoto-3 NPP. The Lithuanian specialists familiarized themselves with the legal framework and infrastructure of nuclear safety regulation in Finland and the principles of regulation. They also displayed interest in the process of Olkiluoto-3 licensing, safety requirements that are being applied, the safety assessment of the NPP design and state supervision of the construction. As preparations are under way to increase VATESI resources in view of construction of a new NPP in Lithuania, it was very useful to learn about the volume of additional work by STUK related to construction of Olkiluoto-3, the technical support received by the authority for assessment of the new facility's safety and resources allocated for this purpose.

On May 3, 2007, Lithuanian specialists visited the Olkiluoto NPP again. They were interested in the problems of design and construction of the new facility, specific features of an international consortium, etc.

At present, cooperation between VATESI and STUK is extremely important, as Finnish colleagues share their valuable experience in state regulation of nuclear safety of the NPP under construction. In the future, study visits of VATESI specialists to STUK are planned with a view to get more thoroughly acquainted with specific features of individual regulation areas and the supervision that is being conducted during construction of the new NPP.



*Olkiluoto Nuclear Power Plant.*



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

The following projects of support to VATESI were being implemented by the Department of Trade and Industry of the UK in 2007:

### **DTI project L8 – *Management of severe accidents***

On March 13–15, a workshop was held at VATESI on issues of review and assessment of documentation related to management of severe accidents. Specialists from Serco Assurance shared their experience on issues of accident analysis, important physical phenomena, strategies of accident management, human factor, etc. at the workshop. They also informed about international experience in the area of severe accident management, consulted VATESI and its TSOs on issues that arose in the course of review of INPP documentation on severe accident management (management manuals and their safety justifications). All the work under the project was successfully completed.

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

The objective of the project 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 terms of reference (VATESI had submitted a separate project proposal for this task). The project was broken down into five tasks, two of which, *Upgrading assessment of zirconium alloy screening in RBMK-1500 reactor* and *Updating of VATESI electronic document management system*, were completed in 2006. The task *Upgrading assessment of burnup in a RBMK-1500 reactor* was accomplished in 2007. Work on the project is due to be completed in early 2008.

### **DTI Project L23. *Support to VATESI on Issues of Nuclear Material Transportation***

The work envisaged under the project was successfully completed in 2007. In the course of implementation of the project, VATESI was rendered support in the area of regulation of nuclear material transportation.

While implementing task one of the project, the current system of regulation of radioactive and nuclear material transportation in Lithuania was assessed, including the functions and areas of responsibility of various national institutions. Correspondence of this procedure to international legislature, agreements and EU directives was verified, and this procedure was also compared to international regulation procedures imposing similar nuclear material transportation requirements in other EU Member States. In an effort to identify the drawbacks, Lithuanian regulation procedures were compared to those of radioactive material transportation in the UK and Germany and to the IAEA standard documents.

While implementing task two, the approval methodology was developed for all packaging constructions and consignments that need to be approved by a competent Lithuanian institution as required according to the IAEA Regulations for the Safe Transport of Radioactive Material Safety Requirements No. TS-R-1. In an attempt to define the volume of institutional responsibility for packaging construction and consignment, the IAEA Safety Requirements TS-R-1 were examined. The Safety Requirements are binding, therefore only negligible non-compliances with regulations and practices established by them are allowed.

The methodology proposed was prepared considering the presence of two competent institutions responsible for nuclear and radioactive material licensing activities in Lithuania (VATESI and RPC). The key matter considered in the course of preparation of this methodology is a demand to describe the materials (fissile and non-fissile) in a precise manner and to clearly distinguish materials in accordance with their purpose and derivation (nuclear and non-nuclear purpose materials).

All the aspects of the competent institution's involvement, as defined by the IAEA requirements TS-R-1, are explicated in the methodology, with a diagram guiding prospective applicants in selection of the competent institution to be contacted on commencement of the approval process included. Information requirements provided by the methodology will assist both the competent institution and the applicant in making sure the IAEA requirements TS-R-1 are met.

Within the framework of task three of the project the methodology was produced for assessing the safety of the radioactive material package construction and consignments, the current and future needs of assessment were analyzed in accordance with the IAEA TS-R-1 requirements, and a review was conducted of professional skills, training and experience necessary to those conducting assessment. It was emphasized that a person carrying out assessment must possess adequate skills and experience, and be well versed in the IAEA TS-R-1 requirements, in particular those related to the definite area of assessment. Other work was done whilst implementing this task of the project. Among other things, potential training requirements were discussed and suitable providers of training services were named, calculations were made of the time required for assessing the safety of package construction and consignment, resources available at VATESI were reviewed that the Inspectorate can allocate for assessing the submitted applications, and the number of applications that may be

received in the future was forecast. In addition to that, interest was displayed in the equipment other countries have for testing package construction and the need for Lithuania to purchase such equipment in the future.

Within the framework of task four of the project, an infrastructure was proposed for regulating transportation of radioactive material, with boundaries clearly delineated between institutions, the functions of functions of VATESI and RPC in transportation of radioactive material were discussed, and nuclear fuel cycle materials were clearly defined. Based on the analysis of legislature performed during task one and on the methodology developed in the course of task two, a recommendation was made to use the term *nuclear fuel cycle material* that would define more precisely the boundaries of responsibilities between VATESI and RPC. The main objective of the recommendation is to assign to VATESI competence all activities related to nuclear material and radioactive material resulting from the nuclear energy generation process (activated and contaminated substances), including transportation of material and waste. The following changes in the regulation system were proposed:

- Concrete functions shall be given to every competent institution.
- Functions envisaged in the Law on Nuclear Energy and the Law on Radiation Protection shall be separated.
- Responsibilities shall be specified set forth in the Law on Radioactive Waste Management for granting licenses to transport radioactive material.
- The above changes shall be integrated into secondary legislation.
- Requirements shall be prepared and approved for packages and consignments of nuclear fuel cycle materials.

After laws, resolutions and orders were reviewed, recommendations were submitted as regards changes to be made in the Law on Ratification of International Agreements Regarding Transportation of Dangerous Freights, the Law on Nuclear Energy, the Law on Radiation Protection, the Law on Radioactive Waste Management, the Regulations Governing the Activities with Sources of Ionizing Radiation, the Regulations Governing Export, Import, Transit and Transportation within the Country of Radioactive Materials and Radioactive Wastes, and the Provisions for Licensing Nuclear Energy Activities, as well as regarding draft requirements for nuclear fuel cycle material package and consignments. When the changes are introduced, the functions of VATESI and RPC as competent authorities in transporting radioactive materials and granting licenses for transporting radioactive materials and radioactive wastes will be specified.

## 30. ACTIVITIES OF 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:



VATESI ICG meeting held on April 26, 2007.

- 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 Lawrence Berkeley National Laboratory, the USA, and other institutions participate in the activities of VATESI ICG.

The Head of VATESI, Gytis Maksimovas, was elected ICG Chairman, and SKI expert, Per Bystedt, his Deputy.

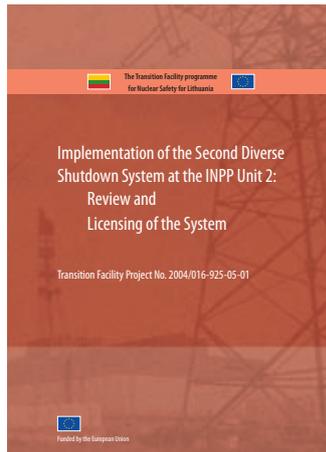
Two meetings of ICG were held in 2007, on April 26 and October 8. VATESI preparation to execute additional work related to construction of a new nuclear power plant, was discussed at the meetings. In addition to that, the projects of beyond-design-basis accident management at the Ignalina NPP and introduction of new servo drives were assessed, safety assessment of the Ignalina NPP decommissioning projects and implementation of SIP-3 were reviewed. The participants also shared their views on the most important events at NPPs.



## 31. PUBLIC INFORMATION

Assessment of the consequences of the approaching final decommissioning of the Ignalina NPP to the country's energy economy and all its economic safety was one of the hottest topics of discussion dealt with in Lithuanian media in 2007. The public discussions that were taking place were inspired by the ever-growing public interest in nuclear energy that is becoming increasingly popular worldwide.

Lithuania has declared its ambition to remain a nuclear state. Our country has been encouraging an ecological and sustainable attitude towards development of energy. Lithuania is getting ready to implement the project of construction of a new nuclear power plant on its territory with its partner states, Latvia, Estonia and Poland. That is why the public has been more and more eager to receive as comprehensive information on issues of nuclear energy as possible. Discussions are especially heated as regards construction of a new nuclear power plant. It remains one of the key topics of the country's media that interests every consumer of electricity and every citizen alike.



### The 2007 publication by VATESI Implementation of the Second Diverse Shutdown System at the INPP Unit 2: Review and Licensing of the System.

2004/016-925-01-01. The publication is in Lithuanian and English, its electronic version in the pdf format can be found on VATESI website [http://www.vatesi.lt/fileadmin/documents/leidiniai/lt/Phare\\_brosiura\\_LT\\_2008.pdf](http://www.vatesi.lt/fileadmin/documents/leidiniai/lt/Phare_brosiura_LT_2008.pdf).

VATESI prepared in 2007 press releases and communications on topical issues of nuclear safety and radiation protection in Lithuania, provided information to the public about the condition of the Ignalina NPP and other nuclear power installations of the country. The Inspectorate's representative participated in workshops on issues of public information in Lithuania and abroad, improved her skills of public information in the ECURIE (system of urgent exchange of information about critical radiological situations) exercises arranged by the EC at the Emergency Response Center of VATESI.

VATESI website was updated in 2007. The most important information on all issues of the Inspectorate's activities, nuclear safety and emergency preparedness, as well as information on legislature related to nuclear energy issues is presented there. VATESI website that is being supplemented on a continuous basis also contains comprehensive information about Lithuania's nuclear energy installations, international cooperation in the area of nuclear safety and implementation of international projects. Besides, the visitors are offered information about the nuclear power plant that is to be built, as well as facilities for managing and storing radioactive waste. Visitors to the website can familiarize themselves with all publications, information material and reports by VATESI, and download the electronic versions of these.

Good news is that the interest of the media representatives and the public in issues of nuclear safety and radiation protection has been. The condition of the still-operational Unit 2 at the Ignalina NPP, the aspects of safe operation, the general state of nuclear safety in the country, all kinds of issues related to radiation protection, the activities of VATESI itself and important issues it was addressing also received considerable attention in 2007. Such topical issues were analyzed as improvement of nuclear safety at the INPP whose operation is about to discontinue, and management of the generated radioactive waste. The media also focused its attention on projects of the INPP Unit 1 decommissioning, as well as economic and social impacts of the decommissioning.

The EU has been providing substantial support in upgrading of nuclear safety at the Ignalina NPP through projects of the PHARE program and special projects. One of these, introduction of a diverse shutdown system (DSS) in the Ignalina NPP Unit 2, was completed in 2007. Now the Unit has two completely separated and diverse shutdown systems. Therefore if an emergency occurs and one of the systems fails to respond, the other one will shut the reactor down and thus neither the population nor the environment will be endangered.

With a view to informing the public about the project objectives, progress in implementation and importance in terms of safety improvement, the publication *Implementation of the Second Diverse Shutdown System at the INPP Unit 2: Review and Licensing of the System* was issued in 2007. The key aspects of the DSS installation and licensing are described in the brochure.

This publication intended for the general public was produced within the framework of the transition facility project *Support to VATESI during Review and Licensing New Servo Drives' Design and Commissioning at INPP Unit 2*,



VATESI website.

## LIST OF ABBREVIATIONS

ANRA	– Armenian Nuclear Regulatory Authority
BDBA	– Beyond Design Basis Accident
DSS	– Diverse Reactor Shutdown System
DTI	– Department of Trade and Industry (presently BERR – Department for Business, Enterprise and Regulatory Reform) the UK
ENAC	– Early Notification and Assistance Conventions
ERC	– Emergency Response Center
EURATOM	– European Atomic Energy Community
FI	– Institute of Physics
GRS	– German State Nuclear Reactor Safety Consulting Association
HLG	– High-Level Group on Nuclear Safety and Waste Management
IAEA	– International Atomic Energy Agency
INES	– International Nuclear Event Scale
INPP	– Ignalina Nuclear Power Plant
IPSART	– International Probabilistic Safety Assessment Review Team
IRSN	– French Institute of Nuclear Safety
KTU	– Kaunas University of Technology
LEI	– Lithuanian Energy Institute
NRC	– U.S. Nuclear Regulatory Commission
NUSS	– Nuclear Safety Standards
OECD	– Organisation for Economic Co-operation and Development
PIV	– Physical Inventory Verification
PSA	– Probabilistic Safety Assessment
QMS	– Quality Management System
RAMP	– Review of Accident Management Programs
RATA	– Radioactive Waste Management Agency
RHWG	– Reactor Harmonization Working Group (WENRA)
RW	– Radioactive Waste
SAR	– Safety Analysis Report
SIIT	– State Institute of Information Technologies
SIP-1, SIP-2, SIP-3	– Safety Improvement Programs 1, 2 and 3
SKI	– Swedish Nuclear Safety Regulatory Authority
SNF	– Spent Nuclear Fuel
SNFS	– Interim Spent Nuclear Fuel Storage of Dry Type
SSI	– Swedish Radiation Protection Authority
STUK	– Radiation and Nuclear Safety Authority of Finland
TSO	– Technical Support Organization
VGUT	– Vilnius Gediminas University of Technology
WASSC	– Waste Safety Standards Commission
WENRA	– Western European Nuclear Regulators' Association
WGWD	– Working Group on Waste and Decommissioning (WENRA)
WPNS	– Working Party on Nuclear Safety



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ANNUAL REPORT 2007

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